MEMORANDUM

March 21, 1996

To: The Faculty.

From: Bishop Hunt,
      Faculty Secretary

About: Meeting

The eighth and final regularly-scheduled meeting of the Faculty Senate will convene at 5:00 p.m. on Tuesday, April 2 in Maybank 100.

Agenda

Speaker’s Report

Committee on Nominations and Elections: elections of 1996-97 senate committees and the Ad Hoc Committee on General Education; nominations for the 1996-97 Committee on Nominations and Elections

Academic Standards Committee: “grading and tracking of external pre-approved-program student records”

Curriculum Committee

Faculty Welfare Committee: bicycle traffic on campus

Constituents’ Concerns

Remaining Regularly-Scheduled Meetings for Spring, 1996

Faculty Senate: April 2 (Maybank 100)

Full Faculty: Monday, April 22 (Recital Hall, Simons Center for the Arts)
Speaker’s Report

April 2, 1996

1) The Department of Mathematics will host the April Sherry Hour at the Faculty House, 20 Glebe St., in honor of Professor Emeritus, James P. Anderson. Jim will be there, along with his portrait, which now resides in the dining room of the Faculty House. Please join us there at 4:30 p.m., Thursday, April 4.

2) You have the “New Program Policy” which is part of your packet for this meeting. Please look it over and forward any comments to me.

3) We will need to have another Senate meeting in order to conclude action on this year’s business. The plan is to recess today’s meeting at a convenient time and reconvene in two weeks, April 16, same time and place. I am anticipating additional items for the agenda of the April 16 meeting. You will receive an agenda and packet for the April 16 meeting one week ahead as is required by our by-laws.
February 16, 1996

To: Bob Mignone
   Speaker

Fr: David Cohen
    Associate Provost

Re: New Program Policy

The Provost is considering the adoption of the attached policy for inclusion in the Academic Affairs Policy Manual. This policy gives faculty developing new curricular programs a sense of the internal and external calendar requirements that need to be met to assure appropriate approvals. This policy has already been reviewed and approved by the Deans and Directors in Academic Affairs.

As you know the Provost has some discretion about what policies are referred to the Senate for review. Our original intention was simply to put it into effect. After the discussion with the Deans however it was suggested that I send it along to the Senate. It certainly contains useful information about the process for initiating and approving new programs.

You may want to refer it to a committee. You may simply supply it as information to the senate. Let me know. Thanks.
New Program Proposals

0.0 CONTENTS
1.0 Purpose
2.0 Definitions
3.0 Internal Development, Review and Approval of the Program Concept Letter
4.0 Internal Development, Review and Approval of the Program Proposal
5.0 Calendar For Internal Review and Approval
6.0 Commission on Higher Education Approval Process

1.0 PURPOSE

The Commission on Higher Education (CHE) has approved a revision of the policies and procedures governing the submission of new academic program proposals (November 1994). The Board of Trustees and the general administration of the College of Charleston require internal review and approval of new academic programs. This policy outlines the format, the calendar and the approval requirements for new program proposals. Simultaneously with the issuance of new procedures, the CHE published *Policy and Procedures Concerning New Programs Manual* (November 1994). Copies of this manual are kept in the Provost's Office.

The CHE approves new programs using the following procedures: submission of a Program Concept Letter, submission of a Full Program Proposal, review by the Advisor.

2.0 DEFINITIONS

2.1 New Programs --- offerings which lead to the conferral of a degree or the establishment of any administrative unit such as an institute or research center engaged in research, public service or instruction.

2.2 Program Concept Letter --- replaces the Letters of Intent; the Program Concept Letter is submitted to the CHE at the beginning of the institutional planning process. The purpose of a Program Concept Letter is to inform the College community and the CHE of the possibility of developing a new academic program proposal and submitting it to internal, College review and approval as well as CHE review and approval.

2.3 New Program Proposal --- whether describing a degree program or an academic unit, the Program Proposal is submitted to the CHE once the internal College review and approval process (including Board of Trustees approval) has been completed.

2.4 Program Modifications --- The CHE expects to review program modifications such as the extension or transfer of a program to another site, the addition of new concentrations within a major, the elimination of majors or concentrations,
consolidation of majors and substantive modifications of majors or concentrations.

3.0 INTERNAL DEVELOPMENT, REVIEW AND APPROVAL OF THE PROGRAM CONCEPT LETTER

3.1 The Program Concept Letter should contain: justification of the proposed program; anticipated program demand and productivity; assessment of possible duplication with other programs; relationship to other College programs; relationship to other programs at other institutions; information about faculty credentials; costs broken down into new cost vs. redirected cost summaries; total cost summaries. The proposal should be in the form of a letter from the President of the College to the chief executive officer of the Commission on Higher Education.

3.2 Deans and department chairs should notify the Provost of their intention to develop Program Concept Letters well in advance of submitting the letters for internal review and approval. Once the Program Concept Letter has been written, the department chair and/or dean of the school where the program resides submits the Letter to the Provost for review and approval six weeks prior to date the Letter will be submitted to the CHE. The Program Concept Letter should include statements of support from the academic dean and the Graduate Dean (as appropriate). The Provost may reject Program Concept Letters. The Provost will submit the cover letter to the President of the College for final review and signature. Submission of a Program Concept Letter to the CHE in no way commits the College to the new program but simply signals the intention of the College to develop a new program. Full administrative and faculty review and approval must take place prior to the implementation of any new academic program (see below).

4.0 INTERNAL DEVELOPMENT, REVIEW AND APPROVAL OF THE PROGRAM PROPOSAL

4.1 It is the responsibility of the department chair or the Dean in the area where the new program will reside to develop a Program Proposal. The draft covers the following elements: cover page, classification, justification, enrollment projections, curriculum, faculty, physical plant, equipment, library resources, accreditation, estimated costs. The CHE requires a specific format for a Program Proposal which appears in its Manual (Appendix A).

4.2 Chairs and Deans developing proposals should review them with the Associate Provost (for undergraduate proposals) or the Director of Graduate Programs (for graduate proposals) prior to beginning the internal review and approval process (below). These officers have examples of proposals from other units in the school and from other institutions in South Carolina. They may send the proposals for informal review from the CHE staff. They will assure that the proposals are in the appropriate format with all the required elements.

4.3 Each department where a proposal resides should review and approve the proposal. The dean of the school where a proposal resides should review and approve the proposal.
4.4 Proposals for graduate programs should be reviewed by the Faculty Committee on Graduate and Continuing Education and approved by the Graduate Council. Proposals for undergraduate programs should be reviewed by the Faculty Curriculum Committee. The Faculty Senate will review and approve all proposals.

4.5 Once the faculty review process has been completed, the proposal will be reviewed and approved by the Provost, the President and the Board of Trustees. Each proposal should have a signature sheet for noting the appropriate approvals as identified in steps 4.3, 4.4 and 4.5.

5.0 Calendar for Internal Review and Approval

The CHE approval process requires a minimum of one year from the time of submission of a Program Concept Letter until approval of a new program by the Commission. The CHE has two deadlines, November 1 and May 1, each year for receipt of Program Concept Letters and Program Proposals.

5.1 Program Concept Letter

Draft Program Concept Letters must be submitted to the Provost six weeks prior to the deadlines for submission to the CHE.

5.2 Program Proposal

The table below contains a schedule for internal review for New Program Proposals. The schedule represents the minimum time required for review/approval. New program development requires ongoing consultation among all parties and therefore often takes a great deal of time.

<table>
<thead>
<tr>
<th>CHE Submission Deadline</th>
<th>May 1</th>
<th>November 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Departmental development</td>
<td>Summer, early Fall</td>
<td>Winter, early Spring</td>
</tr>
<tr>
<td>Academic deans review</td>
<td>early Fall</td>
<td>early Spring</td>
</tr>
<tr>
<td>Graduate Dean review</td>
<td>early Fall</td>
<td>early Spring</td>
</tr>
<tr>
<td>(graduate prgm. proposals only)</td>
<td>early Fall</td>
<td>early Spring</td>
</tr>
<tr>
<td>Draft proposal sent to CHE for staff review (optional but encouraged)</td>
<td>early Fall</td>
<td>early Spring</td>
</tr>
<tr>
<td>Curriculum Committee reviews (undergrad. prgm. proposals only)</td>
<td>Fall</td>
<td>Spring</td>
</tr>
</tbody>
</table>
6.0 Commission Approval Process

A Program Concept Letter in the hands of the Commission by November 1 will be reviewed by its Advisory Committee on Academic Programs the following January. A final Proposal based on this Program Concept Letter and in the hands of the Commission by May 1 will be reviewed by the Advisory Committee on Academic Programs the following July. It will be reviewed by the Committee on Academic Affairs in October and the full Commission in November (a minimum of one year after the initial Program Concept Letter was submitted).

A Program Concept Letter in the hands of the Commission by May 1 will be reviewed by its Advisory Committee on Academic Programs the following July. A final Proposal based on this Program Concept Letter and in the hands of the Commission by November 1 will be reviewed by the Advisory Committee on Academic Programs the following January. It will be reviewed by the Committee on Academic Affairs in April and the full Commission in May (a minimum of one year after the initial Program Concept Letter was submitted).
Memorandum

To: All Faculty Senators

From: Committee on Nominations and Elections

Re: Ad Hoc Committee on General Education

Date: March 22, 1996

The Committee on Nominations and Elections recommends the election of the following slate of candidates to the Ad Hoc Committee on General Education:

Arts:
Diane Johnson      Art History
Al Lyndrup         Theater

Business & Economics
Roger Daniels      Accounting & Legal Studies
Paul Jursa         Economics

Education:
Andy Lewis         Physical Education
Monica Janus       Educ. Found. & Spec.

Humanities & Social Sciences:
Lynne Ford         Political Science
Todd Grantham      Philosophy

Sciences & Mathematics:
Henry Donato       Chemistry
Arch McCallum      Biology
Memorandum

To: All Faculty Senators
From: Committee on Nominations and Elections
Re: Senate Committees
Date: March 22, 1996

The Committee on Nominations and Elections recommends the election of the following slate of candidates to the Standing Senate Committees:

**ACADEMIC PLANNING**
7 faculty members, majority must be faculty senators

- Cherry, Lynn
- Courson, Frances (S)
- Grantham, Todd
- Jones, Martin (S)
- Kaiser, Charles (S)
- McBroom, Deanna
- Morrison, Susan (S)

- English & Communications
- Educational Foundations & Specializations
- Philosophy
- Mathematics
- Psychology
- Music
- Biology

**BUDGET**
7 faculty members, majority must be faculty senators

- Donato, Henry
- Friedman, Doug (S)
- Leclerc, Anthony
- Livingston, Tom
- Olejniczak, Bill (S)
- Sarvate, Dinesh (S)
- Wilder, Hugh (S)

- Chemistry
- Political Science
- Computer Science
- Economics
- History
- Mathematics
- Philosophy

**BY-LAWS**
3 faculty members, majority must be faculty senators

- Doig, Marion (S)
- Hunt, Bishop (S)
- Parson, Jack

- Chemistry
- English & Communications
- Political Science
Proposal to the Faculty Senate
Re: Credit for coursework taken as part of an external pre-approved program.

The Faculty Committee on Academic Standards, Admissions and Financial Aid proposes the following policy, to be included in the Policy and Procedures Manual of Student Records:

All coursework taken as part of an external pre-approved program (specifically the International Student Exchange Program, the National Student Exchange Program and the Bilateral Exchange Program) be considered for credit and academic enrollment status the same as if it were completed at the College of Charleston. The Senior Year Residency requirement is not altered in any way by this policy.

Rationale

Currently all students participating in the above-mentioned programs receive transfer credit for coursework taken at the host institution. In particular, such students do not receive credit for “D” work at the host institution. This practice violates federal regulations governing programs for which students are eligible for federal financial aid. The result is that our students cannot get federal financial aid for any of these programs and so some students are effectively excluded from these programs on financial grounds.

The proposed policy has the advantage of making these exchange programs available to more of our students and the disadvantage of requiring us to lower our standards by accepting credit for D’s awarded at other institutions. The Academic Standards Committee concluded that the advantage outweighed the disadvantage. For acceptance into any of these programs, a student must meet minimum GPA requirements (2.5 for NSE, 2.75 for ISEP, 3.0 for Bilateral Exchange) and must have two letters of recommendation from faculty. The College of Charleston requires that all courses that the student plans to take be pre-approved by the relevant department and the Dean of Undergraduate Studies. All three of these agreements give us the option of refusing to accept any course. If a student, while at an exchange institution, takes a course which has not been pre-approved, then that course falls outside the agreement, and may be considered for transfer credit only.

The proposed policy does not affect coursework taken elsewhere for transfer credit (we would still give credit only for grades of C or better) and it does not affect coursework taken under the cross-registration agreement (as we already accept all grades taken under this agreement as if they came from the College of Charleston).

For the reference of faculty senators, some supporting material is attached.
MEMORANDUM

TO: Bill Anderson, Registrar

FROM: Deborah D. Eulater, Acting Director
Student Intercultural Programs

RE: Compliance with Federal Regulations

DATE: January 22, 1996

I met with Donald Griggs concerning the treatment of credits and grades for students who participate in Study Away Programs such as National Student Exchange (NSE), International Student Exchange (ISEP), Independent Exchange and other Bilateral Programs. As a result of that meeting I am requesting that the College develop a policy concerning the treatment of credits and grades of students who study away. Since we encourage students to participate in these programs we should be in compliance with the regulations.

Federal regulations governing disbursement of Title IV financial aid funds require that the student’s home institution must give credit for the courses taken at the schools on the basis as it would for coursework taken at the home school; it cannot be treated differently in any way. This includes coursework in which the grade was usually low (generally a "D"), but would have been accepted had the student taken the same course and earned the same grade at his/her own institution.

Don has agreed to forward a copy of the 1995-96 Federal Student Aid Handbook from the National Association of Student Financial Aid Administrators (NASFAA) to provide additional support when you present a proposal to the Provost concerning this matter.

Thank you for your assistance. If additional information is needed please do not hesitate to call. Looking forward to a response as soon as possible.

cc: Sue Sommer-Kresse
    Donald Griggs
    David Singleton
TO: Bill Anderson, Registrar

FROM: Donald R. Griggs, Director

DATE: January 19, 1996

RE: "Study Away Programs"

As requested in our meeting yesterday with Deborah Euland, I am providing this memo of endorsement and recommendation to support your proposal to the Provost concerning the treatment of credits and grades for students who are participating in any "Study Away Program" such as the International Student Exchange, National Student Exchange, Study Abroad Programs, and individualized consortia programs which are entered into individually with students who wish to study elsewhere. The experiences students can take advantage of are enormous and the College has made a decision to encourage students to participate. The U. S. Department of Education also supports such activity and certainly the Office of Financial Assistance wants to serve these students as well.

The issue: Federal regulations state that if the institution has signed an agreement to participate in any of these programs or has entered into an individual student consortia agreement with the student and a host institution, then that means the College has determined that the courses are acceptable and equal to courses taken on our campus. With that determination made, then the credits and grades for these courses must be treated exactly the same as they would be had the student sat in classes here at the College.

Action Needed: In order for me to approve federal financial aid for any of these programs, I must have on file in my office written confirmation from the academic side of the house that the College does in fact comply with these regulations. This certification can simply be in the form of a memo from you to me and that will satisfy the auditors and federal program reviewers. It is important to note that during our annual audits the College must be able to show that this procedure is in fact being practiced.
Attached please find a copy of the guidance provided in the 1995-96 Federal Student Aid Handbook and a summary provided earlier this fall from the National Association of Student Financial Aid Administrators (NASFAA). I hope this information is helpful in differentiating between the treatment of transfer credit and credits under one of the special programs.

For the legal perspective, I have discussed this matter with Andy Abrams and he concurs that probably the wisest thing to do is to comply with the regulation because certainly the College does not want to deny aid to students who wish to participate in these programs.

As soon as we receive your certification that the College will comply with these regulations, my office will begin certifying students for the up-coming summer. Please note that we are already getting inquiries and a decision is needed soon. Thank you for your help in this matter.

Enclosures: 2

CC: Sue Sommer-Kresse
    Deborah Eufland
    David Singleton
Some institutions have recently experienced federal program review questions regarding the treatment of courses taken under written agreements. Under a written agreement as described in section 600.9 of the institutional eligibility regulations, an institution can allow its students to take part of their programs at another institution. Written agreements can be between an eligible institution and other eligible institutions (also known as consortium agreements), or between an eligible institution and an institution that is not eligible to participate in the Title IV programs (also known as contractual agreements).

With a written agreement in place, the home institution can process federal student aid for the portion of the student’s program taken at the other institution. If the other institution is also an eligible institution, the agreement can stipulate that the other institution will process aid and maintain the appropriate records.

A written agreement can be a blanket document reflective of an ongoing formal agreement for any number of students in a particular program, or for students wishing to take advantage of a standing formal agreement which expands their choice of coursework. A written agreement can also be designed for an individual student under a one-time arrangement between two institutions.

The program review questions have centered on the treatment by the home institution (i.e., the institution from which the student will earn the degree or certificate) of courses taken at the institution with which it has the agreement. Section 600.9(b)(2) requires the home institution to give credit to students enrolled in the portion of their program provided by the other institution "on the same basis as if it provided that portion of the program itself." Apparently some institutions have been cited for two kinds of violations of this regulation.

In one type of violation, the home institution entered into written agreements to allow students to attend other institutions near their homes for the summer; these students were considered "visiting students" at the other institutions, and the home institution accepted credits under the same rules it applied to transfer students. That is, it would not give credit for a grade of 'D' received at the other institution, even though it gave credit for 'D' grades in its own courses. This practice is clearly contrary to the regulation. Regardless of the situation prompting the written agreement, the institution must comply with the requirement that courses be accepted on the same basis as if they were offered by the home institution. The underlying assumption is that the home institution has made a determination that the standards at the other institution are acceptable when it enters into the written agreement.

As a result, if a written agreement has been executed to allow the student to receive federal financial aid, the institution should not treat differently the student taking a summer course.
acceptable towards his/her degree at another institution for convenience, from the student taking part of a program formally arranged to be offered by another institution. Note however, that this requirement does NOT affect an institution's ability to assess coursework simply transferred from another institution with which no written agreement had been arranged; the institution is free to apply whatever academic standards it deems appropriate to transfer credits when no written agreement is involved.

The other type of violation involved the use of grades. In this instance, the home institution gave the student credit for the coursework taken under the written agreement, but did not use any of the grades to calculate the student's grade point average. The Department of Education does not consider this treatment to be consistent with the regulatory requirement to give credit on the same basis. Again, the assumption is that the home institution accepts the credit as if it had offered the course itself -- including the use of grades.

Other information about written agreements may be found in the 1993-94 Federal Student Financial Aid Handbook, pages 89 - 91 in chapter 3 and pages 41 - 42 in the new section of chapter 4 that was recently distributed to institutions.

By Joan Berkes, NASFAA
MEMORANDUM

To: William Anderson, Registrar
From: Edward C. McGuire, Dean
Date: February 1, 1996
Re: Policy Revision

I have read your proposal of February 1, 1996 regarding the awarding of grades to students who "study away".

It is with enthusiasm that I support your recommendation that we award students the grade given by the host institution.

We at the School of the Arts are encouraging our students to seek an international educational experience, and more and more of our students are doing so. Further, those "host" institutions are institutions of higher education that are among the finest.

To punish students who "study away" and to refuse to recognize the quality of host institutions seems to be doubly wrong. Let's do it!

M/H
Memo

To: Bill Anderson, Registrar

From: Nan Morrison

Date: February 7, 1996

Thank you for sending me a copy of the proposed revision of the policy governing transfer credit for students engaged in "study away" programs. I enthusiastically support this new policy.

Study abroad should not be a privilege enjoyed only by affluent students. If we must change our policy regarding transfer credit to enable our students to receive financial aid for study abroad, then we must do it.
MEMORANDUM

To: Bill Anderson

From: Gordon E. Jones

Date: February 5, 1996

Subject: Proposed Revision of Policy for "Study Away" Programs

Unless there are considerations that have not occurred to me, I concur with the proposal that College of Charleston comply with Federal regulations. Specifically, we should regard credit obtained by students under programs approved by the College as equivalent to credit taken on campus. To do otherwise, it seems to me would imply that we are not fully convinced of the value of study experiences abroad.

One of the strong recommendations of our SACS Self-Study is that the College do more to encourage students to broaden their perspectives by participating in student exchanges, especially those that take them into other cultures and countries. Clearly we must examine carefully each program that we approve for student credit, but once we have done so, there is little reason not to accept this credit as equivalent to what we offer on the campus.

/blh
MEMORANDUM

TO:       Bill Anderson, Registrar

FROM:     Hugh Wilder, Acting Dean, Humanities and Social Sciences

RE:       Proposed Policy Revision

February 5, 1996

Thank you for your proposal for changing College policy on grading and tracking “study away” program student records. I strongly endorse the proposed policy. It will allow our students to participate fully in study away programs, while having financial aid available to them.

The proposed policy states that “all course work taken as part of an approved ‘study away’ program” will be treated for grading and residency status as if it had been completed at the College. My only question concerns the term “approved”: By whom? According to what standards? Additional clarity on this point might help. But overall, adoption of the proposed policy will be an important improvement for students.
MEMORANDUM

To:         David Cohen
From:       Edward C. McGuire
Date:       February 6, 1996
Re:         Overseas Study

I want to reiterate that the School of the Arts' faculty and administration believe that the process our students must undergo in order to register for an overseas course is at best cumbersome and at worst bureaucratic.

By strongly encouraging students to study overseas, we are working diligently to adhere to President Sanders' vision of an institution focused on international issues. It is our judgement that the paper-work to register for an overseas experience both confines and discourages the faculty and the students.

M/H

cc:         William Anderson
November 2, 1995

Andy Laryea
Coordinator for International and Exchange Programs
College of Charleston
66 George Street
Charleston, SC 29424

RE: Compliance with Federal Financial Aid Regulations
Regarding Consortium Agreements

Dear Andy:

From conversations and correspondence with you, I understand that your campus is reviewing ways it can come into compliance with regulations governing disbursement of federally funded financial aid to students exchanging under a consortium agreement. As you know, of particular issue is the regulation which requires that if a campus provides federally funded financial aid to students exchanging under a consortium agreement (like NSE) then it is obligated to treat the work from the student’s host institution in the same manner as though earned at the home campus.

At its recent meeting, the NSE Council reviewed and approved a Position Paper which might be of assistance to you as you continue address this issue at your institution. The paper provides background information and articulates possible campus reactions to the federal policy and NSE response to these reactions.

You might like to know that out of NSE’s 133 members, 116 colleges and universities are in full compliance with the federal financial aid regulations governing acceptance of coursework taken on exchange. All but two of the remaining institutions are working to address this issue. If you have recently adopted a policy which allows you to comply with these regulations, I would appreciate receiving a copy of the policy and/or a memo from you indicating your campus is in compliance.

Thank you in advance for your attention to this matter. Let me know how I can be of assistance.

Cordially,

Bette Worley
Executive Director

Quality Service to Universities and Students Since 1968
Ms. Betty Worley  
Director  
National Student Exchange  
4656 West Jefferson, Suite 140  
Fort Wayne, Indiana 46804  

Dear Ms. Worley:

Thank you for your inquiries requesting clarification of a National Association of Student Financial Aid Administrators technical regulatory report on written agreements and visiting students. Because your inquiry has impact on the overall Title IV programs I am responding to your concerns. The report discusses several types of program review findings at institutions who establish written agreements between an eligible institution and another institution or organization under §600.9 of the Institutional Eligibility regulations.

The Institutional Eligibility regulations under 34 CFR 600 apply to all institutions participating in the Title IV programs authorized under the Higher Education Act of 1965, as amended. If an eligible institution establishes a written agreement with another institution, that institution is also subject to the requirements in §600.9(b)(2) and must give "... credit to students enrolled in the portion of the educational program that is provided by the other institution or organization on the same basis as if it provided that portion of the program itself." The eligible institution, by entering into an agreement, is recognizing the educational coursework earned at the other institution or organization to be the equivalent of its own coursework. Therefore, the eligible institution from which the student will receive his or her degree must accept the credits from the other institution or organization as if the student had earned them at that institution (including coursework in which the grade point average was unusually low but would be counted if the student took the coursework at the institution). Upon further review, we have determined that the institution does not need to accept the grades earned at the other institution or organization and average them into the student's grade point average at that institution. We will inform our regional offices of this policy decision.

If an eligible institution establishes an agreement with another eligible institution and Federal Pell Grant funds are involved, then, in addition to adhering to the regulatory requirements in §600.9, the institution must also establish an agreement that conforms to the requirements in §690.9 of the Federal Pell Grant Program regulations. Section 690.9 requires that an agreement...
between two eligible institutions indicate: (1) which institution will pay the student his or her Federal Pell Grant and determine the student’s enrollment status; and (2) that the institution paying the student will maintain all records related to the student’s financial aid.

I hope this information is helpful to you.

Sincerely,

Robert W. Evans
Director, Division of Policy Development
and Member, Direct Student Loan Task Force

cc: U.S. Department of Education
    Regional Offices
    Dr. A. Dallas Martin, President
    National Association of Student
    Financial Aid Administrators
To: Faculty Senators
From: Trisha Folds-Bennett, Chair, Curriculum Committee
Date: March 21, 1996

Enclosed are several proposals that I, on behalf of the Curriculum Committee, will present for your consideration at the April 2 Senate meeting.

You should have the following proposals:

✓ Art History:
  Proposal for minor in Historic Preservation and Community Planning
  Course change (ARTH 410)

✓ Physics:
  Addition to the electives for the minor and concentration in Astronomy.

✓ Accounting and Legal Studies:
  Course changes
  ACCT 409
  ACCT 407
  Change in requirements
  deletion of BADM 300

✓ Management and Marketing:
  New course proposals
  BADM 346
  BADM 347
  BADM 351

✓ School of Mathematics and Sciences:
  modification of Undergraduate Bulletin prescriptions for minors

✓ Biology:
  New course proposals
    BIOL 406
    BIOL 421
    BIOL 444
    BIOL 503
  Course changes
    BIOL 440
    BIOL 341

If you have any questions prior to the meeting, please call (3-5517) or e-mail (Bennett@cofc.edu) me.
Committee on Curriculum and Academic Planning
Proposal to Change a Course

1. Department: Art History

2. Course Number and Title: ARTH 410 Internship

3. Course changes will go into effect: Fall 1996

4. Change(s) Desired:
   - Remove the description of eligible students as "visual arts student."
   - Change description to include interns entering specific organizations, "Art..."
   - Change prerequisite rules that course may be applied for and be accepted by the internship director in the department.

5. Justification for Change(s):
   - The new description is more accurate in terms of opportunities available, students' areas of interest, and the application process used.

6. Date Approved by the Department: 1/26/96 Date Submitted: 1/31/96

7. Signature of Department Chair: [Signature]

IF MORE SPACE IS NEEDED, USE EXTRA SHEET AND ATTACH
(form last revised August, 1988 and replaces all others)

New Course Description:

"ARTH 410: Internships are intended to provide the opportunity for the student to apply knowledge and skills learned during a normal course of study to actual situations encountered in work with area arts or preservation organizations. Junior and Senior Art History majors or Historic Preservation minors with GPAs of 3.0 or better in major are eligible for application. Permission of faculty internship director is required."
The minor in Historic Preservation and Community Planning is a 21-hour curriculum offered by the Program in Historic Preservation and Community Planning at the College of Charleston. It consists of fifteen hours of required core courses, and an additional six hours selected from the list of electives. In addition to the courses listed below, interested students are encouraged to enroll in cognate courses offered by other departments within the College.

CORE COURSES (for all students selecting the minor)

- Urban Planning
- Introduction to Historic Preservation
- The City as a Work of Art (A History of City Making)
- American Urban History
- Internship/practicum

ELECTIVES (students select six hours from the following courses)

- History of American Architecture
- History of South Carolina
- Charleston Architecture
- Society and Culture of Early Charleston
- Urban Design Studio
- Urban Politics
- Urban Geography
- Preservation Planning (TBA)
- Special Topics in Art History, History, Political Science, Urban Studies (these could include, for example, the Addlestone seminars in the Art History dept, or Victorian Charleston, offered by the History dept, or a course like Land Use Law offered by the Urban Studies Program)
SUGGESTED COGNATE COURSES

Introduction to Architecture (Art History 245)
History of 18th and 19th-Century Architecture (Art History 394)
History of 20th-Century Architecture (Art History 395)
Drawing I (Studio Art 119)
Principles of Macroeconomics (Economics 201)
Urban Economics (Economics 307)
Archaeology (Anthropology 202)
Urban Anthropology (Anthropology 351)
African American History to 1865 (History 216)
History of the South to 1865 (History 224)
History of Science and Technology (History 256)
Colonial America, 1585-1763 (History 301)
Stuart England, 1603-1714 (History 355)
Georgian England (History 356)
Victorian Britain (History 357)
Introduction to Urban Studies (Urban Studies 201)
Proposal for an Interdisciplinary Minor in Historic Preservation and Community Planning

1. Goals, Objectives and Outcomes of the Minor Program

The goal of the proposed minor in Historic Preservation and Community Planning is to introduce the student to the history, theory and practice of historic preservation, and the present necessity to link preservation with parallel issues in community planning. Because of changes in the world of historic preservation it is no longer sufficient to consider the preservation of particular buildings or landscapes without a concomitant vision of what might best be called the context of the object.

Since this is to be an undergraduate minor, its own context should be seen as being firmly placed within the Liberal Arts tradition of the College of Charleston. This is not intended to be 'training' for the technical field of historic preservation, but rather as an introduction to the broader issues which are presently being grappled with by preservationists.

The ideal result of this minor program will be to awaken in the student an appreciation for the complexity of the field of historic preservation. Through a combination of general and survey courses and specific practical applications the student will begin to understand the multitude of forces acting upon cities, towns and rural areas that either encourage or hinder the preservation of historic sites at the end of the 20th century.

2. Development of Goals through the Curriculum

Given the necessarily restricted curriculum of a minor program, it is not expected that anything like a complete exposure to the field can be achieved. Nevertheless, it is possible to make a good beginning toward this goal at both the macro and the micro levels.
80% of the core courses can be characterized as broad in scope, with some of them being frankly introductions to their subject (Urban Planning, Introduction to Historic Preservation, The City as a Work of Art). These constitute the 'macro' approach to the field of preservation. At the other end is the internship/practicum, whereby the student has the opportunity to understand how the broader issues are applied to a particular 'hands-on' situation.

Something over two thirds of the hours for the minor are within the core, so students choosing the program will share an extensive common grounding. There is, however, still room for individual preference. The elective hours will allow the students to gain some background in ancillary areas that are of particular interest to them. Therefore a student might choose courses in public policy, or visual form, or historical background, depending on his own predilection.

3. Clarifying Goals for the Students

The purpose of the minor will be made clear to the student in three ways. The first is through the catalog description and other publicity material (flyers, etc.). The second is through advising and personal contact. Obviously faculty involved in advising the students will be able to explain the purposes of the minor in an individual and one-on-one fashion. Additionally, since Historic Preservation is a relatively new field to academics, and a complicated one, it is expected that many students who may be interested in what the minor is about will seek out faculty for further explanation. Finally, the faculty teaching the core courses will be aware that some of their students are actual or potential minors in Historic Preservation, and - while the course might not necessarily be pitched to that particular group of students -- this constituency will certainly be considered. Therefore, although the introductory course in Historic Preservation is self-evidently concerned with the goals of the minor, another core course, The City as a Work of Art, for example, will include an examination of the historical urban context for either destroying or adaptively re-using parts of a city.
4. Goals and Course Linkage

Insofar as the general and specific goals of the minor program in Historic Preservation have been reflected in the choice of the core courses (as well as the electives and cognates), the answer is generally in the affirmative. More particularly, three of the core courses (Urban Planning, Introduction to Historic Preservation and The City as a Work of Art) have been constituted with this minor in mind, and reflect, to a greater or lesser extent, the goals and intended outcomes of the program.

5. The Minor Program in Historic Preservation in the Context of a Liberal Education

As has already been mentioned in section 1, it is the intention of all the faculty participating in this proposed minor that it be located integrally within the matrix of a Liberal Arts education. It is felt that the minor steers a safe course between the Scylla of an overly technical and narrow training, and the Charybdis of a body of courses so broad and multi-faceted that it is only with the greatest generosity that they can be seen as being related at all.

The Academy is the best place to deal with the underlying theories and implications of a discipline; things that are often poorly considered in the chaos and swirl of the 'real world.' Conversely it is possible for an academic program to pay too little heed to how things actually work. By giving a dominant place to the former issues without disregarding the practice of Historic Preservation and Community Planning entirely, it seems that this minor curriculum does what should be done in the context of undergraduate Liberal Arts education.
Dear Prof. Bennett,

The Physics and Astronomy Department hereby requests a small change to the recently approved minor and concentration in Astronomy. The History Department regularly offers a course entitled 'The Cosmos In History To 1800' (History 251); a syllabus for the course is attached. Since our Astronomy courses preferentially treat modern Astronomy whereas HIST251 preferentially treats archeoastronomy, we felt that this course would make a valuable addition to the minor/concentration in Astronomy, especially since it is taught from a Humanities perspective which will give students a broader prospective of Astronomy.

Hence, we request that this course be included as an additional elective the students can consider for a minor or concentration in Astronomy. The History department strongly supports this change, and a letter of support is attached.

We propose the following Catalog description (course titles are for review of this proposal only and will not be placed in the Catalog description): "A minor in astronomy shall consist of at least 6 courses, which must include 2 core courses and 4 elective courses. The core courses must consist of either Physics 129 and Physics 130 (with associated labs), Honors Astronomy, or Physics 310 and Physics 311. The elective courses can be chosen from History 251 (The Cosmos through History), Physics 101 (Introductory Physics), 102 (Introductory Physics), 201 (General Physics), 202 (General Physics), 205 (Intelligent Life in the Universe), 298 (Special Topics), 301 (Classical Mechanics), 306 (Physical Optics), 390 (Research), 399 (Tutorial), 412 (Special Topics), 413 (Astrophysics), 420 (Senior Research), and 499 (Bachelor's Essay) in addition to Physics 310 and 311 if they were not taken as core courses. A maximum of three courses may be at the 100 level. Physics 298, 390, 399, 412, 420 and 499 must involve astronomy. A minimum of 3 credit-hours of Physics 390 or 412 must be taken for these courses to count towards the minor. Students may not receive credit for both Physics 101 and 201, for both Physics 102 and 202, or for both Physics 129/130 and Honors Astronomy. Physics 101 and 102 must include associated laboratories. The courses must be approved by the student's major advisor and the astronomy minor program director."

All other sections of our original proposal approved by the Senate on Jan. 16, 1996 remain the same. Note that the addition of History 251 as an elective only strengthens our arguments regarding depth and breadth of the minor/concentration and adds to the course offerings students may select from.

Signature of Department Chair: ____________________________ Date submitted: 1/20/96
Signature of School's Dean: ____________________________ Date: 1/22/96
Signature of Business Affairs Official: ____________________________ Date reviewed: 1/26/96
Signature of Curriculum Committee Chair: ____________________________ Date approved: 3/2/96
Signature of Faculty Senate Secretary: ____________________________ Date approved: ____________________________
Committee on Curriculum and Academic Planning
Proposal to Change a Course

1. Department: Accounting and Legal Studies
2. Course Number and Title: Accounting 409--Auditing
3. Course changes will go into effect: Fall Semester, 1996
4. Change(s) Desired: Accounting 407--Accounting Information Systems--will become a prerequisite for ACCT 409--Auditing
5. Justification for Change(s): A working knowledge of accounting information systems will better prepare the accounting major for an understanding of the auditing process
6. Date Approved by the Department: December 6, 1995
   Date Submitted: January 30, 1996
7. Signature of Department Chair:

IF MORE SPACE IS NEEDED, USE EXTRA SHEET AND ATTACH (form last revised August, 1988 and replaces all others)

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Committee on Curriculum and Academic Planning
Proposal to Change a Course

1. Department: Accounting and Legal Studies

2. Course Number and Title: ACCT 407--Accounting Information Systems

3. Course changes will go into effect: Fall Semester, 1996

4. Change(s) Desired: Change ACCT 316--Intermediate Accounting I--from a corequisite to a prerequisite for ACCT 407--Accounting Information Systems

5. Justification for Change(s): Reason: ACCT 316 provides an in-depth working knowledge of the accounting cycle, an understanding of which is critical for ACCT 407--Accounting Information Systems

6. Date Approved by the Department: December 6, 1995
   Date Submitted: January 30, 1996

7. Signature of Department Chair:

IF MORE SPACE IS NEEDED, USE EXTRA SHEET AND ATTACH
(form last revised August, 1988 and replaces all others)

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Committee on Curriculum and Academic Planning
Proposal to Change a Course

1. Department: Accounting and Legal Studies

2. Course Number and Title: BADM 300--Management Information Systems

3. Course changes will go into effect: Fall of 1996

4. Change(s) Desired: BADM 300--Management Information Systems--will be removed from the accounting major.

5. Justification for Change(s): BADM 300--Management Information Systems--was in the accounting major before ACCT 407--Accounting Information Systems--was created. The accounting major does not need both systems courses and is much better served with the ACCT 407.

6. Date Approved by the Department: December 6, 1995
   Date Submitted: January 30, 1996

7. Signature of Department Chair: [Signature]

IF MORE SPACE IS NEEDED, USE EXTRA SHEET AND ATTACH
(form last revised August, 1988 and replaces all others)

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COLLEGE OF CHARLESTON
Committee on Curriculum and Academic Planning
New Course Proposal

The Faculty Committee on Curriculum and Academic Planning has adopted the Association of American Colleges and Universities' framework for program review. (A copy of the booklet Program Review and Educational Quality in the Major has been provided with this packet.) When examining the rationale and justification presented for courses within the major and outside the major (electives/general degree requirements), the Committee's deliberations will be focused by the questions listed 6, 7, 8 and 9. A number of departments at the College have participated in a self-examination known as "reforming the major." Names of department chairs willing to serve as resources may be obtained from the deans of the School of Humanities and Social Sciences and Sciences and Mathematics.

1. Department: Management and Marketing

2. Course number and title: BADM 346 Business and Technology
   Number of Credits: 3
   Total hrs/week: 3 Lecture: 3 Lab: 0

3. Course will be offered first: This course has been taught as a BADM 360, Selected Topics since Fall 1993. One section per semester.

4. Catalog description (please limit to 50 words): This course introduces students to the importance of entrepreneurship and the impact technology has on productivity and ultimate success of the business. Technological issues will be examined as will the relationship between the firm's strategic business plan and its technological plan for product and production process.

5. Prerequisites (or other restrictions): Junior Standing

6. Rationale/Justification for course (consider the following issues):
   (a) What are the goals and objectives of the course? To introduce students to the methods of successfully commercializing new technology.
   (b) How does the course support the mission statement of the department and the organizing principles of the major? This course expands students' understanding and appreciation of the intricacies of entrepreneurship.

7. For courses in the major, how does the course enhance the beginning, middle or end of the major? Allows students to understand how theoretical knowledge gained from other business courses applies to the small and new business environment.

8. (a) For courses used by non-majors, how does the course support the liberal arts tradition including linkages with other disciplines? Non-Business majors who are creative and inventive will learn how to profit from their technological innovations.
   (b) Are other Departments affected by this course. (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.) No
9. Method of teaching: Lecture, class discussion and case analysis

10. (a) Address potential enrollment pattern shifts in the department or college-wide as it relates to the offering of this course. No enrollment shifts are expected

(b) Address potential shifts in staffing of the department as it relates to the offering of this course. No changes expected since Mr. Witunsiki, an Executive in Residence, will continue to teach this course

11. Requirements for additional resources made necessary by this course:

   (a) Staff None

   (b) Budget None

   (c) Library None

(Note: Courses requiring additional resources will need extensive justification. Those courses offered through reorganization of current staffing and resources are encouraged.)

12. Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).

13. Signature of Department Chair: ____________________________ Date submitted: 1/17/96

14. Signature of School's Dean: ____________________________ Date: 1/17/96

15. Signature of Budget Director, Business Affairs Official: ____________________________ Date reviewed:

16. Signature of Curriculum Committee Chair: ____________________________ Date approved: 3/21/96

17. Signature of Faculty Senate Secretary: ____________________________ Date approved by Senate:

Completed form should be sent by the Faculty Senate secretary to the Registrar. Copies of the completed form should be sent by the Registrar to:

1. Department Chair
2. Business Affairs Office (for establishing course fee structure in SIS)
3. College Relations for addition to Undergraduate Bulletin (Attn: Rhonda Spell)
4. Academic Affairs Office (Attn: Beth Murphy)
5. Undergraduate Studies (SNAP, ON COURSE)

(If an additional diskette for word processing of this form is desired, please send a blank diskette to Chivon Jenkins, Undergraduate Studies. This form last revised April 24, 1994 and replaces all others.)
The Faculty Committee on Curriculum and Academic Planning has adopted the Association of American Colleges and Universities' framework for program review. (A copy of the booklet Program Review and Educational Quality in the Major has been provided with this packet) When examining the rationale and justification presented for courses within the major and outside the major (electives/general degree requirements), the Committee's deliberations will be focused by the questions listed 6, 7, 8 and 9. A number of departments at the College have participated in a self-examination known as "reforming the major." Names of department chairs willing to serve as resources may be obtained from the deans of the School of Humanities and Social Sciences and Sciences and Mathematics.

1. Department: Management and Marketing

2. Course number and title: BADM 347 Small Business Finance Number of Credits: 3
   Total hrs/week: 3 Lecture: 3 Lab: 0

3. Course will be offered first: Course has been taught as BADM 360, Selected Topics, since Fall of 94.

4. Catalog description (please limit to 50 words): This course is designed to familiarize the student with sources and types of financing available to entrepreneurs with emphasis on investor and lender analysis of project financial requirements.

5. Prerequisites (or other restrictions): Accounting 203 and 204, Economics 201 and 202; junior standing

6. Rationale/justification for course (consider the following issues):
   (a) What are the goals and objectives of the course? Students will be introduced to methods of identifying sources of capital, investor analysis of projects, and financial negotiation.
   (b) How does the course support the mission statement of the department and the organizing principles of the major? The course provides valuable information to potential entrepreneurs, bankers, investors and those interested in finance.

7. For courses in the major, how does the course enhance the beginning, middle or end of the major? Allows students to understand how theoretical knowledge gained from other business courses applies to the small and new business environment.

8. (a) For courses used by non-majors, how does the course support the liberal arts tradition including linkages with other disciplines? Non-business majors can learn the intricacies of raising capital for new ventures.
   
   (b) Are other Departments affected by this course. (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it) No
9. Method of teaching: Lecture, class discussion, and case analysis.

10. (a) Address potential enrollment pattern shifts in the department or college-wide as it relates to the offering of this course. No enrollment shifts are expected.
(b) Address potential shifts in staffing of the department as it relates to the offering of this course. No changes are expected since Prof. Charles Cathcart, an Executive-In-Residence, will continue to teach this course.

11. Requirements for additional resources made necessary by this course:
(a) Staff None
(b) Budget None
(c) Library None

(Note: Courses requiring additional resources will need extensive justification. Those courses offered through reorganization of current staffing and resources are encouraged.)

12. Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).

13. Signature of Department Chair: Date submitted: 4/17/96
14. Signature of School's Dean: Date: 1/17/96
15. Signature of Budget Director, Business Affairs Official: Date reviewed:
16. Signature of Curriculum Committee Chair: Date approved: 3/21/96
17. Signature of Faculty Senate Secretary: Date approved by Senate:

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1. Department: Management & Marketing

2. Course number and title: BADM 351 Hotel Management Number of Credits: 3
   Total hrs/week: 3 Lecture: 3 Lab: 0

3. Course will be offered first: During the Spring 1995-1996 semester, the course will be taught as a BADM Special Topics course.

4. Catalog description (please limit to 50 words): Examination of hotel and motel management and operational issues with an emphasis on general hospitality management (structure, staffing, reservations), corporate structures and operational concepts, feasibility determination, guest service, sales and public relations, forecasting, hotel accounting and controls, labor management, guest relation and industry future.

5. Prerequisites (or other restrictions): Junior Standing & BADM 210 (or permission of the instructor). Relevant industry experience or equivalent college coursework may substitute for BADM 210.

6. Rationale/justification for course (consider the following issues):
   (a) What are the goals and objectives of the course? To develop an understanding of the organizational structure within which a hotel/motel operates; to examine trends and developments in new areas of the industry, which approaching hotel and motel operations from a business and financial point of view.
   (b) How does the course support the mission statement of the department and the organizing principles of the major? Strong competitive forces exist in the lodging industry today. The hotel industry is a part of the much larger hospitality industry that comprises those businesses that provide services to the business and personal/pleasure traveler as well as those engaged in leisure activities.

7. For courses in the major, how does the course enhance the beginning, middle or end of the major? This course will be a required course in the Hospitality and Tourism concentration within the Department of Management and Marketing. This course will also serve as a Business Administration elective.

8. (a) For courses used by non-majors, how does the course support the liberal arts tradition including linkages with other disciplines? The course provides linkages for non business majors in that it includes various aspects of hotel development related to national/international history of the industry, cultural events, cross-cultural implications of hotel management, etc.
   (b) Are other Departments affected by this course? (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.) No.
9. Method of teaching: This course will be taught using a combination of lecture, class participation, projects requiring group interaction, cases studies, guest speakers, and field trips.

10. (a) Address potential enrollment pattern shifts in the department or college-wide as it relates to the offering of this course. Most enrollment is projected to come from students planning a business major. No noticeable shift away from any other one particular area is anticipated.

(b) Address potential shifts in staffing of the department as it relates to the offering of this course. This course will be taught by a new Faculty member to be hired on the approved hospitality and tourism position line.

11. Requirements for additional resources made necessary by this course:
   (a) Staff  Current adjunct pool.
   (b) Budget  Current adjunct pool.
   (c) Library  None.

(Note: Courses requiring additional resources will need extensive justification. Those courses offered through reorganization of current staffing and resources are encouraged.)

12. Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).

13. Signature of Department Chair: ________________________ Date submitted: 3/29/96

14. Signature of School's Dean: ________________________ Date: 2-29-96

15. Signature of Budget Director, Business Affairs Official: ________________________ Date reviewed:

16. Signature of Curriculum Committee Chair: ________________________ Date approved: 3/21/96

17. Signature of Faculty Senate Secretary: ________________________ Date approved by Senate:

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5. Undergraduate Studies (SNAP, ON COURSE)

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This form last revised April 24, 1994 and replaces all others.)
Memorandum

To: Trisha Folds-Bennett, Chair, Curriculum Committee

From: Lou Burnett, Chair, Department of Biology
Jim Deavor, Chair, Department of Chemistry and Biochemistry
Bob Dukes, Chair, Department of Physics and Astronomy
Bill Golightly, Chair, Department of Mathematics
George Pothering, Chair, Department of Computer Science

Date: February 9, 1996

Re: Proposal to Modify the Requirements for a Minor

The faculty in the School of Sciences and Mathematics have studied the language in the 1994-1996 undergraduate bulletin on the requirements for minors (page 108). According to the bulletin, minors “must include a minimum of six three-hour or four-hour courses selected from a formally designated group.” This requirement would result in a student taking a minimum of 18 semester hours and as many as 24 semester hours for a minor.

In the science departments in the School, two four-unit courses are prerequisites for all upper division courses within the discipline. Thus, students who wish to minor in any science must take at least 20 semester hours. Furthermore, it is unlikely that a student would complete the minor in any science discipline by taking only 3-unit upper division courses, since most upper division courses are 4 units because they are accompanied by laboratories. So it is more likely that a student fulfilling a “six course” requirement would accumulate 21 or 22 semester hours within the discipline. Interestingly, it is possible for a major program and a minor program both to require 24 semester hours of work (see page 107, last paragraph of the 1994-1996 undergraduate bulletin). Furthermore, most programs listed in the undergraduate bulletin state requirements in terms of semester hours and not courses.

Most, if not all, minors outside the School of Sciences and Mathematics can technically be fulfilled by a student taking 18 semester hours of courses. We feel that the current policy does not recognize the significance and the importance of laboratory experiences the students obtain in introductory and upper division courses. Although students generally earn only one unit of credit for a laboratory, they spend two to three hours in the laboratory or field gaining knowledge and experience that complements and supplements information in the lecture portion of the course.

Thus, we suggest that the minor requirement outlined in the undergraduate bulletin is overly restrictive and penalizes science departments which offer the majority of courses as four unit courses. It is even more important to recognize that students are penalized. We recommend, therefore, that the current policy be changed.
To: Trisha Folds-Bennett  
From: Dept. Chairs, School of Sciences and Mathematics  
Date: February 8, 1996  
Re: Proposal to Change the Minor  
Page: 2

The current policy is stated on page 108 of the 1994-1996 Undergraduate Bulletin as follows:

Concentrations and Minors. A student may elect to pursue a program of study organized around a particular theme within the major discipline—a concentration—or outside the major discipline—a minor. Both concentrations and minors will be shown on the student’s transcript. Either program must include a minimum of six three-hour or four-hour courses selected from a formally designated group. ...

We propose the following.

Concentrations and Minors. A student may elect to pursue a program of study organized around a particular theme within the major discipline—a concentration—or outside the major discipline—a minor. Both concentrations and minors will be shown on the student’s transcript. Either program must include a minimum of six three-hour or four-hour courses selected from a formally designated group. Either program must require at least 18 semester hours from a formally designated group of courses. ...

A student could fulfill this requirement by taking five 4-unit courses. A student fulfilling the requirements in this way will receive a total of 15 contact hours of training in lecture and 15 contact hours of training in laboratory (most laboratory courses are three hours long) for a total of 30 contact hours for the minor. This perspective more accurately describes the experiences a student would gain with a minor in our school.

Approved: [Signature]
Gordon E. Jones, Dean

Date: 2/12/96
1. Department: Biology

2. Course number and title: BIOL 406, Conservation Biology
   Number of credits: 3  Total hrs/week: 3  Lecture: 3  Lab: 0

3. Course will be offered first: Spring 1997

4. Catalog description (please limit to 50 words):
   A course exploring the origin, maintenance and preservation of biodiversity at all levels: genetic, population, community, ecosystem and biosphere. The focus will be on applying ecological, genetic and evolutionary principles to problems in conservation. Optional field trips will make use of the rich biota of the Charleston area.

Check if appropriate: ___ Humanities  ___ Social Science (meets minimum degree requirements)

5. Prerequisites (or other restrictions):
   BIOL 341 (General Ecology) and either BIOL 311 (Genetics) or BIOL 350 (Evolution), or permission of the instructor.

6. Rationale/justification for course (consider the following issues):
   (a) What are the goals and objectives of the course?
       The goal of this course is to provide an in-depth understanding of the application of ecological, evolutionary and population-genetic theory to the maintenance of biodiversity. The course will investigate the scientific principles which underlie the establishment of sound conservation strategies, and will help students understand the links between basic and applied research.

   (b) How does the course support the mission statement of the department and the organizing principles of the major?
       Genetics (BIOL 311) and General Ecology (BIO 341) are two of the “core” courses in the Biology major. Conservation Biology will provide undergraduate majors and graduate students the opportunity to explore the applications of genetic, ecological and evolutionary principles to an applied problem, the conservation of biodiversity. Conservation Biology thus is a “synthesis” course, one that cuts across taxonomic boundaries and demonstrates the interconnections between other biological subdisciplines. Many of the other upper-division courses (e.g., Biology of Fishes, Comparative Anatomy of Vertebrates, Entomology, Herpetology, Invertebrate Zoology, Ornithology) are more taxon-centered. Conservation Biology also will expand the non-marine biology course offerings available to students in the nascent graduate program in Environmental Studies, thus complementing an existing strength of this curriculum.

7. For courses in the major, how does the course enhance the beginning, middle, or end of the major?
   This course will enhance the major by demonstrating the interrelationships between ecology, evolution and genetics, and their practical applications to an applied problem, the preservation of biodiversity.

8. (a) For courses used by non-majors, how does the course support the liberal arts tradition including linkages with other disciplines?
    Not a non-majors course.

   (b) Are other Departments affected by this course? (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.)
    No.
9. **Method of teaching:**
   Lecture (with discussion of the primary literature) plus in-class demonstrations that will emphasize simulations of population dynamics and population genetics. Guest speakers from within the Department of Biology, other departments, and from industry, agencies, and nongovernmental organizations will add expertise and breadth to lectures and in-class discussions. Optional field trips will introduce students to conservation solutions that are being effected in the Charleston area. Graduate students will be required to write a grant proposal, species-recovery plan, proposal for listing, or a similar professional document.

10. (a) **Address potential enrollment pattern shifts in the department or college-wide related to the offering of this course.**
    (b) **Address potential shifts in staffing of the department as it relates to the offering of this course.**

   The Department of Biology struggles to offer enough space in all of its courses, especially upper division biology courses. This has been difficult due to the rapid growth of the College and the more rapid growth (with respect to the College) experienced by this department. During the past five years the sizes of lecture sections have risen in response to enrollment pressures. Furthermore, the number of sections we have offered has increased. Nonetheless, it is still a struggle to offer enough space. Our efficiency in filling upper division classes is very high; typically greater than 95% of the upper division slots are filled. While this may seem to be admirable, students complain they are not able to get the classes of their choice and they often must take required courses later rather than sooner. A comfortable margin would yield between 10 and 15% of the available spaces unfilled.

   The department needs to offer more upper division biology courses to reduce overcrowding. Adding new courses to our curriculum will enrich the curriculum and take advantage of the expertise of our newly-hired faculty members. By offering the courses as 400/600 level courses, we can also enrich the graduate curriculum, fulfill our responsibilities to the graduate program in Environmental Studies, and provide extraordinary experiences for undergraduate students. This course requires shifts in staffing of upper division biology.

   (c) **Frequency of offering:**
      - each Fall
      - each Spring
      - every two years
      - every three years
      - other (Explain)

11. **Requirements for additional resources made necessary by this course:**

   (a) **Staff**  The Department of Biology continues to struggle to offer enough spaces in upper division biology courses (see 10a and 10b above). This course fill some of that need and also serve students in the Environmental Studies Program.

   (b) **Budget**  Optional field trips will require vans, which the department will pay for from its operating budget.

   (c) **Library**  The department has requested a major journal, *Biological Conservation*. Some additional books will be purchased through the normal ordering process.

   (Note: Course requiring additional resources will need special justification.)

12. **Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).**
Completed form should be sent by the Faculty Senate secretary to the Registrar. Copies of the completed form should be sent by the Registrar to:

1. Department Chair
2. Business Affairs Office (for establishing course fee structure in SIS)
3. College Relations for addition to Undergraduate Bulletin (Attn.: Rhonda Spell)
4. Academic Affairs Office (Attn.: Beth Murphy)
5. Undergraduate Studies (SNAP, ON COURSE)
I. Department: Biology

2. Course number and title: BIOL 421, Topics in the Physiology, Cell and Molecular Biology of Marine Organisms
   Number of credits: 3  Total hrs/week: 9  Lab: 0

3. Course will be offered first: Summer 1996, this course is intended only for summer

4. Catalog description (please limit to 50 words):
   A course for students with interests in cellular, molecular and physiological approaches to research in marine biology. Specific lecture topics center on environmental bioindicators, developmental biology, organismal and environmental physiology, immunology and population genetics of marine organisms.

   Check if appropriate: ___ Humanities ___ Social Science (meets minimum degree requirements)

5. Prerequisites (or other restrictions):
   BIOL 312 or 313; BIOL 321; and permission of the instructor

6. Rationale/justification for course (consider the following issues):
   (a) What are the goals and objectives of the course?
   The goal of this course is to allow advanced science majors to experience how working scientists approach problems in specific areas of marine biology. In addition, this course will provide students interested in pursuing a career related to marine biology with an understanding of how tools in cellular and molecular biology and physiology may be used to answer questions in marine biological research. Field trips to local habitats will familiarize students with the environmental conditions in which local marine organisms live and reinforce the themes of environmental biology emphasized in the course.

   (b) How does the course support the mission statement of the department and the organizing principles of the major?
   This course integrates a number of significant areas of the core biology curriculum. It may be especially useful to students majoring in Marine Biology or Biology with an Emphasis in Molecular Biology.

7. For courses in the major, how does the course enhance the beginning, middle, or end of the major?
   This course will assist Biology and Marine Biology majors in deciding whether they would like to pursue a career in scientific research by (1) directing students to a number of current research topics currently being pursued by scientists associated with the College of Charleston and (2) providing appropriate incentives and independence to explore questions of specific interest to the student.

8. (a) For courses used by non-majors, how does the course support the liberal arts tradition including linkages with other disciplines?
   NA

   (b) Are other Departments affected by this course? (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.)
   Department of Chemistry and Biochemistry

9. Method of teaching:
   Class will be primarily lectures. Students will be provided with handouts and readings from the current literature.
10. (a) **Address potential enrollment pattern shifts in the department or college-wide related to the offering of this course.**

   It is anticipated that this course will not significantly influence enrollment patterns at the departmental or college-wide level. Students enrolled in this course are expected to be advanced (400-level) students at the College of Charleston and advanced students from other colleges and universities who are interested in research careers employing modern scientific techniques to address questions in marine biology. Students enrolled from outside the College of Charleston will be drawn largely from the Fort Johnson Summer Research Program, which provides a small number of fellowships to selected applicants from around the United States. This course has operated successfully as a Special Topics course for several years in conjunction with the Fort Johnson Summer Research program. While the course was operated in conjunction with the summer research program, students may be enrolled in the course without being a part of the summer research program. The research program and course have gained a good reputation nationally. Students apply for entry into the summer program since research space and stipends are limited. Because of the quality of the experience and the support, the quality of the students in both the course and the program has been very high. Course enrollments have typically been 8 or fewer.

(b) **Address potential shifts in staffing of the department as it relates to the offering of this course.**

   This is exclusively a summer course and will, therefore, not affect staffing in the department. Staff for this course will be drawn primarily from research scientists at Fort Johnson.

11. **Requirements for additional resources made necessary by this course:**

   (a) **Staff** none

   (b) **Budget** Photocopy expenses for course flyers (1,000 flyers) - $35 (mailings will "piggy-back" those of the Marine Biology Graduate Program; Photocopy expenses for class handouts - $75

   (c) **Library** no additional requirements

   (NOTE: Courses requiring additional resources will need extensive justification. Those courses offered through reorganization of current staffing and resources are encouraged.)

12. **Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).**

   This course has been offered as Special Topics (Biology 502). A course syllabus is appended.
REVIEW APPROVALS

13. Signature of Department Chair: [Signature] Date submitted: 2/28/96

14. Signature of School's Dean: [Signature] Date: 3/6/96

15. Signature of Business Affairs Official: [Signature] Date reviewed: 

16. Signature of Curriculum Committee Chair: [Signature] Date approved: 3/2/96

17. Signature of Faculty Senate Secretary: [Signature] Date approved by Senate: 

Completed form should be sent by the Faculty Senate secretary to the Registrar. Copies of the completed form should be sent by the Registrar to:

1. Department chair
2. Business Affairs Office (for establishing course fee structure in SIS)
3. College Relations for addition to Undergraduate Bulletin (Attn: Rhonda Spell)
4. Academic Affairs Office (Attn: Beth Murphy)
5. Undergraduate Studies (SNAP, ON COURSE)

(For additional copies of this form, please photocopy the blank form. If a diskette for word processing of this form is desired, please send a blank diskette to Tonya Pharr, Undergraduate Studies. This form last revised March 23, 1995 and replaces all others.)
1. Department: Biology

2. Course number and title: BIOL 444, Plant Ecology
Number of credits: 4  Total hrs/week: 6  Lecture: 3  Lab: 3

3. Course will be offered first: Fall 1996

4. Catalog description (please limit to 50 words):
Plant Ecology will explore the population ecology of plants covering the genetic, spatial, age and size structure of plant populations. The focus will be on understanding the origin of these different kinds of structures, understanding how they influence each other, and understanding why they change with time.

Check if appropriate: _Humanities _Social Sciences (meets minimum degree requirements).

5. Prerequisites (or other restrictions):
BIOL 111, 111L, BIOL 112, 112L, and BIOL 341, General Ecology, or permission of the instructor.

6. Rationale/justification for course (consider the following issues): (Note: if more space is needed, attach additional sheets to this form).

(a) What are the goals and objectives of the course?
The goals of this course are to provide an in-depth understanding of ecological concepts as they apply to plants (the focus will be on terrestrial plant communities). For both undergraduates and graduate students the course will provide a detailed examination of ecological theory and the application of theory as it pertains to plants. The course will familiarize students with experimental techniques in plant ecology and with the primary literature. The course will expand upon the ecological principles covered in general ecology.

(b) How does the course support the mission statement of the department and the organizing principles of the major?
General Ecology is a "core" course for biology majors. The department also has a botany requirement for majors. Plant Ecology will provide majors with the opportunity to explore ecological principles and plants in greater detail. Also, despite the botany requirement, the Biology Department offers relatively few specialized courses in which undergraduates can expand beyond a very general botany background (e.g., phycology) whereas the zoological side of our department offers a plethora of specialized courses (e.g., ornithology, herpetology, the biology of fishes, parasitology, zoogeography, animal behavior, etc.).

7. For courses in the major, how does the course enhance the beginning, middle, or end of the major?
This course would enhance the end of the major by providing an opportunity for majors to explore ecology and plants in greater detail (see discussion above).

8. (a) For courses used by non-majors, how does the course support the liberal arts tradition including linkages with other disciplines?
N/A.

(b) Are other Departments affected by this course? (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.)
N/A.
9. **Method of teaching:**
Lecture, plus a laboratory section that will emphasize experimental ecology. About 1/3 of the laboratories will also be dedicated to a discussion of papers from the primary literature. Graduate students will be required to write an extensive research paper derived from the primary literature with an emphasis on conceptual issues in plant ecology. Graduate students will be expected to exhibit greater depth of understanding than undergraduates in essay exams, laboratory reports and laboratory discussion. Grading will reflect these different expectations.

10. (a) **Address potential enrollment pattern shifts in the department or college-wide related to the offering of this course.**
(b) **Address potential shifts in staffing of the department as it relates to the offering of this course.**
The Department of Biology struggles to offer enough space in all of its courses, especially upper division biology courses. This has been difficult due to the rapid growth of the College and the more rapid growth (with respect to the College) experienced by this department. During the past five years the sizes of lecture sections have risen in response to enrollment pressures. Furthermore, the number of sections we have offered has increased. Nonetheless, it is still a struggle to offer enough space. Our efficiency in filling upper division classes is very high; typically greater than 95% of the upper division slots are filled. While this may seem to be admirable, students complain they are not able to get the classes of their choice and they often must take required courses later rather than sooner. A comfortable margin would yield between 10 and 15% of the available spaces unfilled.

The department needs to offer more upper division biology courses to reduce overcrowding. Adding new courses to our curriculum will enrich the curriculum and take advantage of the expertise of our newly-hired faculty members. By offering the courses as 400/600 level courses, we can also enrich the graduate curriculum, fulfill our responsibilities to the graduate program in Environmental Studies, and provide extraordinary experiences for undergraduate students. This course requires shifts in staffing of upper division biology.

(c) **Frequency of offering:**
- X each Fall
- every two years
- each Spring
- every three years
- other (Explain)

11. **Requirements for additional resources made necessary by this course:**
(a) **Staff** The Department of Biology continues to struggle to offer enough spaces in upper division biology courses (see 10a and 10b above). This course will fill some of that need and will also serve students in the Environmental Studies Program.
(b) **Budget** No special supplies or materials are required for this course that are also not required for BIOL 341, General Ecology. Some materials have already been purchased that can be used in many such field courses. There are no additional costs associated with this course.
(c) **Library** None anticipated.

12. **Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).**
13. Signature of Department Chair: ___________ Date submitted: 2/7/96

14. Signature of School's Dean: ___________ Date: 2/6/96

15. Signature of Business Affairs Official: ___________ Date reviewed: 2/12/96

16. Signature of Curriculum Committee Chair: ___________ Date approved: 2/21/96

17. Signature of Faculty Senate Secretary: Date approved by Senate: 

Completed form should be sent by the Faculty Senate secretary to the Registrar. Copies of the completed form should be sent by the Registrar to:

1. Department Chair
2. Business Affairs Office (for establishing course fee structure in SIS)
3. College Relations for addition to Undergraduate Bulletin (Attn: Rhonda Spell)
4. Academic Affairs (Attn: Beth Murphy)
5. Undergraduate Studies (SNAP, ON COURSE)
1. **Department:** Biology

2. **Course number and title:** BIOL 503, Special Topics in Ecology

   Number of credits: 3-4  Total hrs/week: 3-6  Lecture: 3  Lab: 0-3
   This course may sometimes include a lab in which case the number of credits will be 4.

3. **Course will be offered first:** Spring 1997

4. **Catalog description (please limit to 50 words):**
   Investigation of advanced, specific areas of ecology beyond General Ecology (BIOL 341). Examples of offerings may include marine microbial ecology, phytoplankton ecology, benthic ecology, community ecology and population ecology.

   Check if appropriate: _Humanities _Social Sciences (meets minimum degree requirements)

5. **Prerequisites (or other restrictions):**
   BIOL 111/111L, BIOL 112/112L, and BIOL 341 (General Ecology) or permission of the instructor.

6. **Rationale/justification for course (consider the following issues):**

   (a) **What are the goals and objectives of the course?**
   To provide both undergraduate and graduate students with training in advanced and more specialized areas of ecology. Anticipated topics include benthic ecology, phytoplankton ecology, marine microbial ecology, population ecology, and community ecology. One major objective is to provide additional course options for graduate students in both Marine Biology and Environmental Studies. This course will expose potential and incoming graduate students to new faculty and new areas of study which are currently not well represented in our course offerings.

   (b) **How does the course support the mission statement of the department and the organizing principles of the major?**
   General Ecology (BIOL 341) is one of the “core” courses in biology. Special Topics in Ecology will give both undergraduates and graduate students an opportunity to focus more specifically on particular areas within ecology and/or apply principles learned in general ecology to specific ecosystems. Specifically for the Marine Biology programs, the proposed course will provide a variety of options for exploring the interactions of specific groups of organisms with their physical and biological surroundings. This will augment the relatively larger number of courses focused at or below the level of the individual organism.

7. **For courses in the major, how does the course enhance the beginning, middle, or end of the major?**
   This course will enhance the end of the major by allowing students interested in the broad field of ecology to further their understanding of central principles while allowing them to focus on specialized areas within ecology, giving them the more specific training that they will need for graduate school or future employment.

8. **(a) For courses used by non-majors, how does the course support the liberal arts tradition including linkages with other disciplines?**
   N/A

   (b) **Are other Departments affected by this course? (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.)**
   N/A
Method of teaching:
Methods will range among the various courses to be taught under the BIOL 503 listing from lecture plus discussion to lecture with lab. Students will have two written essay exams and one term paper (presented in both oral and written formats) plus one research proposal (NSF format). Lectures will be derived from the primary literature as well as the main text, and will focus on concepts. The proposal will require that students consider the most pressing problems in the field and synthesize the literature to develop a clear plan of action.

However, because this is a special topics course, the methods of teaching may be different depending upon topic and instructor.

10. (a) Address potential enrollment pattern shifts in the department or college-wide related to the offering of this course.

(b) Address potential shifts in staffing of the department as it relates to the offering of this course. The Department of Biology struggles to offer enough space in all of its courses, especially upper division biology courses. This has been difficult due to the rapid growth of the College and the more rapid growth (with respect to the College) experienced by this department. During the past five years the sizes of lecture sections have risen in response to enrollment pressures. Furthermore, the number of sections we have offered has increased. Nonetheless, it is still a struggle to offer enough space. Our efficiency in filling upper division classes is very high; typically greater than 95% of the upper division slots are filled. While this may seem to be admirable, students complain they are not able to get the classes of their choice and they often must take required courses later rather than sooner. A comfortable margin would yield between 10 and 15% of the available spaces unfilled.

The department needs to offer more upper division biology courses to reduce overcrowding. Adding new courses to our curriculum will enrich the curriculum and take advantage of the expertise of our newly-hired faculty members. By offering the courses as 400/600 level courses, we can also enrich the graduate curriculum, fulfill our responsibilities to the graduate program in Environmental Studies, and provide extraordinary experiences for undergraduate students. This course requires shifts in staffing of upper division biology.

(c) Frequency of offering: ____ each Fall  ____ every two years

X ____ each Spring  ____ every three years

____ other (Explain)

11. Requirements for additional resources made necessary by this course:

(a) Staff The Department of Biology continues to struggle to offer enough spaces in upper division biology courses (see 10a and 10b above). This course will fill some of that need and will also serve students in the Environmental Studies Program.

(b) Budget No special supplies or materials are required for this course that are also not required for BIOL 341, General Ecology. Some materials have already been purchased that can be used in those offerings of BIOL 503 that include a field component. There are no additional costs associated with this course.

(c) Library None anticipated.

(Note: Course requiring additional resources will need special justification.)

12. Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).
REVIEW/APPROVALS

13. Signature of Department Chair: [Signature]
    Date submitted: 2/7/96

14. Signature of School's Dean: [Signature]
    Date: 2/9/96

15. Signature of Business Affairs Official: [Signature]
    Date reviewed: 2/12/96

16. Signature of Curriculum Committee Chair: [Signature]
    Date approved: 3/21/96

17. Signature of Faculty Senate Secretary: 
    Date approved by Senate: 

Completed forms should be sent by the Graduate Studies Office to the following:
1. Registrar (for entering course in SIS course inventory)
2. Department Chair
3. Graduate Program Director
4. Business Affairs Office (for establishing course fee structure in SIS)
5. Academic Affairs Office
1. Department: Biology
2. Course number and title: 440, Evolution
3. Changes Desired: There are two changes we wish to make.

First, we wish to renumber the course to a 300-level course to reflect the removal of the BIOL 311 prerequisite that occurred a number of years ago.

Second, we wish to add this course to our central or core courses. Students will have the option of taking a course from three of five groups instead of four. The evolution course will form the fifth group.

Catalog description (please limit to 50 words): The catalog description is unchanged from the current description.

A study of the mechanism and pattern of plant and animal evolution, with emphasis on the species level of organization. Lectures, three hours per week.

Prerequisites (or other restrictions):
Biology 111, 111L, 112, 112L (i.e., the standard prerequisites for 300-level biology courses).

4. Rationale/justification for course changes:

Evolution integrates a number of important disciplines in biology in an attempt to explain the results and the mechanisms of changes through time in living organisms. The department feels that students should have the opportunity to become acquainted in a focused way with the unifying concepts of biology on which evolution is based.

Offering a fifth category of central or core courses will provide the students with more choices in the biology curriculum. While the concept is pedagogically sound, it offers some direct benefits to students who, because of enrollment pressures, often find it difficult to enroll in the core courses. This course will have no budgetary impact on the College.

5. Date Approved by Dept.: 11-14-94 Date Submitted: 11-16-94

6. Signature of School's Dean: [Signature]

7. Signature of Department Chair: [Signature]
1. Department: Biology

2. Course number and title: 341, General Ecology

3. Changes Desired: We wish to add the prerequisite of one year of chemistry.

Catalog description (please limit to 50 words):
Consideration of organisms and their environmental relationships. Lectures, three hours per week; laboratory, three hours per week.

Prerequisites (or other restrictions):
Biology 111, 111L, 112, 112L (i.e., the standard prerequisites for 300-level biology courses), one year of chemistry.

4. Rationale/justification for course changes:
The field of ecology deals with subject matter that is broadly cross disciplinary. Organisms interact with their environment and these interactions are often chemical interactions or result in changes to the environment that are chemical in nature (e.g., the recycling of nutrients). The department feels that one year of chemistry will better prepare the students to learn ecology.

This change will have virtually no budgetary impact since all biology majors must take chemistry.

5. Date Approved by Dept.: 12-7-94   Date Submitted: 12-15-94

6. Signature of School's Dean: [Signature]

7. Signature of Department Chair: [Signature]
The Welfare reconvened yesterday to consider the remanded proposal on bicycle safety. Given the previously described issues, we make the following proposals:

Proposal #1: The College of Charleston administration should work with Public Safety to ensure that:
   a. bicycle rules are given to students and staff upon the registration of bicycles,
   b. rules are printed in the student newspaper and posted in prominent locations around campus,
   c. bicycle racks are repositioned to perimeter entrances of pedestrian areas, and
   d. bicycle rules are enforced.

Proposal #2: Representatives of the College of Charleston who have necessary authority should meet with City of Charleston officials to develop strategies to improve bicycle, pedestrian, and vehicular safety in and around campus. These should include but are not limited to:
   a. establishing designated bicycle lanes on streets bounding and intersecting the campus;
   b. adding a crosswalk on St. Philip Street at Liberty Street;
   c. slowing traffic during peak school hours on Calhoun, Coming, St. Philip, and Wentworth; and
   d. closing George Street (between St. Philip and Coming) between 7:30 and 4:30.
Add to Agenda for the April 2, 1996 Faculty Senate Meeting

Between Committee on Nominations and Elections and Academic Standards Committee:

Graduate School Proposals:

1) Master of Education in Science and Mathematics
2) List of Master's Candidates for May
3) Course proposals for the following:

- Biol 503
- Biol 645
- Engl 557
- Engl 563
- Evss 628
- Evss 629
- Evss 681
- Puba 650

Passed with two faculty members.
University of Charleston, SC

Master of Education in Science and Mathematics

March 7, 1996
# MASTER OF EDUCATION IN SCIENCE AND MATHEMATICS

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MASTER OF EDUCATION IN SCIENCE AND MATHEMATICS

March 5, 1996

CLASSIFICATION

The University of Charleston, S.C., proposes to offer the degree of Master of Education in Science and Mathematics. The proposed starting date is the Fall semester of 1997. The program falls in the category of CIP 13.1399 (Teacher Education, specific academic and vocational programs, other) of the USDE’s Classification of Instructional Programs.

JUSTIFICATION

Purposes and objectives

There is renewed realization of the need to address science and technology literacy. Educational institutions and associations, professional science societies, and state and national governments have adopted the goal of increasing science literacy for all segments of the population in the United States. The National Science Teachers Association Position Papers, Science for All Americans, and Benchmarks for Science Literacy from Project 2061 of the American Association for the Advancement of Science, and publications of the National Council of Research all specifically state that attention to science and technology education is a national imperative and demands a wide-spread systemic approach to meeting the need.

This same urgency is seen in the Curriculum and Evaluations Standards For School Mathematics of the National Council of Teachers of Mathematics presently being implemented across the United States. At the state level the South Carolina Mathematics Curriculum Frameworks document addresses this need and specifies practices that are designed to serve the state’s needs. The proposals of these documents are supported by extensive research to identify and develop curriculum, materials, reforms, and pedagogy to accomplish the goal of producing a mathematics and science literate society for the next century.

The School of Education and the School of Sciences and Mathematics will offer a Master of Education in Science and Mathematics. The purpose of this program is to offer graduate level courses in the sciences, mathematics, and education appropriate for teachers. This program is based on the belief that the key to extensive improvement in Sciences and Mathematics education in the United States is the classroom teacher. Graduates of this program will implement in the classroom: knowledge of the discipline, teaching, and leadership skills that will raise the level of science and mathematics learning in their own classrooms and in those of their colleagues as well.
Content courses in science and mathematics will be offered by faculty in the discipline using pedagogical practices consistent with the discipline and appropriate for the K-12 classroom curriculum. Education content and integrated courses (courses which integrate several disciplines along a theme line) complement the science and mathematics content component of the program by emphasizing the interrelationships that exist among the science and mathematics content areas and across the K-12 curriculum. This program will enhance teachers' knowledge and impart successful ways of building science and mathematics concepts in K-12 classrooms.

This program is aimed at practicing teachers and is not designed as a certification program. The program's intention is to strengthen and broaden these teachers' science, mathematics, and education knowledge and understanding for use in elementary, middle, and high school classrooms.

Relationships to Other Programs at the College of Charleston and the University of Charleston, S.C.

The second paragraph of the institution's statement of purpose adopted by the College of Charleston Board of Trustees in January of 1991 reads that the institution:

"...provides an increasing number of master's degree programs which are compatible with the community and the state."

Designing and conducting graduate programs which meet the needs of the community is an institutional goal (from instructional goal 9 of the Statement of Institutional Goals approved by the State College Board of Trustees on March 12, 1986). As indicated above, the proposed Master of Education in Science and Mathematics degree clearly fits this statement of purpose.

The University of Charleston currently offers master's degree programs in Marine Biology, Mathematics, Elementary Education, and Environmental Studies. These programs are designed for graduate students who will assume responsibilities at the local, state, and federal levels. Most graduates pursue careers in government agencies or industry.

For over 20 years the Marine Biology Program has produced students who have focused on basic and applied research. This program is administered through the Department of Biology at the University of Charleston. The graduate faculty are broadly represented by scientists from local institutions, including the University of Charleston, The Citadel, MUSC, the National Marine Fisheries Service Laboratory, and the South Carolina Marine Resources Research Institute (a division of the South Carolina Department of Natural Resources).

The master of science degree program in mathematics at the University of Charleston is intended to help prepare students for professional opportunities in business, industry, and government which require training at the graduate level. The proposed program takes advantage of the strengths of the program offered by the Department of Biometry and Epidemiology at
MUSC by utilizing MUSC's statistical methods courses to supplement its course offerings. Additionally, Citadel faculty teach courses in the MS program in mathematics. The Citadel offers a masters of education in mathematics for secondary math teachers. The proposed program and existing programs are designed for substantially different audiences. The proposed program is not expected to compete for students with our other masters programs, except for the overburdened Elementary Education program, which would welcome an in-house option for a different masters program for teachers. Traditionally, there is little competition for students between pure science/math masters programs and education programs emphasizing science and math. We fully expect that to be the case here also.

The 1987 CHE Review Report states that the B.S. Program in Mathematics at the College of Charleston, with three options in Pure Mathematics, in Applied Mathematics, and in (secondary) Teaching, offers good flexibility and diversity to majors. The report further states how strong and dedicated the faculty are as they continue to support and encourage research productivity. The report acknowledges the fact that the Mathematics Department has sufficient library resources, adequate equipment, and good labs for their students.

The 1992-93 College of Charleston Fact Book states that the master’s degree in Elementary Education at the University of Charleston serves the largest percentage of students at the University, having grown over 180% in the past seven years. This master’s degree program currently has major fundamental education courses in place which will meet some of the proposed program’s requirements. The School of Education has recently hired two faculty members specializing in science education. They will work collaboratively with the faculty from the School of Sciences and Mathematics in order to establish innovative courses with effective pedagogy for the Master of Education in Science and Mathematics curriculum.

The strong connection between the new and existing programs is evident because a number of the core courses and elective courses are currently offered at the University of Charleston. Thus, the University of Charleston Master of Education in Science and Mathematics would strengthen all local masters programs, but would not draw from the same population of potential students. Another strength lies in the commitment of the administration of the Schools of Science and Mathematics and of Education to support collaboration between the two schools and their faculties to develop and teach the courses necessary for this program. However, additional faculty will be necessary. The new faculty will blend into the existing programs, thus strengthening current research areas.

Additional sections of the education courses that exist would be opened as required to accommodate the new students for this program. All the education courses have an individualized component. For example, students would take Educational Research to learn the range educational research traditions and then focus on studies from their discipline. Science teachers would study science education research and so on. These education courses already incorporate technology. In the research course, computers are used to analyze quantitative data and categorize qualitative data.
Technology is increasingly important in today's world and, therefore, is essential in the schools. Every class listed by the program has a technology component. Technology involved in the educational research class has been mentioned. Technology is already used in EDEE 670 (Science for Elementary Teachers) in the form of laser discs, computers, VCR's, and a multitude of measuring devices ranging from graduated cylinders to clocks. The same technology emphasis is included in the science courses and will include technologies ranging from pH meters to on-line services, such as databases available through sources such as the Internet and World Wide Web. Professors of education at the University of Charleston have for some time included technology in the classroom. Professors in the sciences and mathematics have incorporated pedagogy and technology with content through institutes such as Woodrow Wilson.

Relationships With Like Objectives at Other Institutions in South Carolina and Other States

Other Master of Education programs exist in South Carolina, at U.S.C. and Clemson. Both schools are a substantial distance from Charleston and would draw students from different geographical areas of the state. The program brochures from both institutions list a Master of Education, with an emphasis in science. Both programs as currently described are significantly different from the program proposed by the University of Charleston. These other state programs, as well as the M.Ed. programs in biology and mathematics at The Citadel and the M.Ed. in Secondary Education at Charleston Southern University, follow the national norm in science and mathematics education, in which science, math, and education are separate components, unlike our proposed integrated approach.

The University of South Carolina offers an Interdisciplinary Master of Arts in Natural Science, a program which aims at certified elementary or middle level teachers. The program which had been offered only on the U.S.C. campus recently submitted a proposal under which some of the courses in their program will be offered by videotape to external sites. Each course would have the supplemental hands-on, investigative help of a middle school classroom teacher who has completed their program. For nearly 50% of the required course work, students would have to travel to the Columbia campus.

In our proposed program, establishing the K-12 teacher in a professional association with University science and mathematics faculty is a prime focus. This human touch with university faculty in all course work will create the benefits of a local network of contacts, access to advice, and outside speakers in the classroom. Our proposed program includes mathematics as well as chemistry, physics, geology, and biology. Additionally, this program provides for a capstone experience with mentoring and research options. Our science and mathematics courses provide for an integration of content, methods, and technology unlike what is found in more traditional programs. A student in the proposed program will be allowed to work at a variety of levels dependent on the student's interests, experience, and needs and will develop a K-12 vision of what pupils learn in science and mathematics rather than just on the level at which they teach.

The proposed program differs significantly from master's degree programs currently offered by The Citadel. The Citadel offers several advanced degrees for teachers. The only programs in
which there are possible overlaps with the proposed program for certified teachers would be the Masters of Arts in Education in the areas of Biology or Mathematics. The proposed program differs significantly from these and is aimed at a substantially different audience.

While The Citadel’s programs are aimed at secondary teachers of biology or mathematics, and provide valuable training in these two single disciplines specifically, the proposed program is designed to be multidisciplinary, with all participants required to take courses in mathematics and in science disciplines. This allows someone to explore several fields, in addition to their own (if they are secondary teachers) discipline. In addition, each student will be required to take interdisciplinary courses, designed and jointly taught by a team of instructors with differing expertise. For example, one interdisciplinary course, SMFT -- Materials Science, would be jointly taught by a physicist and a chemist, and would require that students solve problems by an approach that incorporates both chemical and physical perspectives. All courses would incorporate mathematics and the appropriate use of computers.

The proposed program would serve a different audience from those secondary teachers currently enrolled in The Citadel programs in mathematics or biology. This proposed program was designed to meet the needs of K-12 teachers who are increasingly being called upon to offer interdisciplinary perspectives on sciences and mathematics, or to teach in an area other than their primary area of training.

Course work from The Citadel and from MUSC which is consistent with the design of the proposed program may be applied toward the proposed degree. In particular, participation of science and mathematics faculty from The Citadel would be welcome. They have been approached and invited to participate. The Citadel has suggested nine particular courses which they offer and which they feel are consistent with the proposed program. These would be examined to determine if the combination of content, pedagogy, and technology are indeed consistent. Courses deemed to be consistent could be taken at The Citadel or at the University of Charleston. Any courses taught by Citadel faculty would carry FTG credit for The Citadel. The Citadel has indicated that some faculty from their science and mathematics departments would be willing to work with students in the program who are involved in research projects. Additionally, The Citadel would have representation on the program’s steering committee.

While most programs in the United States, including those of The Citadel, offering a Master’s Degree in Education in Science and Mathematics have separate education and science/mathematics content courses, the proposed program will integrate science and mathematics content with effective pedagogy. The teaching in all courses will model methodology appropriate for use in the participants’ classrooms. Science/mathematics and education courses will be designed specifically for teachers by teams of science/math/education faculty with input from respected classroom teachers. This approach is innovative, and recognizes that the needs of the teacher differ from those of other graduate or undergraduate students.

Nationally, science education master’s degree programs exist in several states, with Florida, Indiana, Iowa, Kansas, and Oregon listed as some of the largest and most innovative of
programs. Many of these programs require a strong education component of courses as well as science courses. No program has attempted to integrate the sciences and education as thoroughly as the University of Charleston program proposes. For example, the Oregon State Program appears to require 45 hours of course work for completion with 30 hours in science or mathematics education and 15 hours of a planned combination of science, mathematics or computer science content courses. At the University of Iowa students in a non-thesis masters program take 13 hours of science education, 17 hours of science content and eight hours of course work in one area of concern. Finally, at Purdue, students take six hours of specialization courses in education, 9-18 hours of education electives and the remainder of the required 33 hours in related study outside of the College of Education. Examination of these programs indicates various levels of an integrated approach, all with much less integration than in the proposed program, to provide professional advanced degrees for teachers of science and mathematics.

The proposed program follows the basic pattern found in several institutions across the U.S. that are designed to recognize that teachers of science need to be well versed in three major areas: experience in and knowledge of science, understanding of how children learn (science and mathematics specifically) and the inter-relationships and applications of the different science disciplines and mathematics in the recognition and solution of problems. The major difference between the University of Charleston program and the other programs described in this section is that the courses proposed herein intend to integrate these three major areas in all courses. For example, a science course would focus on science content, use appropriate pedagogy, and require students to recognize and solve problems. An education course would be based on education content, use science examples, and require students to recognize and solve problems.

Need for the program

In the Fall semester of 1992, a survey was conducted at a sample of three elementary, two middle, and three high schools in the tri-county area. The schools used represent a diversity of socio-economic and cultural backgrounds. Two kinds of questionnaires were used, one for elementary teachers and one for middle/high school teachers. The questionnaires explained in general terms the aims and purpose of the proposed degree. All teachers who teach science/mathematics were required to fill out and turn in the questionnaires. Teachers could respond "yes" or "no" as to their interest in such a program and make comments or suggestions. An earlier version of the questionnaire was sent out to a wider audience which could elect to respond. This occurred near the end of the school year and the response rate was very low. The questionnaires filled out by all teachers at the schools sampled allow for a more meaningful projection and extrapolation. Twenty-seven percent of the respondents (45 out of 164) indicated interest in the program.
Viewed by level, 36% (or 21 of 59) of elementary teachers, 18% of middle school teachers, and 33% of secondary teachers who teach mathematics or science expressed interest in the proposed program.

Number of Teachers Who Teach Math or Science in the Tri-County Area in Public Schools

<table>
<thead>
<tr>
<th>Elementary</th>
<th>Middle</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charleston County</td>
<td>850</td>
<td>120</td>
</tr>
<tr>
<td>Dorchester County</td>
<td>345</td>
<td>34</td>
</tr>
<tr>
<td>Berkeley County</td>
<td>510</td>
<td>125</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1705</td>
<td>279</td>
</tr>
</tbody>
</table>

(36% OF 1705) + (18% OF 279) + (33% OF 378) = 789

From the table and percentages provided above, an estimated 789 science/math teachers in the tri-county area public schools would be expected to express an interest in the proposed degree.

Additionally, a 1986 survey conducted by the Charleston Higher Education Consortium asked 3336 public school faculty and staff whether they wanted to earn a graduate degree higher than any degree they currently hold. Sixty-seven percent said they did.

The Curriculum and Evaluation Standards for School Mathematics of the National Council of Teachers of Mathematics (NCTM) has set national standards that must be met so that students may gain mathematical power. The South Carolina Mathematics Framework has developed content strands for each grade level in our state and emphasizes that new teaching techniques must be employed. The National Research Council has set similar standards for science, and
South Carolina is currently developing its science frameworks. Members of this masters committee are well acquainted with these national and state guidelines. Several committee members have served on panels to review these documents and many have already developed and offered courses implementing these standards as a main objective.

The preparation and development of education professionals is listed as Critical Need #2 in the July 1992 Report of the Governor’s Mathematics and Science Advisory Board (MSAB). The South Carolina State Systemic Initiative (SSI) proposal also states, “Teachers must take an active role in charting their own professional growth and have access to high quality professional development opportunities led by successful teachers and coordinators of science and mathematics.” Furthermore, courses should use the same techniques that teachers will implement in their classrooms (Principle #5, SSI, page 12). The overall goal of the SSI is to improve mathematics and science education for all students in South Carolina. The MSAB and the SSI both agree that the teacher is the key to change.

“Mathematics and science education will not improve until we supply an adequate basis at the early grades through existing teachers. The basis should be formed with an integrated approach among the content areas using appropriate pedagogy. I feel that this program provides a good blend and content level courses which are realistic.” (Sandra Powers, Member of Board of Directors, National Council of Teachers of Mathematics.)

This master’s program has been designed to address the needs stated above. Content for the courses will be selected in accordance with the content strands of the SC Mathematics and Science Curriculum Frameworks. Instructors will model innovative teaching techniques such as cooperative learning. Hands-on participation will be introduced so that teachers may see how to incorporate this technique into their own classrooms. Where appropriate, instructors will model methods of assessment and, in some courses, participants will develop their own assessment standards.

This program provides K-12 teachers the opportunity to pursue an interdisciplinary M.Ed. in Science and Mathematics. The current science reform movements of the National Research Council (NCR), Scope, Sequence & Coordination (SSC), and the American Association for the Advancement of Science (AAAS) all emphasize both (1) every science every year, and (2) the interdisciplinary nature of science. In keeping with the philosophy of the South Carolina Frameworks, the Trident area schools are focusing their curricula on (1) every science, every year in K-5, (2) units in middle school that call for variety in science knowledge, and (3) a national trend toward content integration in the high schools that require heavy reliance on broad based science experience. Tech prep courses also utilize a more interdisciplinary approach to teaching science than the traditional courses previously offered in the public schools.

The movement in the Trident area toward integrating the sciences with each other and with other content areas is an instructional paradigm shift. Note that all 16 Charleston County middle schools adhere to or aspire toward the model of content integration and interdisciplinary
instruction. Also, a growing number of high schools are teaching interdisciplinary science courses.

"I know that teachers in the school district are anxious to have the program available for their future professional development. ... The plan specifically seems to address the needs of the elementary, middle, and high school teachers. The integrated courses provide opportunities for integrating the disciplines in ways that are interrelated in the natural world."
(Carol Tempel, Coordinator, Charleston County School District Office of Math, Sciences, and Technology.)

The proposed program provides the student an opportunity to emphasize content within a single discipline through (B1) courses while promoting interdisciplinary (B2) courses. Chemistry, physics, and geology are not offered as an M.Ed. program at any of the higher education institutions in this area for either middle or high school teachers. A biology and a mathematics M.Ed. is offered at The Citadel, but we do not propose to compete with these programs. In fact, the University of Charleston has made a commitment to advise students desiring a singular, non-science integrated M.Ed. to enroll in The Citadel’s mathematics or biology programs.

Additionally, the proposed program will address a common need, that of teachers who teach two or more content disciplines, by making it possible for the student to take a variety of science courses and learn up-to-date content which could be carried back to their own classrooms.

"This masters program will provide the diversity in science training that our teachers at all levels have been requesting. Teachers who have degrees just in Biology or just Chemistry find it difficult to teach other areas of science. Most science teachers teach at least one science course outside their science major. Chemistry teachers are assigned one biology class to teach as well as biology teachers teaching chemistry."
(Pamela Coffey, Berkeley County School District Science Coordinator.)

The University of Charleston’s proposed program for a Master of Education in Science and Mathematics is designed to bring teachers of science and mathematics in contact with scientists and mathematicians within the local university system to enhance the interaction between these groups. This program has been designed on the fundamental premise that teachers of science and mathematics are members of the science and mathematics professional community. It has been designed to build a place for teachers within existing science and mathematics departments. This is quite a revolutionary move, one that seeks to support active alliances between those who are involved with the sciences and mathematics as participants in the further development and expansion of humanity’s understanding of the physical world with those who bear the responsibility for introducing students to an increasingly technological world.

"There is a real need for this type of program where courses stress the integration of science and mathematics content and incorporate technology into the instruction. The program of studies in this proposal provides a perfect blend of mathematics, science
and technology which will strengthen and enhance the knowledge of the practicing teacher. In addition, the Category C requirements, the Capstone Experiences, promote the notion of the teacher as a life-long learner and a member of the professional community which is one of the keystones of the South Carolina Mathematics Framework and the NCTM Standards.”
(Christine Pateracki, President, South Carolina Council of Teachers of Mathematics.)

This degree program seeks to further enhance the interaction between local teachers and the faculty of the University. The School of Sciences and Mathematics of the University of Charleston has been very active in programs which strengthen the fundamental knowledge of both teachers and pre-college students. This degree program would allow the science and mathematics departments to help deliver a coordinated, developmental sequence of course work for each teacher with the goal of helping to create a truly scientific and mathematically literate teaching force with a place in the academic institutions that deal with the subjects with which they are involved.

The core courses in this degree are to be designed by teams of science, mathematics, and education faculty and exemplary classroom teachers. The teaching methods and materials used in the core courses model methods and materials that can be used in the classrooms of the teachers. Each course will be developed using the most recent materials available. The college faculty and the consulting classroom teachers will be expected to be familiar with current curricula, advances in classroom technology, and alternate methods of teaching and assessment, and resources that are available to the schools in the state of South Carolina.

“...In fact, the establishment of this program is vital if we are to make significant changes aimed at preparing all students as scientific, mathematical, and technology literate citizens of the 21st century.”
(Paula Keener-Chavis, Director, Charleston Math and Science Hub.)

Finally, there are compelling non-numerical arguments supporting this degree proposal. The world community is becoming increasingly more dependent on technology and is requiring a society that is more literate in sciences and mathematics. Teachers who are proficient in mathematics and the sciences are desperately needed at each of the elementary, middle, and secondary levels. Teachers at all levels who teach science/mathematics need enough involvement with science/mathematics to be able to generate a positive attitude about these subjects in their students. Student attitudes about mathematics and science are established at early levels and need nurturing throughout the K-12 years. Techniques which will help teachers teach science and mathematics effectively are necessary as well.
Administration

The program will be administered by the University of Charleston, including initial funding, enrollment of students, management of budget and finances, and granting of degrees.

A graduate faculty will be selected from faculty at the University of Charleston. A faculty member must have primary assigned duties in one of the following departments: mathematics, chemistry, biology, geology, physics, elementary education, or foundations and specializations (includes secondary education programs) and indicate a desire to be a member of the graduate faculty of this program. Any changes in the curriculum must be approved by a vote of the graduate faculty of this program. Further, The Citadel will be contacted to determine which of their science, mathematics, and education faculty indicate a desire to be members of the graduate faculty of the program. Upon review and approval by the program's Steering Committee, these would be added to the list of graduate faculty.

The program will be jointly governed by the School of Education and the School of Sciences and Mathematics. There will be a steering committee consisting of one director and two advisors from each school. Of the three members from the School of Sciences and Mathematics, at least one member must be from mathematics. Of the three members from the School of Education, both the elementary education and the foundations and specializations divisions must be represented. There shall be Citadel representation on the Steering Committee. The number of representatives will be negotiated by the two institutions. The Steering Committee will ensure the integrity and quality of the program and that content is consistent with the science and mathematics curricula in the schools. An ex officio mentor advisory board will be formed to ensure the quality of mentor experiences for the program. This board will consist of individuals who provide mentor experiences.

Enrollment

A conservative estimate of the number of students in the proposed program is made by comparing the proposed program to numbers 30% in excess of our smallest education masters program (M.Ed. in Special Education, joint with The Citadel). This program serves a population of 667 special education teachers in the area and teaches about 348 credit hours each year. This equates to 116 people taking one course each, or 17% of the target teacher population. The estimate for the proposed program would then be 453 hours per year, after the phase in period. This is equivalent to 151 people taking one course each.

There are 2362 public elementary, middle, and secondary math or science teachers in the tri-county region, plus a substantial number in the private sector. If 17% of just the public school teachers took one course each, we would have to provide 1206 credit hours for 402 students, more than triple the size of the special education program. While the special education teachers have only one local masters degree option, the math and science teachers have alternative programs available. Consequently, we are comfortable projecting enrollments in the proposed program to be scaled down from the 402 student figure to 130% of the number of participants in
the special education program. This reflects a participation rate of less than one-third of the participation rate of the teachers served by the special education masters program. The following chart reflects an increase over three years, to this conservative level.

Most of these hours will be generated by part-time students. The following tables reflect this fact and that a phase-in period of three years is expected.

**TABLE 1**
ANTICIPATED ENROLLMENTS FOR EACH FALL TERM FOR FIVE YEARS
(Starting in 1997)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall Full-time</th>
<th>Full-time (FT+PT)</th>
<th>Head-count (FT+PT)</th>
<th>Total enrollment (FT x 3 courses)+(PT x 1 course)*</th>
<th>SCHs = Enrollment 3 Hours</th>
<th>FTEs = (SCH + 12)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>2</td>
<td>24</td>
<td>26</td>
<td>30</td>
<td>90</td>
<td>7.5</td>
</tr>
<tr>
<td>1998</td>
<td>3</td>
<td>36</td>
<td>39</td>
<td>45</td>
<td>135</td>
<td>11.25</td>
</tr>
<tr>
<td>1999 Base Year</td>
<td>4</td>
<td>48</td>
<td>52</td>
<td>60</td>
<td>180</td>
<td>15</td>
</tr>
<tr>
<td>2000</td>
<td>4</td>
<td>48</td>
<td>52</td>
<td>60</td>
<td>180</td>
<td>15</td>
</tr>
<tr>
<td>2001</td>
<td>4</td>
<td>48</td>
<td>52</td>
<td>60</td>
<td>180</td>
<td>15</td>
</tr>
</tbody>
</table>

Note: *Full-time for graduate students at the University of Charleston, SC, is considered to be three (3-hour) courses, and part-time is considered to be one (3 hour) course. For FTE calculations, a full-time student is considered to be taking 12 graduate hours per semester.

**For CHE purposes, FTE is equal to 12 semester hours.**

**TABLE 2**
Number of Estimated Additional Credit Hours

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall Term</th>
<th>Spring Term</th>
<th>Summer Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997-98</td>
<td>90</td>
<td>90</td>
<td>48</td>
</tr>
<tr>
<td>1998-99</td>
<td>135</td>
<td>135</td>
<td>72</td>
</tr>
<tr>
<td>1999-2000</td>
<td>180</td>
<td>180</td>
<td>93</td>
</tr>
<tr>
<td>2000-01</td>
<td>180</td>
<td>180</td>
<td>93</td>
</tr>
</tbody>
</table>
CURRICULUM

The proposed program is a radical departure from the more traditional programs existing and expanding in South Carolina and elsewhere. Our program allows the teachers to interact with the entire faculty of the School of Sciences and Mathematics. Scientists and mathematicians, with very strong interest in pre-college education, will constitute the majority of the exposure the participants in the program will get. This program constitutes perhaps the strongest commitment made anywhere by a university level coalition of science and mathematics faculty to a teacher enhancement master's degree program. Many teachers, particularly those with elementary emphasis, have vastly more pedagogical education and experience than they do content. This program involves a marriage of content and pedagogy.

The proposed program has, by intention, an amorphous grade level specification on many courses. It is the goal of the program to have participants placed in courses consistent with their experience, training, local needs, and SC Framework goals. This placement will be accomplished by close coordination between the participant, the advisor, the steering committee, and the program directors.

The proposed curriculum will be subject to the policies of the Graduate School at the University of Charleston. A total of 36 hours would be required for completion of the program, with courses selected from the following four categories.

1). Category A: Fundamental Education Curriculum (9 hours)
2). Category B1: Fundamental Science and Mathematics Curriculum (at least 14 hours)
3). Category B2: Integrated Science Courses (6 hours)
4). Category C: Capstone Experiences (at least 6 hours)

Category A courses would be offered by the School of Education. The three courses are designed to provide teachers with an opportunity to understand science and mathematics education from philosophical, psychological, and historical perspectives. Another emphasis is placed on educational research.

Category B1 courses would be offered by the School of Sciences and Mathematics. A minimum of two science courses and one mathematics course is required from Category B1. Each of the B1 classes will involve a computer component to introduce teachers to available software and to provide experience working with programs suitable for classroom use. Throughout each course, teachers would acquire conceptual knowledge of appropriate scientific and mathematical processes, with the expectation of developing classroom activities primarily appropriate for their grade levels.

Category B2 courses are also offered by the school of Sciences and Mathematics and are designed to use an integrated, interdisciplinary approach to investigate applications of scientific principles. Emphasis will be given to topics of current or local interest and/or across the curriculum. Also, a student may take courses currently offered in our existing master's degree programs.
Category C courses are capstone courses which emphasize faculty supervised research, internship, graduate science, and mathematics course work, or a course designed to teach them how to maintain excellence in their disciplines through grants, curriculum development, and policy issues. Students may select from among:

- SMFT ___ CAPSTONE SEMINAR
- EDFS ___ CURRICULUM, POLICY, AND SYSTEMS IN SCIENCE AND MATHEMATICS EDUCATION
- SMFT ___ THESIS (based on a research experience, an internship experience, a project development experience, or another area approved by the Steering Committee)

The following is a list of courses proposed for the program. It should be pointed out that the course prefix SMFT stands for “science and mathematics for teachers.” A course sequence for the first three years is presented in Table 3. Sample plans for study for elementary, middle, and high school teachers are outlined in Table 4. Course descriptions follow the sample plans of study. Existing graduate courses in science and mathematics from the University of Charleston’s programs in Marine Science, Environmental Studies, and Mathematics. Courses offered by The Citadel and MUSC may also be taken, with the approval of the Steering Committee.
LIST OF COURSES*

CATEGORY A:
EDFS 635  EDUCATIONAL RESEARCH
EDFS 632*  EDUCATIONAL PSYCHOLOGY
EDFS 660*  NATURE OF SCIENCE, MATHEMATICS, AND SCIENCE/MATHEMATICS EDUCATION

CATEGORY B1:
EDEE 670  SCIENCE FOR THE ELEMENTARY SCHOOL TEACHER
SMFT(GEOL) 523*  EARTH SCIENCE FOR TEACHERS
SMFT(GEOL/PHYS) 524*  SPACE SCIENCE FOR TEACHERS
SMFT(BIOL) 530*  INTRODUCTION TO BIOLOGICAL SCIENCE
SMFT(BIOL) 537*  TOPICS IN BOTANY FOR TEACHERS
SMFT(BIOL) 538*  TOPICS IN ZOOLOGY FOR TEACHERS
SMFT(MATH) 510*  INTRODUCTION TO PROBLEM SOLVING
SMFT(MATH) 518*  APPLICATIONS OF CALCULUS
SMFT(MATH) 511*  INTRODUCTION TO PROBABILITY AND STATISTICS
SMFT(CHEM/PHYS) 548*  ATOMIC THEORY OF MATTER FROM LUCRETIUS TO QUARKS
SMFT (PHYS/CHEM) 540*  FUNDAMENTALS OF PHYSICAL SCIENCE
SMFT (PHYS/CHEM) 546*  PHYSICAL SCIENCE
SMFT(PHYS) 555*  TOPICS IN PHYSICS FOR TEACHERS
SMFT(MATH) 516*  APPLICATIONS ACROSS THE MATHEMATICS CURRICULUM WITH TECHNOLOGY
SMFT(MATH/Biol/Chem/Geol/Phys) 680*  SPECIAL TOPICS
EDUC 6XX  WOODROW WILSON INSTITUTES FOR TEACHERS OF SCIENCE AND MATHEMATICS (MATH, BIOLOGY, CHEMISTRY, PHYSICS) (Treated as a special topics course)

CATEGORY B2:
(K-8 options):
**SMFT(BIOL/GEOL) 644*  MARINE AND COASTAL SCIENCE
**SMFT (PHYS) 645*  THE PHYSICS OF FORCE AND MOTION FOR TEACHERS
GEOL 640  EARTH SYSTEMS SCIENCE
EDFS 661*  SCIENCE, TECHNOLOGY, AND SOCIETY: ENVIRONMENTAL CONNECTIONS
EVSS 650  ENERGY PRODUCTION AND RESOURCE MANAGEMENT

(8-12 options):
SMFT(BIOL) 637*  BIOTECHNOLOGY
SMFT(PHYS/Chem) 647*  SPECTROSCOPY: KEY TO MODELS OF ATOMS AND THE UNIVERSE
**SMFT(BIOL/Chem/Geol) 665*  SOCIETY AND STRESS ON THE ENVIRONMENT
SMFT(CHEM/PHYS/Geol) 667*  MATERIALS SCIENCE

CATEGORY C:
SMFT 701*  CAPSTONE SEMINAR
EDFS 703*  CURRICULUM, POLICY, AND SYSTEMS IN SCIENCE AND MATHEMATICS EDUCATION
SMFT 700*  THESIS (based on a research experience, an internship experience, a project development experience, or another area approved by the Steering Committee)

Graduate courses in other sciences and mathematics degree programs as described above.

Note: Courses which are to be developed for the program are identified with a department acronym only, without a course number.

** Course available for both K-12 and 8-12 options.
<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer 1</th>
<th>Summer 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(A)</td>
<td>EDFS 635</td>
<td>(A)</td>
<td>(A)</td>
</tr>
<tr>
<td></td>
<td>(B1)</td>
<td>EDEE 670</td>
<td>(B1)</td>
<td>(B1)</td>
</tr>
<tr>
<td></td>
<td>(B1)</td>
<td>SMFT(CHEM/PHYS) 548</td>
<td>(B1) SMFT(MATH) 510</td>
<td>SMFT(GEOL/PHYS) 523 or 524</td>
</tr>
<tr>
<td></td>
<td>(B2)</td>
<td>Atomic Theory of matter from Lucretius to quarks</td>
<td>(B1) SMFT(MATH) 511 Introduction to probability and statistics</td>
<td>Earth or space science for teachers</td>
</tr>
<tr>
<td></td>
<td>(B2)</td>
<td>GEOL 640 Earth System Science (K-12)</td>
<td>(B2) SMFT(BIOL) 637 Biotechnology (8-12)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(A)</td>
<td>EDEE 670</td>
<td>(A)</td>
<td>(A)</td>
</tr>
<tr>
<td></td>
<td>(B1)</td>
<td>EDFS 635</td>
<td>(B1)</td>
<td>(B1)</td>
</tr>
<tr>
<td></td>
<td>(B1)</td>
<td>SMFT(BIOL) 538</td>
<td>(B1) PHYS/CHEM 546</td>
<td>SMFT(BIOL) 530 Intro. to Biological Science</td>
</tr>
<tr>
<td></td>
<td>(B1)</td>
<td>Topics in zoology for teachers</td>
<td>(B1) Physical Science</td>
<td>EDFS 661 Science, technology, and society: environmental connections</td>
</tr>
<tr>
<td></td>
<td>(B1)</td>
<td>SMFT(PHYS) 555</td>
<td>(B1) SMFT(MATH) 518 Applications of calculus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(B2)</td>
<td>Topics in Physics for Teachers</td>
<td>(B2) EVSS 650</td>
<td>(B2) SMFT(CHEM/PHYS/GEOL) 667 Materials science (8-12)</td>
</tr>
<tr>
<td></td>
<td>(B2)</td>
<td>SMFT(PHYS/CHEM) 647 Spectroscopy: Key to models of atoms and the universe (8-12)</td>
<td>(B2) Energy Production and Resource Management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(B2)</td>
<td>GEOL 640 Earth System Science (K-12)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 3**

**COURSE SEQUENCE**
<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer I</th>
<th>Summer 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>(A) EDFS 635</td>
<td>(A) EDFS 632. Educational Psychology</td>
<td>(A) EDFS 635</td>
<td>(B1) Woodrow Wilson Institute (K-8)</td>
</tr>
<tr>
<td></td>
<td>(A) EDFS 660</td>
<td>(B2) SMFT(PHYS) 645</td>
<td>(B2) SMFT(BIOL/ CHEM/ GEOL) 665</td>
<td>(B2) SMFT(BIOL/ GEOL) 644</td>
</tr>
<tr>
<td></td>
<td>Nature of Science, Math, and Science/Math Education</td>
<td>Physics of Force and Motion for Teachers (K-8)</td>
<td>Society and stress on the environment</td>
<td>Marine and Coastal Science (K-12)</td>
</tr>
<tr>
<td></td>
<td>(B1) EDEE 670</td>
<td>(B2) EVSS 650 Energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(B2) GEOL 640</td>
<td>Production and Resource Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Earth Systems Science (K-12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(C) EDFS 703</td>
<td>Curriculum, Policy and Systems in Science and Mathematics Education</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 4
SAMPLE PLANS OF STUDY

#### Elementary School Teachers

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer 1</th>
<th>Summer 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EDEE 670 Science for the Elementary School Teacher</td>
<td>SMFT(PHYS/CHEM) 540 Fundamentals of Physical Science</td>
<td>SMFT(MATH) 511 Introduction to probability and statistics</td>
<td>SMFT(GEOL/PHYS) 523 or 524 Earth or space science</td>
</tr>
<tr>
<td>2</td>
<td>EDFS 635 Educational Research</td>
<td>EDFS 632 Educational Psychology</td>
<td>EDFS 661 Science, Technology, and Society: Environmental Connections</td>
<td>EDFS 665 The Physics of Force and Motion for Teachers</td>
</tr>
<tr>
<td>3</td>
<td>EDFS 660 Nature of Science, Math and Science/Math Education</td>
<td>SMFT(PHYS) 645</td>
<td>CAPSTONE</td>
<td>CAPSTONE</td>
</tr>
</tbody>
</table>

#### Middle School Teachers

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer 1</th>
<th>Summer 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EDFS 635 Educational Research</td>
<td>SMFT(MATH) 510 Introduction to Problem Solving</td>
<td>SMFT(MATH) 511 Introduction to Probability and Statistics</td>
<td>SMFT(GEOL/PHYS) 523 or 524 Earth or space science</td>
</tr>
<tr>
<td>2</td>
<td>SMFT(PHYS) 555 Topics in Physics for Teachers</td>
<td>EDFS 632 Educational Psychology</td>
<td>SMFT(Chem/GEOL/PHYS) 667 Materials Science</td>
<td>EDFS 665 The Physics of Force and Motion for Teachers</td>
</tr>
<tr>
<td>3</td>
<td>EDFS 660 Nature of Science, Math and Science/Math Education</td>
<td>CAPSTONE</td>
<td>CAPSTONE</td>
<td>CAPSTONE</td>
</tr>
</tbody>
</table>

#### High School Teachers

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer 1</th>
<th>Summer 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SMFT(CHEM/PHYS) 548 Atomic Theory of Matter from Lucretius to Quarks</td>
<td>SMFT(BIOL) 537 Topics in Botany for Teachers</td>
<td>EDFS 635 Educational Research</td>
<td>EDUC(MATH/BIOL/ CHEM/PHYS) 6XX Woodrow Wilson Institute</td>
</tr>
<tr>
<td>2</td>
<td>EDFS 632 Educational Psychology</td>
<td>SMFT(CHEM/GEOL/PHYS) 667 Materials Science</td>
<td>SMFT(MATH) 516 Applications Across the Mathematics Curriculum with Technology</td>
<td>EDFS 665 The Physics of Force and Motion for Teachers</td>
</tr>
<tr>
<td>3</td>
<td>EDFS 660 Nature of Science, Math, and Science/Math Education</td>
<td>EVSS 650 Energy Production and Resource Management</td>
<td>CAPSTONE</td>
<td>CAPSTONE</td>
</tr>
</tbody>
</table>

Note:
(1) Category C courses in research of internship may be taken during any of the semesters near the end of the student's program.
(2) Courses which are to be developed for the program are identified with a department acronym only, without a course number.
COURSE DESCRIPTIONS

CATEGORY A: FUNDAMENTAL EDUCATION CURRICULUM (9 HOURS)

EDFS 635 Educational Research (3)
An in-depth study of methods used in different types of educational research. Includes involvement of the student in the process of educational research design, implementation, reporting, and evaluation.

EDFS 632 Educational Psychology (3)
This course incorporates current research, knowledge, and concepts in which both teachers and prospective teachers can base informed decisions that positively affect student attitudes and achievement. Major course topics include quantitative and qualitative methods for classroom observation and research, strategies for dealing with student diversity, social-constructivist learning and instructional issues, concepts and strategies with which to address complex classroom behaviors and interactions, and strategies for developing, reflecting on, and refining teaching style.

EDFS 660 Nature of Science, Mathematics, and Science/Mathematics Education
Topics include the historical development of science and mathematics and the variety of philosophies in science/mathematics education. Other topics include social trends affecting science education in the United States since 1900, including reform movements of 1904, 1937, 1945, 1960, and the present; and local frameworks addressing national and global concerns.

CATEGORY B1: FUNDAMENTAL SCIENCE AND MATHEMATICS CURRICULUM (at least 14 hours)

EDEE 670 Elementary Science Instruction (3)
A course for elementary teachers who have at least partial responsibility for science teaching. It focuses on comprehension and application of integrated science process skills using concepts from life, earth, and physical science to teach them.

SMFT(GEOL)523 Earth Science for Teachers (4)
This course examines the physical nature of the earth, its oceans, and atmosphere. Teachers will examine the geological processes affecting the surface of the earth and the interaction of earth's dynamic hydrosphere and atmosphere. Throughout the course, teachers will acquire conceptual knowledge of these processes with the expectation of learning and developing classroom activities appropriate for primary and middle school students. Where appropriate, teachers will use computer-downloaded real-time satellite images and space shuttle photographs to develop activities.
SMFT(GEOL/PHYS) 524
SPACE SCIENCE FOR TEACHERS (4)
This course will consist of two components: planetary science and astronomy. Teachers will learn the physical properties of the Solar System and the geological characteristics of the planets and moons within the context of the origin of the Solar System. Astronomy will be used to develop an understanding of stellar evolution and composition of the cosmos. Teachers will use acquired conceptual knowledge to develop classroom activities appropriate for primary and middle school students. An emphasis will be placed on acquisition, via remote sensing, of data and images downloaded from NASA centers.

SMFT(BIOL) 530
INTRODUCTION TO BIOLOGICAL SCIENCE (4)
This course provides an introduction to ecosystems and to some of the various plant and animal species that belong to them with emphasis on local species and habitats. Fundamental concepts of genetics and evolution will be introduced through appropriate model organisms. The course will address basic anatomy and physiology of animals and plants and give an introduction to model plant systems that are appropriate for the classroom. Throughout the course teachers will acquire conceptual knowledge of biology with the expectation of developing classroom activities primarily appropriate for elementary students.

SMFT(BIOL) 537
TOPICS IN BOTANY FOR TEACHERS (4)
This more advanced course introduces plant taxonomy with emphasis on South Carolina species and their habitats. The course further investigates anatomy and physiology of plants. Appropriate model plant systems will be used to introduce plant physiology, genetics, and development. Plant tissue culture will be introduced.
Prerequisite: One year of teaching biology, and one year of college biology.

SMFT(BIOL) 538
TOPICS IN ZOOLOGY FOR TEACHERS (4)
This course will provide an introduction to animal diversity with emphasis on South Carolina species and their habitats. It will address the anatomy and physiology of animals. The fundamental concepts of genetics and evolution will be introduced through appropriate model organisms.
Prerequisite: One year of teaching biology and one year of college biology.

SMFT(MATH) 510
INTRODUCTION TO PROBLEM SOLVING (3)
A course designed primarily for elementary and middle-level teachers to investigate school mathematics topics through problem solving activities. Topics covered will include numeric and algebraic concepts and operations; patterns, relationships, and functions; geometry and spatial sense; and
measurement. The NCTM standards, NCTM Addenda Series, and the South Carolina Mathematics Curriculum Frameworks will serve as a basis for the nature and content of activities. AIMS activities will also be included so that teachers may investigate the ways to integrate mathematics and science in the classroom.

SMFT(MATH) 518
APPLICATIONS OF CALCULUS (3)
Applications of calculus appropriate to the natural sciences. This course will present a wide range of practical problems in differential and integral calculus, suitable for incorporation in either calculus or science courses. The course includes presentation pedagogy and may also include exposure to graphing calculators and computerized symbolic mathematics programs. Prerequisite: One semester of calculus or permission of the instructor.

SMFT(MATH) 511
INTRODUCTION TO PROBABILITY AND STATISTICS (3)
This course is designed primarily for the elementary and middle-level teachers. The course will examine methods of statistical measurement and their uses and misuses in interpreting and describing data. The course also addresses variation, the underlying framework and application of basic probability distributions, and inductive reasoning through probability.

SMFT(CHEM/PHYS) 548 (4)
ATOMIC THEORY OF MATTER FROM LUCRETIUS TO QUARKS
This course looks at milestones in the development of atomic theory as a means to understand the basic concepts of modern atomic theory and as an example of the dynamic nature of model building in science. The experimentation that led to the proposal of a particulate nature of matter, to the concept of energy states for atoms, and the discovery of elementary materials will be discussed and repeated where possible. Modern methods for analysis of the nature of matter will be addressed. The nature of the nucleus and nuclear changes will be included. Prerequisite: One year of teaching high school chemistry, physics, or physical science; one year of college chemistry or physics.

SMFT (PHYS/CHEM) 540
FUNDAMENTALS OF PHYSICAL SCIENCE (4)
The course will explore the creative nature of science, build observational and descriptive skills, discover laws of chemistry and physics, familiarize and use the tools of science (from meter sticks to computers). A significant component of the course will be the development of instructional, hands-on activities for students appropriate for the K-8 classroom. General topics will include: measurement, estimation, heat, light, sound, electricity, magnetism, and gravity. Chemistry topics will include the nature of elements, compounds, and mixtures; chemical and physical properties of matter;
chemical reactions from a matter and energy perspective; and applications of chemistry.

**SMFT (PHYS/CHEM) 546**

**PHYSICAL SCIENCE (4)**
Philosophically similar to, but more advanced than PHYS/CHEM 540. A significant component of the course will be the development of instructional, hands-on activities for students that are appropriate for high school level physical science classrooms. Scientific concepts will be further developed and applied to phenomena and modern technology that affect our lives. Topics such as superconductors, nuclear physics, lasers, rainbows, blue sky, microwave ovens, environmental health, remote controls, the development of new material for space-age living, and the chemistry of living systems will be used as vehicles to develop physics and chemistry concepts and to, hopefully, entice students to explore the physical sciences further in their choices of high school course.

**Prerequisite:** Fundamentals of Physical Science, one year of college physics, or one year of teaching physical science.

**SMFT (MATH) 516**

**APPLICATIONS ACROSS THE MATHEMATICS CURRICULUM WITH TECHNOLOGY (3)**
This course will investigate the connections among various mathematical topics and their applications. Emphasis will be placed on modeling real world phenomena. The use of geometric models, trigonometry, and probability and statistics to represent problem situations will be developed. Other topics will include network theory, matrices, and linear programming. This course will explore a variety of uses of technology to aid student investigation, conjecturing, verifying, and applying mathematics. Throughout the course teachers will develop activities appropriate for middle and secondary level classes.

**SMFT (MATH, BIOL, CHEM, GEOL, OR PHYS) 680**

**SPECIAL TOPICS (3)**
A semester course on a topic in one or more of the sciences and/or mathematics.

**SMFT (PHYS) 555**

**TOPICS IN PHYSICS FOR TEACHERS (4)**
An examination of an area of physics of special interest to teachers. Possible topics include: optics (including lasers), computer modeling in physics. The course will ordinarily be a combination of lecture, demonstration, and laboratory exercises, including the development of suitable experiences for the pre-college classroom.

**Prerequisite:** permission of the instructor.
EDUC(MATH/BIOL/CHEM/PHYS) 6XX

WOODROW WILSON INSTITUTES FOR TEACHERS OF SCIENCE AND MATHEMATICS (3)

These institutes are available in biology, chemistry, physics, secondary mathematics, physical science, and middle school mathematics. The institutes are designed to update content knowledge of teachers, introduce them to the latest laboratories, demonstrations, and computer software available on the topic of the institute, and allow each teacher to experience the new labs. The institutes are conducted by teams of the most outstanding middle and high school science teachers in the USA. The institutes are also designed to encourage participating teachers to become involved in local, state, and national professional activities and associations.

CATEGORY B2 INTEGRATED COURSES (APPLICATIONS OF SCIENCE) (6 HOURS).

(K-8 Options)

SMFT(BIOL/GEOL) 644

MARINE AND COASTAL SCIENCE (3)

This course investigates the Earth's major ocean basins and adjacent coastlines. Course topics will include the physical and chemical properties of oceans, marine ecology, coastal wetlands, barrier islands, and the impact of coastal development and human activities on the seashore. Applications of topics will be used to develop classroom activities dealing with the South Carolina wetlands and shoreline.

SMFT(PHYS) 645

THE PHYSICS OF FORCE AND MOTION FOR TEACHERS (3)

A course which ties principles of force and motion to the everyday world. Newton's laws of motion will be used in conjunction with the fundamental forces of electricity and gravity to develop the understanding of motion of things in the world around us. Waterfalls, weather systems, waves, plate tectonics, friction, and other applications of the laws of nature that relate directly to motion will be studied. Teaching and presentation techniques suitable for the pre-college classroom will be a significant aspect of the course.

GEOL 640

EARTH SYSTEMS SCIENCE (3)

The Earth Systems Science course investigates the interactions among the atmosphere, ocean, ice, solid-Earth, and biological systems. In this course, students will study the evolution of solid-Earth, the formation of the atmosphere and oceans, and the origin of life. Rate and scale of changes of the Earth's environment will be examined through an analysis of changing climates. Finally, the course examines human evolution and technological development to gain an understanding of our impacts on the global environment.
EVSS 650  ENERGY PRODUCTION AND RESOURCE MANAGEMENT (3)
A study of the nature of energy and scientific issues relating to its production, storage, distribution, and use from a physics perspective. Production methods to be studied include: hydroelectric, fossil fuel, fission, fusion, wind, photovoltaic, bio-mass, and solar-dynamics. Scientific issues will be related to the cultural and philosophical framework surrounding energy infrastructure and policy.

EDFS 661  SCIENCE, TECHNOLOGY, AND SOCIETY: ENVIRONMENTAL CONNECTIONS (3)
This course explores an environmental problem, the various physical, biological, and social factors that have an impact on the problem, and potential approaches to ameliorate the problem.

(8-12 options)
SMFT(BIOL)637  BIOTECHNOLOGY (4)
This course will cover approaches and techniques that are used in Biotechnology. The structure of proteins and DNA will be reviewed, and the importance of these molecules in biotechnology will be discussed. Techniques to be described in the course include gel electrophoresis, Western blotting, immunolocalization, and basic cloning techniques. Where applicable, computer programs will be used to enhance the learning of the techniques and principles. Applications of the techniques, such as gene mapping and gene therapy, will be discussed along with ethics issues raised by their use.

SMFT(PHYS/CHEM) 647
SPECTROSCOPY: KEY TO MODELS OF ATOMS AND THE UNIVERSE (4)
This course investigates the discovery and development of spectroscopy as a major tool for studying the nature of matter. Its application to the study of modern atomic theory and modern astronomy will be explored. Laboratory work will include exercises in the use of this technique in modern analytical investigations.

SMFT(BIOL/CHEM/GEOL) 665
SOCIETY AND STRESS ON THE ENVIRONMENT (4)
This course examines problems and potential future problems with the environment. Also treated are methods of analysis, possible solutions, and ethics issues in maintaining a balanced environment.
SMFT(CHEM/PHTHYS/GEOL) 667
MATERIALS SCIENCE (4)
This course is an inter-disciplinary approach to the study of the nature of matter and the relationship between the fundamental structure of materials and the consequential function and behavior of those materials. Course topics include basic atomic theory; bonding theory for ionic compounds, molecular compounds and network solids; and physical and chemical properties as a function of structure. Materials emphasizing everyday, real-world properties will be used in hands-on classroom experiences and laboratories.

CATEGORY C: (K-12) CAPSTONE EXPERIENCES (at least 6 hours)

SMFT 701 CAPSTONE SEMINAR (3)
This course will provide students with an opportunity to present the results of research on an assigned topic of scientific and/or mathematical interest. Groups of students from two or more disciplines will work together as teams during the first part of the course to conduct research and apply knowledge learned through previous course work. Results will be presented to classmates as multidisciplinary oral reports involving all team members. A written report summarizing the project will also be required.

EDFS 703 CURRICULUM, POLICY, AND SYSTEMS IN SCIENCE AND MATHEMATICS EDUCATION (3)
This course is designed to examine possible solutions to current problems in curriculum and policy within school systems in South Carolina. The course is designed to increase organizational and interpersonal skills that empower teachers to alter school climates and garner technical support while designing and implementing K-12 programs of excellence.

SMFT 700 THESIS (based on a research experience, an internship experience, a project development experience, or another area approved by the Steering Committee) (Variable)
Entrance Requirements

To apply for admission to the degree program, one must submit official transcripts of all undergraduate and graduate credit, including documentation of graduation from an accredited four year college or university, and letters of recommendation from two former professors or immediate superiors in recent employment. The steering committee will evaluate applications and approve candidates for admission.

To be admitted to the degree program, one will be required to have a bachelor’s or equivalent with a GPA of 2.50 or better, both overall and in the major, and be a teacher. Certified secondary teachers whose certification is in an area other than mathematics or a science may apply for admission to this program. Their application will be evaluated considering the current College requirements for degrees in secondary education. They will be required to have a bachelor’s degree in a science or in mathematics or to show evidence of pre- or post-graduate science and mathematics college work consistent with a bachelor’s degree in a science or mathematics discipline.

This program is intended for certified elementary, middle, or secondary level teachers. It is possible to be admitted without certification. Exceptions will be considered on a case-by-case basis by the steering committee.

Transfer Credit

Up to 9 hours of graduate course work from other accredited institutions may be transferred and applied to the degree. The Steering Committee will render decisions when students petition to be allowed to receive transfer credit. In making each decision, the Steering Committee shall consider course content, teaching methods, and technology within the course, and whether the course is consistent with one of the program’s curriculum categories.

Science courses state the grouping for which they are designed. The courses reflect elementary, middle, and secondary focus without penalizing a person for having existing knowledge in both the sciences and education. The education courses are designed to illuminate a K-12 scope that is typically missing in programs.

Any course under consideration for acceptability in this program will be evaluated taking into consideration the special needs, abilities, and experience of the student petitioning for the course’s approval. We are not giving carte blanche to participants for courses taken elsewhere. The course must be consistent with the program’s and participant’s goals. Any course taken at another local institution for this program must be approved as a category A, B, or C course, consistent with the philosophy of the category in which it will be applied. There is a strict limit of nine hours as the maximum number of outside, content-oriented course hours which may be applied to this program. Furthermore, such courses will be limited almost exclusively to
category C credit. We do not believe that taking one graduate level course that is heavily content oriented (rather than containing a significant pedagogical component) will negate the efficacy of the remainder of our program. One of our explicit goals is to enhance the content skills of our participants.

**FACULTY**

The University of Charleston's faculty has the broad base of content and pedagogical expertise necessary for the development and execution of the proposed degree program. The combined faculties of the School of Sciences & Mathematics and the School of Education have a record of vigorous involvement with K-12 students and teachers. Faculty experiences include teaching elementary, middle and high school science and mathematics, intense involvement with the Governor's School and with in-service programs for teachers such as the Woodrow Wilson Summer Institutes; teaching science and mathematics courses for K-12 teachers; and participation in the National Science Teachers Association. The science and mathematics faculty are involved in state and national levels of the education arms of the national organizations of their academic disciplines -- mathematics, chemistry, biology, geology, and physics. Faculty have given literally hundreds of programs, presentations and demonstrations for K-12 students. School of Education faculty experience includes involvement with science teaching organizations such as the American Educators of Teachers in Science, development and implementation of science teacher education, and grant projects such as after school science enrichment programs. The participation of Citadel faculty gives additional strength to the program.

Undergraduate programs in the sciences at the College of Charleston are among the strongest and most popular with students. More than 10% of the undergraduate student body are science majors. Faculty in the sciences have a history of maintaining active research programs and strongly supporting undergraduate research. They also have a record of being actively involved with the schools through the Math Meet, Science Fair, Woodrow Wilson Institutes for Science and Math Teachers, etc. About 12% of the undergraduate students are elementary education majors. Faculty in education are very active in the public schools, and with state and national education research organizations. The combination of percentage of the undergraduate student body interested in science and education and the background of the science and education faculty strongly supports the formation of a Master of Education in Science and Mathematics degree program.

The following table identifies existing University of Charleston science, mathematics, and education faculty who have indicated their desire to be involved as graduate faculty in the proposed program.
## TABLE 5
### LIST OF FACULTY

<table>
<thead>
<tr>
<th>Name of Conferring Institution</th>
<th>Name of Faculty</th>
<th>Highest Degree Earned</th>
<th>Year Degree Earned</th>
<th>Field of Study</th>
<th>Teaching in Field (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Pennsylvania State University</td>
<td>Christopher Abate, Assistant Professor</td>
<td>Ph.D.</td>
<td>1993</td>
<td>Hydrogeology and Ground Water Modeling</td>
<td>Yes</td>
</tr>
<tr>
<td>University of Iowa</td>
<td>Gary Asleson, Professor</td>
<td>Ph.D.</td>
<td>1975</td>
<td>Analytical Chemistry</td>
<td>Yes</td>
</tr>
<tr>
<td>University of South Carolina</td>
<td>Louis Burnett, Professor</td>
<td>Ph.D.</td>
<td>1977</td>
<td>Marine Science</td>
<td>Yes</td>
</tr>
<tr>
<td>University of California at Santa Cruz</td>
<td>Mitch Colgan, Associate Professor</td>
<td>Ph.D.</td>
<td>1990</td>
<td>Climatology, Environmental Issues, Reef Ecology, and Remote Sensing</td>
<td>Yes</td>
</tr>
<tr>
<td>University of Hawaii</td>
<td>Cassandra Coombs, Assistant Professor</td>
<td>Ph.D.</td>
<td>1989</td>
<td>Remote Sensing and Planetary Geology</td>
<td>Yes</td>
</tr>
<tr>
<td>University of South Carolina</td>
<td>Sara Davis, Assistant Professor</td>
<td>Ph.D.</td>
<td>1992</td>
<td>Education Resources and Measurement</td>
<td>Yes</td>
</tr>
<tr>
<td>University of South Carolina</td>
<td>James Deavor, Associate Professor</td>
<td>Ph.D.</td>
<td>1983</td>
<td>Analytical Chemistry</td>
<td>Yes</td>
</tr>
<tr>
<td>University of Virginia</td>
<td>Henry Donato, Professor</td>
<td>Ph.D.</td>
<td>1973</td>
<td>Biophysical Chemistry</td>
<td>Yes</td>
</tr>
<tr>
<td>University of Arizona</td>
<td>Bob Dukes, Professor</td>
<td>Ph.D.</td>
<td>1973</td>
<td>Astronomy</td>
<td>Yes</td>
</tr>
<tr>
<td>State University of New York at Stony Brook</td>
<td>Phil Dustan, Professor</td>
<td>Ph.D.</td>
<td>1975</td>
<td>Biological Sciences</td>
<td>Yes</td>
</tr>
<tr>
<td>University of South Carolina</td>
<td>Hope Florence, Assistant Professor</td>
<td>M.A.</td>
<td>1972</td>
<td>Mathematics</td>
<td>Yes</td>
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<tr>
<td>Name</td>
<td>Degree</td>
<td>Institution</td>
<td>Year</td>
<td>Field</td>
<td>Tenured</td>
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<td>-----------------------------</td>
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<tr>
<td>Kem Fronabarger, Assistant</td>
<td>Ph.D.</td>
<td>University of Tennessee, Knoxville</td>
<td>1984</td>
<td>Igneous Petrology and Micro-paleontology</td>
<td>Yes</td>
</tr>
<tr>
<td>William Golightly, Associate</td>
<td>Ph.D.</td>
<td>Clemson University</td>
<td>1972</td>
<td>Mathematics, Analysis</td>
<td>Yes</td>
</tr>
<tr>
<td>Gary Harrison, Professor</td>
<td>Ph.D.</td>
<td>Michigan State</td>
<td>1975</td>
<td>Mathematics, Biological Models</td>
<td>Yes</td>
</tr>
<tr>
<td>Hugh Haynsworth, Associate</td>
<td>Ph.D.</td>
<td>University of Miami</td>
<td>1970</td>
<td>Mathematics, Topology</td>
<td>Yes</td>
</tr>
<tr>
<td>Denis Keyes, Assistant Professor</td>
<td>Ph.D.</td>
<td>University of New Mexico</td>
<td>1992</td>
<td>Special Education</td>
<td>Yes</td>
</tr>
<tr>
<td>Bill Kubinec, Associate Professor</td>
<td>Ph.D.</td>
<td>Case Western Reserve</td>
<td>1971</td>
<td>Astronomy</td>
<td>Yes</td>
</tr>
<tr>
<td>Lee Lindner, Assistant Professor</td>
<td>Ph.D.</td>
<td>University of Colorado, Boulder</td>
<td>1985</td>
<td>Astrophysical Planetary and Atmospheric Sciences</td>
<td>Yes</td>
</tr>
<tr>
<td>Elizabeth Martin, Assistant</td>
<td>M.S.</td>
<td>Georgia State University</td>
<td>1972</td>
<td>Analytical Chemistry</td>
<td>Yes</td>
</tr>
<tr>
<td>Shannon Martinez, Assistant</td>
<td>Ph.D.</td>
<td>University of South Carolina</td>
<td>1991</td>
<td>Physical Chemistry</td>
<td>Yes</td>
</tr>
<tr>
<td>Robert Mignone, Professor</td>
<td>Ph.D.</td>
<td>The Pennsylvania State University</td>
<td>1979</td>
<td>Mathematics, Logic</td>
<td>Yes</td>
</tr>
<tr>
<td>Laney Mills, Associate Professor</td>
<td>Ph.D.</td>
<td>Louisiana State University</td>
<td>1970</td>
<td>Physics</td>
<td>Yes</td>
</tr>
<tr>
<td>Martha Nabors, Associate Professor</td>
<td>Ph.D.</td>
<td>The Pennsylvania State University</td>
<td>1976</td>
<td>Curriculum and Instruction, Science Education</td>
<td>Yes</td>
</tr>
<tr>
<td>Harold Nations, Associate Professor</td>
<td>Ph.D.</td>
<td>The Pennsylvania State University</td>
<td>1982</td>
<td>Astrophysics</td>
<td>Yes</td>
</tr>
<tr>
<td>Robert Norton, Professor</td>
<td>Ph.D.</td>
<td>Oklahoma State University</td>
<td>1974</td>
<td>Mathematics, Probability and Statistics</td>
<td>Yes</td>
</tr>
<tr>
<td>Name</td>
<td>Degree</td>
<td>Institution</td>
<td>Year</td>
<td>Field</td>
<td>Tenured</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------</td>
<td>--------------------------------------------------</td>
<td>------</td>
<td>--------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Robert Nusbaum, Associate Professor</td>
<td>Ph.D.</td>
<td>University of Missouri, Rolla</td>
<td>1984</td>
<td>Mineralogy, Volcanology, and Planetary Geology</td>
<td>Yes</td>
</tr>
<tr>
<td>Susan Prazak, Associate Professor</td>
<td>M.A.</td>
<td>Hunter College</td>
<td>1964</td>
<td>Mathematics</td>
<td>Yes</td>
</tr>
<tr>
<td>Terry Richardson, Senior Instructor</td>
<td>M.S.</td>
<td>Vanderbilt</td>
<td>1971</td>
<td>Astronomy</td>
<td>Yes</td>
</tr>
<tr>
<td>Leslie Sautter, Assistant Professor</td>
<td>Ph.D.</td>
<td>University of South Carolina</td>
<td>1990</td>
<td>Marine Geology, Stable Isotopes, and Planktonic foraminifera</td>
<td>Yes</td>
</tr>
<tr>
<td>Mike Skinner, Associate Professor</td>
<td>Ph.D.</td>
<td>Ohio State University</td>
<td>1986</td>
<td>Special Education</td>
<td>Yes</td>
</tr>
<tr>
<td>Steve Stearns, Senior Instructor</td>
<td>Ph.D.</td>
<td>Texas A&amp;M</td>
<td>1992</td>
<td>General Geology and Mineralogy</td>
<td>Yes</td>
</tr>
<tr>
<td>Meta Van Sickle, Assistant Professor</td>
<td>Ph.D.</td>
<td>University of South Florida</td>
<td>1992</td>
<td>Science Education</td>
<td>Yes</td>
</tr>
<tr>
<td>Fred Watts, Professor</td>
<td>Ph.D.</td>
<td>Virginia Polytechnic Institute and State University</td>
<td>1968</td>
<td>Physics</td>
<td>Yes</td>
</tr>
<tr>
<td>Frances Welch, Associate Professor</td>
<td>Ph.D.</td>
<td>University of South Carolina</td>
<td>1978</td>
<td>Education Psychology</td>
<td>Yes</td>
</tr>
<tr>
<td>Sara White, Assistant Professor</td>
<td>Ph.D.</td>
<td>University of Colorado</td>
<td>1992</td>
<td>Curriculum and Instruction, Mathematics Education</td>
<td>Yes</td>
</tr>
<tr>
<td>Reid Wiseman, Associate Professor</td>
<td>Ph.D.</td>
<td>Duke University</td>
<td>1974</td>
<td>Marine Biology</td>
<td>Yes</td>
</tr>
<tr>
<td>Jeff Wragg, Assistant Professor</td>
<td>Ph.D.</td>
<td>University of Missouri, Columbia</td>
<td>1987</td>
<td>Physics</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Faculty Needed By Year and Term

Table 6 shows estimates of faculty needs based on IFTE, which is defined as 12 teaching hours per semester or 24 teaching hours per academic year. Science Department Courses are 4 semester hour courses which include a lab. Mathematics and Education Department Courses are 3 hour courses. The line estimating IFTE needed to direct capstone experiences is justified in Table 7.

TABLE 6
ADDITIONAL DEPARTMENTAL FACULTY NEEDS FOR FALL AND SPRING SEMESTERS

<table>
<thead>
<tr>
<th></th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
<th>YEAR 4</th>
<th>YEAR 5</th>
<th>YEAR 6</th>
<th>YEAR 7</th>
<th>Anticipated NEW LINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall/Spring IFTE/Semester</td>
<td>0/1</td>
<td>1/0</td>
<td>0/0</td>
<td>0/1</td>
<td>1/0</td>
<td>0/0</td>
<td>0/1</td>
<td></td>
</tr>
<tr>
<td>IFTE/COURSE</td>
<td>0/.5</td>
<td>.5/0</td>
<td>0/0</td>
<td>.5/.5</td>
<td>.5/0</td>
<td>0/0</td>
<td>.5/0</td>
<td></td>
</tr>
<tr>
<td>Chemistry</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
<td>1/1</td>
<td>1/1</td>
<td>0/0</td>
<td>1/1</td>
<td></td>
</tr>
<tr>
<td>IFTE/Semester</td>
<td>.5/1</td>
<td>.5/.5</td>
<td>0/0</td>
<td>.5/.5</td>
<td>.5/.5</td>
<td>0/0</td>
<td>.5/.5</td>
<td></td>
</tr>
<tr>
<td>Physics</td>
<td>1/1</td>
<td>2/1</td>
<td>0/1</td>
<td>1/1</td>
<td>2/1</td>
<td>0/1</td>
<td>1/1</td>
<td></td>
</tr>
<tr>
<td>IFTE/Semester</td>
<td>.5/1</td>
<td>1/1</td>
<td>0/1</td>
<td>.5/.5</td>
<td>.5/.5</td>
<td>0/0</td>
<td>.5/.5</td>
<td>.5*</td>
</tr>
<tr>
<td>Geology</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td></td>
</tr>
<tr>
<td>IFTE/Semester</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
<td>.5*</td>
</tr>
<tr>
<td>Educational Foundations</td>
<td>1/1**</td>
<td>0/1</td>
<td>1/2</td>
<td>1/1</td>
<td>0/1</td>
<td>1/2</td>
<td>1/1</td>
<td></td>
</tr>
<tr>
<td>IFTE/Semester</td>
<td>.25/25</td>
<td>.25/25</td>
<td>.25/25</td>
<td>.25/25</td>
<td>.25/25</td>
<td>.25/25</td>
<td>.25/25</td>
<td>.5*</td>
</tr>
<tr>
<td>Elementary Education</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td></td>
</tr>
<tr>
<td>IFTE/Semester</td>
<td>.25/0</td>
<td>.25/0</td>
<td>.25/0</td>
<td>.25/0</td>
<td>.25/0</td>
<td>.25/0</td>
<td>.25/0</td>
<td>.5*</td>
</tr>
<tr>
<td>Mathematics</td>
<td>0/1</td>
<td>0/1</td>
<td>0/0</td>
<td>0/1</td>
<td>0/1</td>
<td>0/0</td>
<td>0/1</td>
<td></td>
</tr>
<tr>
<td>IFTE/Semester</td>
<td>0/25</td>
<td>0/25</td>
<td>0/0</td>
<td>0/25</td>
<td>0/25</td>
<td>0/0</td>
<td>0/25</td>
<td></td>
</tr>
<tr>
<td>IFTE COURSE TOTAL</td>
<td>1.5/2</td>
<td>2.25/1.5</td>
<td>.5/1</td>
<td>1.5/2</td>
<td>2.25/1.5</td>
<td>.5/1</td>
<td>1.5/2</td>
<td></td>
</tr>
<tr>
<td>YEARLY AVERAGE</td>
<td>1.75</td>
<td>1.875</td>
<td>.75</td>
<td>1.75</td>
<td>1.875</td>
<td>.75</td>
<td>1.75</td>
<td></td>
</tr>
<tr>
<td>IFTE Directing Capstone Experiences</td>
<td>0</td>
<td>0</td>
<td>.75</td>
<td>1.188</td>
<td>1.563</td>
<td>1.563</td>
<td>1.563</td>
<td></td>
</tr>
<tr>
<td>IFTE TOTAL</td>
<td>1.75</td>
<td>1.875</td>
<td>1.50</td>
<td>2.938</td>
<td>3.438</td>
<td>2.313</td>
<td>3.313</td>
<td></td>
</tr>
</tbody>
</table>

* Some existing courses already offered.

** New section of EDFS 635 would be needed.
### TABLE 7
ESTIMATE OF IFTE FOR DIRECTING CAPSTONE EXPERIENCES

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated No. of Students in Program= Estimated Credit Hours+3.6*</td>
<td>25</td>
<td>37.5</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Estimated No. of Students Taking Directed Capstone Experiences (.5x no. of students two years earlier)</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>19</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>IFTE (previous row - 16)</td>
<td>0</td>
<td>0</td>
<td>.75</td>
<td>1.188</td>
<td>1.563</td>
<td>1.563</td>
<td>1.563</td>
</tr>
</tbody>
</table>

* Typically, education and mathematics courses are 3 credit hours each and science courses 4 credit hours each.
### TABLE 8

#### A) ADDITIONAL FACULTY NEEDS FOR SUMMER COURSE INTEGRATED CLASSES

<table>
<thead>
<tr>
<th></th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BIOLOGY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer I/II</td>
<td>1/0</td>
<td>0/0</td>
<td>1/1</td>
</tr>
<tr>
<td><strong>PHYSICS</strong></td>
<td>0/.5</td>
<td>1/0</td>
<td>0/0</td>
</tr>
<tr>
<td><strong>CHEMISTRY</strong></td>
<td>0/0</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td><strong>GEOLOGY</strong></td>
<td>0/1</td>
<td>1/0</td>
<td>1/1</td>
</tr>
</tbody>
</table>

#### B) SUMMER COURSE NON-INTEGRATED

<table>
<thead>
<tr>
<th></th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BIOLOGY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer I/II</td>
<td>1/0</td>
<td>1/0</td>
<td>0/0</td>
</tr>
<tr>
<td><strong>PHYSICS</strong></td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td><strong>CHEMISTRY</strong></td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td><strong>GEOLOGY</strong></td>
<td>0/0</td>
<td>0/0</td>
<td>0/0</td>
</tr>
<tr>
<td><strong>MATHEMATICS</strong></td>
<td>1/0</td>
<td>0/1</td>
<td>0/0</td>
</tr>
</tbody>
</table>

#### C) COURSES SUPPORTED THROUGH WOODROW WILSON AND COLLEGE OF CHARLESTON FUNDS ***

<table>
<thead>
<tr>
<th></th>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BIOLOGY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer I/II</td>
<td>0/1</td>
<td>0/1</td>
<td>0/1</td>
</tr>
<tr>
<td><strong>CHEMISTRY</strong></td>
<td>0/1.5</td>
<td>0/1.5</td>
<td>0/1.5</td>
</tr>
<tr>
<td><strong>PHYSICS</strong></td>
<td>0/1.5</td>
<td>0/1.5</td>
<td>0/1.5</td>
</tr>
<tr>
<td><strong>MATHEMATICS</strong></td>
<td>0/2</td>
<td>0/2</td>
<td>0/2</td>
</tr>
</tbody>
</table>

** *** subject to continued funding - Summer courses must be self supporting
Because the proposed program involves five departments in the School of Sciences and Mathematics and two in the School of Education and is interdisciplinary, the additional staffing needs within any one department are modest. Departments have five year plans in which the proposed program’s new staffing needs have been included. Any new hires would meet the overall needs of the department. Hence each department may staff courses with existing faculty from the above list or with a new hire recruited with the program in mind. Hiring decisions are in the domain of the department.

**PHYSICAL PLANT AND EQUIPMENT**

This program will accommodate graduate students, most of whom are practicing teachers, in a science and math education program that is without equal in the United States in terms of exposure of the students to hands-on, pedagogically aimed science and mathematics classes. This strength requires resources: faculty, space, and equipment.

Some of the space needs can be met by existing facilities. To the extent possible, classroom lecture space will be accommodated by virtue of the late afternoon and early evening offerings in this program. This time of day traditionally places less demand on classroom space. Two additional lecture/lab rooms will be needed to meet the needs of mathematics, biology, chemistry, physics, and geology. These rooms will permit convenient access to lecture-demo and other discipline-specific equipment.

Every aspect of academia has been profoundly affected by information technology. Each course developed in this program will have a computer component. This will require varying degrees of access to computers for each course. Some computer work can be done, or introduced, in the regular lecture rooms by using portable or built-in single-station computers. Some work can also be accomplished using existing small computer facilities in some departments (particularly Physics), and in the Institution’s computing labs. The necessity to use a combination of discipline-specific software and education software will ultimately only be served by a 30-station computer classroom; the scheduling of which is to be coordinated among the faculty in this program. This facility will be scheduled for formal classroom work and also have open hours.

The new faculty (6) will be regular faculty in mathematics, science, and education departments. Offices and additional research space will be needed. Both are already at a premium in all departments.

Graduate students will also require space: a study/resources room with learning resource materials, and TA office space (2 TA’s per office).

In light of the fiscal constraints which classroom teachers face, it is imperative that teachers know how to make their own teaching equipment (e.g., gel electrophoresis apparati,
light boxes, kaleidoscopes). A shoproom will be needed. This is a room where a technician will build apparati for courses and where teachers in the program can learn to make their own apparati for use in their classrooms.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture/lab rooms</td>
<td>2</td>
</tr>
<tr>
<td>Computer classroom</td>
<td>1</td>
</tr>
<tr>
<td>(30 stations)</td>
<td></td>
</tr>
<tr>
<td>Faculty offices</td>
<td>6</td>
</tr>
<tr>
<td>Faculty research space</td>
<td>5</td>
</tr>
<tr>
<td>TA offices –</td>
<td></td>
</tr>
<tr>
<td>In years 1 and 2</td>
<td>1</td>
</tr>
<tr>
<td>Total in years 3 and 4</td>
<td>2</td>
</tr>
<tr>
<td>Total beginning in year 5</td>
<td>3</td>
</tr>
<tr>
<td>Study/resources room</td>
<td>1</td>
</tr>
<tr>
<td>Shoproom</td>
<td>1</td>
</tr>
</tbody>
</table>

**LIBRARY RESOURCES**

The Robert Scott Small Library at the College of Charleston more than meets the ACRL standards for the overall collection. In June of 1994, it had 427,013 book volumes plus bound serials, while the recommended standard is 289,735 for a college its size. The library acquires 15,000 to 17,000 new volumes each year. The computerized card catalog, on-line database search services, Internet and the Information Access Corporation Expanded Academic Index database, interlibrary loan, and readily available reference librarians provide excellent services to the user.
As of June 1994, the book holdings in participating departments were

<table>
<thead>
<tr>
<th>Department</th>
<th>Call Numbers</th>
<th>Volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>QH-QR</td>
<td>15,957</td>
</tr>
<tr>
<td>Chemistry</td>
<td>QD</td>
<td>2,896</td>
</tr>
<tr>
<td>Education</td>
<td>L</td>
<td>13,144</td>
</tr>
<tr>
<td>Geology</td>
<td>QE</td>
<td>5,661</td>
</tr>
<tr>
<td>Mathematics</td>
<td>QA</td>
<td>5,327</td>
</tr>
<tr>
<td>Physics</td>
<td>QB-QC</td>
<td>3,843</td>
</tr>
</tbody>
</table>

which gives total of 46,828. Additional volumes in the sciences, mathematics, and education are available at libraries at The Citadel, MUSC, and Charleston Southern University. The ACRL standard suggests about 6000 volumes for a masters program of any kind.

Journal subscriptions at the University of Charleston Library are as follows for departments participating in the program:

<table>
<thead>
<tr>
<th>Departments</th>
<th>Number of Subscriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>242</td>
</tr>
<tr>
<td>Chemistry</td>
<td>30</td>
</tr>
<tr>
<td>Education</td>
<td>223</td>
</tr>
<tr>
<td>Geology</td>
<td>67</td>
</tr>
<tr>
<td>Mathematics</td>
<td>65</td>
</tr>
<tr>
<td>Physics</td>
<td>41</td>
</tr>
<tr>
<td>Total</td>
<td>668</td>
</tr>
</tbody>
</table>

Other journals are housed in libraries at The Citadel, MUSC, the Biostatistics and Epidemiology Department at MUSC, and Charleston Southern University. The interlibrary loan service makes it easy to obtain copies of journal articles from other libraries, both locally and nationwide.

The University of Charleston Library currently spends about $88,000 for books and $161,000 for journals annually for these departments. The collection is more than adequate to
begin the master's program. An additional $6000 annually is budgeted for new acquisitions in order to strengthen the holdings.

ACCREDITATION, APPROVAL, LICENSURE, OR CERTIFICATION

Upon approval at the University level and through the Commission on Higher Education, this degree program will be incorporated into the School of Education's total program, and, as such, submitted for NCATE (National Council for Accreditation of Teacher Education) approval.

ESTIMATED ADDITIONAL COST

Faculty salary is the dominant item in the budget. Since course offerings have a 3-year cycle and IFTE varies from year to year, once the program has phased in, budgets will have a 3-year cycle, beginning with the fifth year.
### TABLE 9
ESTIMATED ADDITIONAL COSTS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Salaries Program Co-Directors</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>(No., Headcount)</td>
<td>.25</td>
<td>.25</td>
<td>.25</td>
<td>.25</td>
<td>.25</td>
<td>.25</td>
<td>.25</td>
</tr>
<tr>
<td>1/4 of $40,000</td>
<td>$10,000*</td>
<td>$10,000</td>
<td>$10,000</td>
<td>$10,000</td>
<td>$10,000</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>b) Co-Directors Summer Stipends</td>
<td>$3000</td>
<td>$3000</td>
<td>$3000</td>
<td>$3000</td>
<td>$3000</td>
<td>$3000</td>
<td>$3000</td>
</tr>
<tr>
<td>Additional Faculty (No., Headcount)</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>IFTE (previous table) - 1.75</td>
<td>1.75</td>
<td>1.75</td>
<td>1.5</td>
<td>2.938</td>
<td>3.438</td>
<td>2.313</td>
<td>3.313</td>
</tr>
<tr>
<td>IFTE times $35,000</td>
<td>$61,250</td>
<td>$65,625</td>
<td>$52,500</td>
<td>$102,830</td>
<td>$120,330</td>
<td>$80,955</td>
<td>$115,555</td>
</tr>
<tr>
<td>c) Graduate Assistants (Number) Cost</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>e) Fringe Benefits</td>
<td>$17,016</td>
<td>$18,154</td>
<td>$14,812</td>
<td>$27,898</td>
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<td>Travel/Supplies/Phone at $1200 per IFTE</td>
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<td>$2,250</td>
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<td>f) Computer/Networking</td>
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<td>g) Science/Math Course Equipment &amp; Supplies</td>
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</table>

*This assumes that regular faculty and not adjuncts are used to teach courses that the co-directors would have taught.

a) This program involves a one-course per semester reduction shared by directors.
b) The $3000 is to be shared by the co-directors for performing program summer duties.
c) Graduate students will perform duties for faculty in the program.
d) The technician will prepare hands-on materials and maintain computer software.
e) 26% of IFTE faculty plus 8.5% of technician salary plus .5% of graduate assistant salary.
f) $3500 x IFTE
g) Cutting edge, age appropriate, hands-on materials.
GRADUATE STUDENT CANDIDATES FOR GRADUATION - SPRING, 1996
(March 22, 1996)

NAME (FOR DIPLOMA)

John E. Copeland, Jr.
David Matthew Kuczkir

MASTER OF SCIENCE - ACCOUNTANCY

Jennifer Lynn Gaeto
Anthony S. Galasso
Darcy S. Graham
Lisa Cameron Hickey
Kevin Michael Kurtz
Alan Moore Litz
Kimberly Lynn Lovett
Harold Wayne Reynolds Jr.
Kathleen Shroka Wilson

M.A.T. - Early Childhood Education

M.A.T. - ELEMENTARY EDUCATION

M.A.T. - SPECIAL EDUCATION

A. Michael Anderson
Catherine Michelle Dixon Beasenburg
Roberta Maye Guthrie
Brenda Sue Mackaness
Thomas Matthew Wolpert
May, 1996 Commencement List

**M.ED. - EARLY CHILDHOOD EDUCATION**

Shawn Fraser Blunt  
Robin Sydell Hilts  
Gayla Lee Moseley  
Kimberly B. Schulken  
April Crawford Smith

**M.ED. - ELEMENTARY EDUCATION**

Georgia Ann Cannon  
Charlotte Suzanne Lemon  
Lori Renae Phillips  
Michele Amanda Walsh

**M.ED. - SPECIAL EDUCATION**

Akram Mahmoud Al-Qais  
Ashleigh Collins Baker  
Susan Kretzschmar Buckley  
Helen Marie James  
Michelle McLendon Long

**MASTER OF ARTS - ENGLISH**

Miriam Leigh Tomblin

**MASTER OF ARTS - HISTORY**

Steven Thomas Gyorffy  
James Vance Miles  
Peter Andrew Rerig  
Brana Jane Snowden
MASTERC OF PUBLIC ADMINISTRATION

Roland Allocleto Cruickshank
Jan Lauren Lindley
Kelly Lynn McNamara
Melissa Hutson Moïse
Joan Lee Rennhack
Steven Edwin Thomas
Maria Y. Williams

MASTER OF SCIENCE - MARINE BIOLOGY

Sandra E. Brick
Scott Bedford Lerberg
Katherine Marsh
Paul Legare Pennington
Duane E. Stevenson
Christine Marie Walton

MASTER OF SCIENCE - MATHEMATICS

Louis J. Attanasi
Terry Lynn Moss
Juliet Feitel Rieth

As of March 22, 1996 - Aaron
UNIVERSITY OF CHARLESTON, S.C.
Faculty Committee on Graduate and Continuing Education
New Graduate Course Proposal

1. Department: Biology

2. Course number and title: BIOL 503, Special Topics in Ecology
   Number of credits: 3-4 Total hrs/week: 3-6 Lecture: 3 Lab: 0-3
   This course may sometimes include a lab in which case the number of credits will be 4.

3. Course will be offered first: Spring, 1997

4. Catalog description (please limit to 50 words):
   Investigation of advanced specific areas of ecology beyond General Ecology (BIOL 341). Examples of offerings may include marine microbial ecology, phytoplankton ecology, benthic ecology, community ecology and population ecology.

5. Prerequisites (or other restrictions):
   BIOL 111/111L, BIOL 112/112L, and BIOL 341 (General Ecology) or permission of the instructor.

6. Rationale/justification for course (consider the following issues): (Note: if more space is needed, attach additional sheets to this form).
   (a) What are the goals and objectives of the course?
   To provide students with training in advanced and more specialized areas of ecology. Anticipated topics include benthic ecology, phytoplankton ecology, marine microbial ecology, population ecology, and community ecology. One major objective is to provide additional course options for students in both Marine Biology and Environmental Studies. This course will expose potential and incoming students to new faculty and new areas of study which are currently not well represented in our course offerings.

   (b) How does the course support the mission statement of the department and the organizing principles of the major?
   General Ecology (BIOL 341) is one of the "core" courses in biology. Special Topics in Ecology will give students an opportunity to focus more specifically on particular areas within ecology and/or apply principles learned in general ecology to specific ecosystems. Specifically for the Marine Biology programs, the proposed course will provide a variety of options for exploring the interactions of specific groups of organisms with their physical and biological surroundings. This will augment the relatively larger number of courses focused at or below the level of the individual organism.

7. Are other Departments affected by this course? (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.)
   No.

8. Is this course part of joint program? __X__ Yes ___ No. If "Yes", what institution? MUSC
   Will the other institution use the same course number and title? ___Yes ___X__ No. If "No" what will be the course number and title at the other school? This course will also have an EVSS number 503, same title.

9. Method of teaching:
   This is a special topics course and the methods of teaching may be different depending upon the topic and the instructor.
Methods will range from lecture plus discussion to lecture with lab. Lectures will be derived from the primary literature as well as the main text, and will focus on concepts.

10. (a) Address potential enrollment pattern shifts in the department or University-wide as it relates to the offering of this course:
(b) Address potential shifts in staffing of the departments as it relates to the offering of this course. (Note: If more space is needed, attach additional sheets to this form.)

The Department of Biology struggles to offer enough space in all of its courses, especially upper division biology courses. This has been difficult due to the rapid growth of the College and the more rapid growth (with respect to the College) experienced by this department. During the past five years the sizes of lecture sections have risen in response to enrollment pressures. Furthermore, the number of sections we have offered has increased. Nonetheless, it is still a struggle to offer enough space. Our efficiency in filling upper division classes is very high; typically greater than 95% of the upper division slots are filled. While this may seem to be admirable, students complain they are not able to get the classes of their choice and they often must take required courses later rather than sooner. A comfortable margin would yield between 10 and 15% of the available spaces unfilled.

The department needs to offer more upper division biology courses to reduce overcrowding. Adding new courses to our curriculum will enrich the curriculum and take advantage of the expertise of our newly-hired faculty members. By offering this course as a 500-level course, we can enrich the graduate curriculum, fulfill our responsibilities to the graduate program in Environmental Studies, and provide extraordinary experiences for undergraduate students. This course requires shifts in staffing of upper division biology.

11. Requirements for additional resources made necessary by this course:

(a) Staff We continue to be understaffed. However, offering this course will allow us to meet our obligations to the graduate program without sacrificing our undergraduate program.

(b) Budget No special supplies or materials are required for this course that are also not required for BIOL 341, General Ecology. Some materials have already been purchased that can be used in those offerings of BIOL 503 that include a field component. There are no additional costs associated with this course.

(c) Library None anticipated.
(Note: Course requiring additional resources will need special justification.)

12. Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).
REVIEW/APPROVALS

13. Signature of Graduate Program Director: ____________________________ Date submitted: 2/7/96
14. Signature of Department Chair: ____________________________ Date submitted: 2/7/96
15. Signature of School’s Dean: ____________________________ Date submitted: 2/9/96
16. Signature of Budget Director, Business Affairs Office: ____________________________ Date submitted: 
17. Signature of Chair of Faculty Committee on Graduate and Continuing Education: ____________________________ Date submitted: 
18. Signature of Chair of Graduate Council: ____________________________ Date submitted: 
19. Signature of Faculty Senate Secretary: ____________________________ Date approved by Senate: 

Completed forms should be sent by the Graduate Studies Office to the following:
1. Registrar (for entering course in SIS course inventory)
2. Department Chair
3. Graduate Program Director
4. Business Affairs Office (for establishing course fee structure in SIS)
5. Academic Affairs
INSTRUCTOR:  Dr. Craig Plante

COURSE OVERVIEW:

One of the simplest definitions of ecology is “the study of the abundance and distribution of organisms”. In this course we will explore the physical and the biological features and interactions which determine the abundances and distributions of marine microbes. Our definition of “microbes” will include both eukaryotes and prokaryotes, but emphasis will be on the prokaryotes. A central goal of ecology is to try to reduce the incredible complexity of the natural world to an oversimplified, yet hopefully still useful, set of principles. This course will provide an understanding of ecological theory and we will critically examine some real-world applications of such theories. Ultimately, students should be able to relate ecological principles to the most current basic research questions regarding marine microbes, as well as to applied problems associated with marine pollution, resource and waste management, pathogen control, and aspects of mariculture.

We will attempt to highlight the most important principles through lecture and discussion. You are, however, responsible for all material in assigned readings.

COURSE CREDIT:  3 credit hours

COURSE FORMAT:  lecture and discussion (no lab)

TEXT:  *Marine Microbiology* (B. Austin, 1988)

Additional readings will be announced in class and placed on reserve.

GRADE DETERMINATION:

Grades will be determined from the following: two written exams (25% each) and one term paper (20%) plus one research proposal (30%).

Exams are primarily essay with some short-answer. Exams will cover both lecture material and assigned readings.

The term paper topic will be selected by the student but must be approved by instructor. The term paper will be presented in both written and oral formats.

The proposal will require consideration of a current problem or question relevant to marine microbial ecology. Extensive use of recent journal articles is a must! The NSF format for proposals will be used (examples will be provided).
MARINE MICROBIAL ECOLOGY

LECTURE TOPICS:

I. INTRODUCTION
   A. Course goals and overview
   B. History of marine microbiology

II. SURVEY OF MARINE MICROORGANISMS
   A. Eukaryotes
      1. microalgae
      2. fungi
      3. protozoa
   B. Prokaryotes
      1. eubacteria
         a. physiological characteristics
         b. physical/chemical characteristics
      2. archaebacteria
      3. cyanobacteria

III. PHYSIOLOGICAL ADAPTATIONS OF MARINE MICROORGANISMS
   A. The marine environment -- abiotic factors
   B. Microbial responses to external variables
      1. role of diffusion
      2. chemotaxis
      3. substrate availability
      4. pH, temperature, salinity, pressure

IV. MICROBIOLOGICAL METHODS
   A. Sampling
   B. Sample processing
   C. Methods for detection (numbers vs. biomass)
   D. Detection or characterization of specific taxa/functional groups
   E. Estimation of growth
   F. Measurement of metabolic activity
   G. Statistics in microbial ecology

VI. EVOLUTION AND STRUCTURE OF MARINE COMMUNITIES
   A. Colonization and succession
   B. Biofilms
   C. Diversity and stability of microbial communities
   D. Ecosystem modeling
VII. MICROBE-BASED ORGANISMAL INTERACTIONS
A. Microbe-microbe
   1. intraspecific
   2. interspecific
B. Plant-microbe
C. Animal-microbe

VIII. FUNCTIONAL ROLE OF MICROORGANISMS IN ECOSYSTEMS
A. Contributions to community structure/dynamics
   1. pelagic microbial loops
   2. benthic microbial loops
   3. bacteria as food for metazoa
B. Biogeochemical cycles
   1. carbon cycle
   2. nitrogen cycle
   3. sulfur cycle
   4. other elemental cycles

IX. ECOLOGICAL PRINCIPLES AND APPLIED PROBLEMS
A. Opportunities
   1. biodegradation of pollutants
   2. fuel/biomass production
   3. biotechnology
   4. biological control of pests
B. Problems
   1. biodeterioration/biofouling
   2. mobilization of pollutants
   3. animal pathogens
Lecture

1. Introduction to Phytoplankton Ecology: Ecological Theory
2. Taxonomic Survey of Marine Phytoplankton
3. Distribution and Abundance of Marine Phytoplankton in Various Oceanographic Regimes
4. Marine Autotrophic Production
5. Nutrient Uptake Kinetics and Assimilation Rates
6. Growth Rate Measurements
7. Factors Limiting Phytoplankton Growth in the Sea
8. Light in the Sea
9. EXAM I
10. Macro-nutrient Limitation
11. Micro-nutrient Limitation
12. Fe-limitation in the Sea
13. Impact of Grazing on Phytoplankton Populations in the Sea
14. Physiological Ecology of Marine Eucaryotic Ultraplankton
15. Physiological Ecology of Marine Procaryotic Picoplankton
16. Primary Productivity and Biogeochemical Cycles in the Sea
17. Molecular Ecology of Phytoplankton Photosynthesis
18. Importance and Measurement of New Production
19. New Production in Various Oceanographic Regimes
20. EXAM II
21. Phytoplankton Ecology in Coastal Waters
22. Phytoplankton Ecology in the Pacific Equatorial Upwelling Region
23. Phytoplankton Ecology in the Southern Ocean
25. Phytoplankton Ecology in the Oligotrophic Ocean
26. Satellite Ocean Color and Phytoplankton Ecology
27. Phytoplankton and the Global Carbon Cycle
28. Phytoplankton and Global Climate
29. FINAL EXAM

Course Objective: To introduce each student to the diversity of marine phytoplankton in various oceanographic regimes and to gain an insight into the factors limiting primary productivity in the sea. Finally, the student will be introduced to phytoplankton ecology and its role in affecting the global carbon and climates cycles.

Laboratory:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Introduction</td>
</tr>
<tr>
<td>2</td>
<td>Nutrient Measurements (Spectrophotometric)</td>
</tr>
<tr>
<td>3</td>
<td>Micro-Nutrient Measurements (Atomic Absorption)</td>
</tr>
<tr>
<td>4</td>
<td>Phytoplankton Abundance (Laser particle counter)</td>
</tr>
<tr>
<td>5</td>
<td>Fluorometric chlorophyll a determination</td>
</tr>
<tr>
<td>6</td>
<td>HPLC accessory pigment measurements</td>
</tr>
<tr>
<td>7</td>
<td>Productivity vs. Irradiance experiment</td>
</tr>
<tr>
<td>8</td>
<td>Grazing and Dilution Experiments</td>
</tr>
<tr>
<td>9</td>
<td>Dimethylsulfide and Phytoplankton (GC analyses)</td>
</tr>
<tr>
<td>10</td>
<td>Field Trip</td>
</tr>
<tr>
<td>11</td>
<td>Student Project Presentations</td>
</tr>
<tr>
<td>12</td>
<td>Student Project Presentations</td>
</tr>
</tbody>
</table>

Grades: Grades will be determined from the following: 3 exams worth a total of 75%, and the lab write-ups and presentation will be worth 25%. The lowest exam score for each student will be worth 15% and the other two exams will be worth 30% each. Each exam will cover material from the preceding section only, and the final exam will not be cumulative. Exams will cover all assigned readings as well as lecture material. Exam questions will include definitions, short answers, and short essay questions. Note that class attendance is strongly advised as lectures will include material not covered in the text. There are no excuses accepted for missed exams; personal tragedies verified by the Dean of Undergraduate Studies will be considered for incompletes in the course. If an exam is missed, I must be notified before the next class to schedule a make-up. Grades will be determined according to the following scale:

- A = 90-100
- B+ = 85-89
- B = 80-84
- C+ = 75-79
- C = 70-74
- D = 65-69
- F = 0-64

Laboratories: The labs will be held in either the classroom (Rm. #101) or in Rm. #209. The laboratories will be both demonstrations and hands-on experiences but write-ups will be required for all. Lab notebooks will be due on a definite date, and any turned in late will lose 10% of the maximum grade per day. No write-ups will be accepted more than 5 days late. At least one field trip will be made. Details will be provided as soon as the final arrangements have been made.

Student Presentations: Each student will prepare a 7-8 minute talk on an oceanographic topic agreed upon by the instructor before spring break. A two minute question/answer period will follow each presentation. Presentations will be made during the last two laboratory periods and will be worth 25% of the lab grade.
1. Department: Biology

2. Course number and title: BIOL 645, Systematic Biology
   Number of credits: 3
   Total hrs/week: 3
   Lecture: 3
   Lab: 0

3. Course will be offered first: Spring, 1997

4. Catalog description (please limit to 50 words):
   An in-depth coverage of the principles of systematics with emphasis on reconstruction of relationships and evolutionary history of organisms. Topics include current theories of systematic and evolutionary biology, methods of phylogenetic systematics, and critical evaluation of phylogenetic hypotheses.

5. Prerequisites (or other restrictions):
   At least one upper division course in organismal biology.

6. Rationale/Justification for course (consider the following issues): (Note: if more space is needed, attach additional sheets to this form).
   (a) What are the goals and objectives of the course?
   To familiarize the student with the principles and methods of systematics and comparative biology that are fundamental to an appreciation and an understanding of organismal biology and evolutionary biology. This course would fill gaps in the current undergraduate and graduate curricula. The course will be especially useful for students conducting research in conservation biology, ecology, organismal biology, or evolutionary biology. Many of our students do their thesis research in whole organism biology, but due to an inadequate background preparation of the gap in our curriculum, never fully appreciate where their studies fit into the grand scheme of biology. Becoming conversant with systematic biology would provide a foundation for many aspects of organismal and evolutionary biology and allow students to approach their research with perspective not otherwise available.

   (b) How does the course support the mission statement of the department and the organizing principles of the major?
   Systematic Biology is a major part of the foundation upon which all other areas of biology rest and is of critical importance to ecology, organismal biology, and evolutionary studies. Systematics, by offering insights into the relationships of organisms and their phylogenetic histories, is of preeminent importance in the search for solutions to the biodiversity crisis. Perhaps most importantly from the standpoint of the student, systematics requires its practitioners to think critically, and for that reason alone would be a very valuable addition to the curriculum of biology.

7. Are other departments affected by this course? (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.)
   Yes - Geology and Sociology/Anthropology. See attached letters of support.

8. Is this course part of joint program? _X_ Yes ___No If "Yes", what institution? MUSC
   Will the other institution use the same course number and title? ___Yes _X_ No If "No" what will be the course number and title at the other school? This course will also have an EVSS number 627, same title.

9. Method of teaching: Lectures by instructor, student presentations, discussions, and computer-based analyses of problems in systematics. Students will be required to submit a paper in addition to a verbal presentation.
10. (a) Address potential enrollment pattern shifts in the department or University-wide as it relates to the offering of this course:
(b) Address potential shifts in staffing of the department as it relates to the offering of this course.
(Note: If more space is needed, attach additional sheets to this form.)

We are offering a similar course at the 400-level. The Department of Biology struggles to offer enough space in all of its courses, especially upper division biology courses. This has been difficult due to the rapid growth of the College and the more rapid growth (with respect to the College) experienced by this department. During the past five years the sizes of lecture sections have risen in response to enrollment pressures. Furthermore, the number of sections we have offered has increased. Nonetheless, it is still a struggle to offer enough space. Our efficiency in filling upper division classes is very high; typically greater than 95% of the upper division slots are filled. While this may seem to be admirable, students complain they are not able to get the classes of their choice and they often must take required courses later rather than sooner. A comfortable margin would yield between 10 and 15% of the available spaces unfilled.

The department needs to offer more upper division biology courses to reduce overcrowding. Adding a new courses to our curriculum will enrich the curriculum and take advantage of the expertise of our newly-hired faculty members. By offering this course as a 400/600 level course, we can also enrich the graduate curriculum, fulfill our responsibilities to the graduate program in Environmental Studies, and provide extraordinary experiences for undergraduate students. This course requires shifts in staffing of upper division biology.

11. Requirements for additional resources made necessary by this course:
(a) Staff We continue to be understaffed. However, offering this course will allow us to meet our obligations to the graduate program without sacrificing our undergraduate program.
(b) Budget The Department of Biology continues to struggle to offer enough spaces in 300-level and above biology courses. This course will fulfill some of that need and also serve students in the Marine Biology and Environmental Studies Graduate Programs.
(c) Library None anticipated.

(Note: Course requiring additional resources will need special justification.)

12. Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).
REVIEW / APPROVAL PROCESS

13. Signature of Graduate Program Director: [Signature]
   Date submitted: 2/7/96

14. Signature of Department Chair: [Signature]
   Date submitted: 2/7/96

15. Signature of School’s Dean: [Signature]
   Date submitted: 2/9/96

16. Signature of Budget Director, Business Affairs Office:
   Date submitted: 

17. Signature of Chair of Faculty Committee on Graduate and Continuing Education:
   Date submitted: 

18. Signature of Chair of Graduate Council:
   Date submitted: 

19. Signature of Faculty Senate Secretary:
   Date approved by Senate: 

Completed forms should be sent by the Graduate Studies Office to the following:
1. Registrar (for entering course in SIS course inventory)
2. Department Chair
3. Graduate Program Director
4. Business Affairs Office (for establishing course for structure in SIS)
5. Academic Affairs Office
SYSTEMATIC BIOLOGY

An in-depth coverage of the principles of systematics with emphasis on reconstruction of relationships and evolutionary history of organisms. Topics include: historical and current theories of systematic and evolutionary biology, methods of phylogenetic systematics, and critical evaluation of phylogenetic hypotheses.

Textbook

Reference Books

Classics

Course Objectives
To familiarize the student with the principles and methods of systematics and comparative biology that are fundamental to an appreciation and an understanding of organismal biology and evolutionary biology.

Syllabus of Lectures and Discussions
(for a Tuesday-Thursday Sequence)

Part I: Basic Concepts

Lecture 1: History of Classification and Systematics: the Linnean hierarchy and Pre-Darwin classifications; Darwinism and its influence on classification.
Lecture 2: Comparison of Schools of Systematics: evolutionary systematics (the Mayr-Simpson tradition), phenetics (numerical taxonomy), cladistics (phylogenetic systematics).

Lecture 3: Basics of cladistics (1)--Cladograms, evolutionary trees, evolutionary hypothesis ("scenarios"). Evolutionary grade vs. phylogenetic clade. Monophyly, paraphyly, polyphyly.

Lecture 4: Basics of cladistics (2)--Characters and character polarity: plesiomorphy vs. apomorphy; synpleiomorphy, synapomorphy, autapomorphy; ordered vs. un-ordered characters; for ordered characters, how to establish character polarity: outgroup analysis, ontogeny, stratigraphy, form-function analysis; parsimony tests of character polarity.

Lecture 5: Homology: homology vs. analogy; methods for establishing homology: comparative morphology, ontogenetic development, synapomorphies as homology. Parsimony tests of homology ("congruence tests").

Part II. Classification, Nomenclature, and Species Concepts

Lecture 6: Basic Rules Nomenclature: types, identification and keys, diagnosis, priority in publication, synonymies.

Lecture 7: Species concepts: biological species and other species concepts.

Lecture 8: Modes of speciation: allopatric (peripatric), parapatric, sympatric, sibling species, co-evolution, anagenesis vs. cladogenesis.

Lecture 9: Problems and conflicts in evolutionary and phylogenetic classifications above species level.

Lecture 10: Exam I (30% of the grade)

Part III. Practical Approaches to Phylogenetic Reconstructions:

Lecture 11: Introduction to character-taxon matrix: how to build it? (Homework assignment)

Lecture 12: Introduction to MacClade: concepts of tree length, consistency index, retention index.

Lecture 13: Introduction to PAUP: phylogenetic analysis using parsimony: consensus trees, rooted vs. unrooted trees.

Lecture 14: Introduction to Hennig 66.

Lecture 15: Assessment of trees: frequency distribution of tree lengths,

Lecture 16: Boot-strap statistical tests.

Lecture 17: Recent progress in experimental phylogeny and debates on tree assessments.

Lecture 18: Characters revisited: discrete vs. continuous characters.

Lecture 19: Characters in molecular systematics.

Lecture 20: Topics in molecular systematics.
Systematic Biology

Part IV. Applications of Systematics

Lecture 21: Phylogenetic systematics as the foundation to comparative biology.
Lecture 22: Systematics and biogeography (1).
Lecture 23: Systematics and biogeography (2).
Lecture 24: Systematics and historical ecology.
Lecture 25: Systematics and behavioral evolution.
Lecture 26: Systematics and conservation biology.
Lecture 27: Systematics and conservation biology.
Presentations: Student Presentations (20% of the final grade).

Final Exam (50% of the final grade).
To: Louis Burnett, Chair  
    Biology Department

Fr: George E. Dickinson, Chair

Re: Proposed Biology 5XX Course(Systematic Biology)

We see no problem with your department offering Systematic Biology. As a 500-level course, it would not be likely that our students would be able to take this course, since we do not have a graduate program (unless seniors are allowed to take 500-level courses). Many of our anthropology majors become majors after having already taken BIOL 101/102. Would that sequence be considered the "equivalent" of BIOL 111/112, if indeed upper-division undergraduates could take a 500-level course? Also, one of our faculty wanted to know what your department's definition of an "organismal biology" course is?
MEMORANDUM

TO: Wayne Jordan, Chair, Curriculum Committee
FROM: Michael P. Katuna, Chairman, Department of Geology
SUBJECT: Biology Course Proposal.

The Geology Department has reviewed the Systematic Biology (Biology 5XX) course proposal, and supports its adoption.

jen

cc: Louis Burnett, Chair, Biology Department
UNIVERSITY OF CHARLESTON, SOUTH CAROLINA
Proposal to Change a Graduate Course

1. Department: English and Communication
2. Course Number and Title: ENGL 557 CREATIVE WRITING
3. Course changes will go into effect: Immediately
4. Change(s) Desired: New title and catalog description:
   ENGL 557 CREATIVE WRITING--Poetry. Class discussion of student writing using 20th-century poems as models.

5. Justification for Change(s): As now taught 557 includes both poetry and fiction. Changing 557 and adding 563 (see other proposal) would allow for two genre-specific courses.

6. Signature of Program Director: Date: 12/1/95
7. Date Approved by the Department: 12/1/95
8. Signature of Department Chair:

RETURN FORM TO THE GRADUATE STUDIES OFFICE FOR FURTHER PROCESSING

9. Signature of Chair of the Faculty Committee on Graduate and Continuing Education Date: 2/19/96
10. Signature of Chair of Graduate Council Date:
11. Signature of Speaker of the Faculty Date:

IF MORE SPACE IS NEEDED, USE EXTRA SHEET AND ATTACH
(form last revised November, 1995 and replaces all others)
1. Department: **English and Communication**

2. Course number and title: **ENGL 563 Creative Writing--Fiction** Number of Credits 3
   
   Total hrs/week: 3 Lectures: 3 Lab: 3

3. Course will be offered first: 1997


5. Prerequisites (or other restrictions): **Graduate Standing**

6. Rationale/justification for course (consider the following issues): (Note: If more space is needed, attach additional sheets to this form.)
   (a) What are the goals and objectives of the course? To introduce students to the craft of fiction writing
   
   (b) How does the course support the mission statement of the department and the organizing principles of the graduate program? It is an elective course in the MA program and complements the program's literature courses.

7. Are other Departments affected by this course? (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.)

8. Is this course part of joint program? X Yes No If "Yes", what institution? The Citadel
   Will the other institution use the same course number and title? X Yes No If "No" what will be the course number and title at the other school?

9. Method of teaching: **Lecture and discussion**
10. (a) Address potential enrollment pattern shifts in the department or University-wide as it relates to the offering of this course: This course results from splitting ENGL 557 CREATIVE WRITING into two genre-specific courses--poetry and fiction. See other proposal to change 557.

(b) Address potential shifts in staffing of the departments as it relates to the offering of this course. (Note: If more space is needed, attach additional sheets to this form.)

None. The department already has a fiction writer who will teach this course.

11. Requirements for additional resources made necessary by this course:

(a) Staff None

(b) Budget None

(c) Library None

(Note: Course requiring additional resources will need special justification.)

12. Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).

REVIEW / APPROVAL PROCESS

13. Signature of Graduate Program Director: [Signature] Date submitted: 12/1/95

14. Signature of Department Chair: [Signature] Date approved: 12/1/95

15. Signature of School's Dean: [Signature] Date approved: 1/3/96

16. Signature of Budget Director, Business Affairs Office: [Signature] Date reviewed: 12/1/95

17. Signature of Chair of Faculty Committee on Graduate and Continuing Education: [Signature] Date approved: 2/19/96

18. Signature of Chair of Graduate Council: [Signature] Date approved:

19. Signature of Faculty Senate Secretary: [Signature] Date approved:

Completed forms should be sent by the Graduate Studies Office to the following:

1. Registrar (for entering course in SIS course inventory)
2. Department Chair
3. Graduate Program Director
4. Business Affairs Office (for establishing course fee structure in SIS)
5. Academic Affairs Office

This form was last revised November 16, 1994 and replaces all others.
UNIVERSITY OF CHARLESTON, S.C.
Faculty Committee on Graduate and Continuing Education
New Graduate Course Proposal

1. Department: Biology

2. Course number and title: EVSS 628, Plant Ecology
   Number of credits: 4
   Total hrs/week: 6
   Lecture: 3
   Lab: 3

3. Course will be offered first: Fall 1996

4. Catalog description (please limit to 50 words):
   Plant Ecology will explore the population ecology of plants covering the genetic, spatial, age and size structure of plant populations. The focus will be on understanding the origin of these different kinds of structures, understanding how they influence each other, and understanding why they change with time.

5. Prerequisites (or other restrictions):
   General Ecology (Biology 341) or permission of the instructor.

6. Rationale/justification for course (consider the following issues): (Note: if more space is needed, attach additional sheets to this form).
   (a) What are the goals and objectives of the courses?
   The goals of this course are to provide an in-depth understanding of ecological concepts as they apply to plants (the focus will be on terrestrial plant communities). The course will provide a detailed examination of ecological theory and the application of theory as it pertains to plants. The course will familiarize students with experimental techniques in plant ecology and with the primary literature and will expand upon the ecological principles covered in general ecology.

   (b) How does the course support the mission statement of the department and the organizing principles of the major?
   The Biology Department also has a new graduate program in Environmental Studies. Yet, aside from marine oriented courses, we have few advanced courses to offer graduate students. Plant ecology would begin to fill this need by providing Environmental Studies students with an advanced ecology course that has a terrestrial focus. The faculty member (Paul Marino) hired specifically for this program is a plant ecologist.

7. Are other Departments affected by this course? (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.)
   No.

8. Is this course part of joint program? X Yes No. If “Yes”, what institution? MUSC
   Will the other institution use the same course number and title? X Yes No. If “No” what will be the course number and title at the other school?

9. Method of teaching:
   Lecture plus a laboratory section that will emphasize experimental ecology. About 1/3 of the laboratories will also be dedicated to a discussion of papers from the primary literature. Students will be required to write an extensive research paper derived from the primary literature emphasizing conceptual issues in plant ecology.
10. (a) Address potential enrollment pattern shifts in the department or University-wide as it relates to the offering of this course:
(b) Address potential shifts in staffing of the department as it relates to the offering of this course:

We are offering a similar course at the 400-level. The Department of Biology struggles to offer enough space in all of its courses, especially upper division biology courses. This has been difficult due to the rapid growth of the College and the more rapid growth (with respect to the College) experienced by this department. During the past five years the sizes of lecture sections have risen in response to enrollment pressures. Furthermore, the number of sections we have offered has increased. Nonetheless, it is still a struggle to offer enough space. Our efficiency in filling upper division classes is very high; typically greater than 95% of the upper division slots are filled. While this may seem to be admirable, students complain they are not able to get the classes of their choice and they often must take required courses later rather than sooner. A comfortable margin would yield between 10 and 15% of the available spaces unfilled.

The department needs to offer more upper division biology courses to reduce overcrowding. Adding a new courses to our curriculum will enrich the curriculum and take advantage of the expertise of our newly-hired faculty members. By offering this course as a 400/600 level course, we can also enrich the graduate curriculum, fulfill our responsibilities to the graduate program in Environmental Studies, and provide extraordinary experiences for undergraduate students. This course requires shifts in staffing of upper division biology.

11. Requirements for additional resources made necessary by this course:
(a) Staff
   We continue to be understaffed. However, offering this course will allow us to meet our obligations to the graduate program without sacrificing our undergraduate program.
(b) Budget
   No special supplies or materials are required for this course that are also not required for BIOL 341, General Ecology. Some materials have already been purchased that can be used in many such field courses. There are no additional costs associated with this course.
(c) Library
   None anticipated.

12. Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).
REVIEW / APPROVAL PROCESS

13. Signature of Graduate Program Director:
   Signature: [Signature]
   Date submitted: 2/7/96

14. Signature of Department Chair:
   Signature: [Signature]
   Date submitted: 2/7/96

15. Signature of School's Dean:
   Signature: [Signature]
   Date submitted: 2/7/96

16. Signature of Budget Director, Business Affairs Office:
   Signature: [Signature]
   Date submitted:

17. Signature of Chair of Faculty Committee on Graduate and Continuing Education:
   Signature: [Signature]
   Date submitted:

18. Signature of Chair of Graduate Council:
   Signature: [Signature]
   Date submitted:

19. Signature of Faculty Senate Secretary:
   Signature: [Signature]
   Date approved by Senate:

Completed forms should be sent by the Graduate Studies Office to the following:
1. Registrar (for entering course in SIS course inventory)
2. Department Chair
3. Graduate Program Director
4. Business Affairs Office (for establishing course for structure in SIS)
5. Academic Affairs Office
The goals of this course are to provide an in-depth understanding of ecological concepts as they apply to plants, focusing on terrestrial plant communities. A central goal of ecology is to try to reduce the incredible complexity of the natural world to an oversimplified, yet hopefully still useful, set of principles. This course will provide an understanding of ecological theory as it pertains to plants and we will critically examine some real-world principles to problems of habitat and species conservation, pollution, resource management, pest control and areas of environmental planning. The course will familiarize students with experimental techniques in plant ecology and with the primary scientific literature. The course will build and expand upon the ecological principles covered in General Ecology (Biol 341). A detailed outline for each lecture topic is given in Appendix 1.

Lecture and laboratory will emphasize experimental ecology. About 1/3 of the laboratories will also be dedicated to a discussion of papers from the primary literature (See Laboratory: Discussion Topics/Readings). Students will also be required to write an extensive research paper derived from the primary literature (See Appendix 2) with an emphasis on conceptual issues in plant ecology.

The prerequisite for the course is Biol. 341 (General Ecology) or an equivalent course. Students are expected to be familiar with computers and statistical analysis.

Course requirements:

Lecture: 3 in-class tests, one final exam

Lab: Assignments as detailed in each laboratory exercise, participation in Discussion and two short (2 page) critiques of selected papers covered in discussion.

Research Paper: As discussed previously (Appendix 2).

Grading Policy:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>91-100</td>
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<tr>
<td>B+</td>
<td>86-90</td>
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<tr>
<td>B</td>
<td>81-85</td>
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<tr>
<td>C+</td>
<td>76-80</td>
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<tr>
<td>C</td>
<td>70-75</td>
</tr>
<tr>
<td>Failure</td>
<td>&lt; 70</td>
</tr>
</tbody>
</table>

40% tests (3 tests, lowest score worth 10%, highest two worth 15% each) + 20% final exam + 20% lab (7.5% write-ups, 7.5% critiques and 5% discussion) + 20% term paper.
# Plant Ecology

**REQUIRED TEXTS:**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>History and development of plant ecology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LIFE HISTORIES</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Seed dormancy</td>
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<tr>
<td>3</td>
<td>Germination and seedling establishment</td>
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<tr>
<td>4</td>
<td>Survivorship and fecundity patterns</td>
<td></td>
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<tr>
<td>5</td>
<td>Population growth models</td>
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<tr>
<td>6</td>
<td>Reproductive allocation</td>
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<td>7</td>
<td>Life history strategies</td>
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<td>8</td>
<td>Breeding systems</td>
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<td>9</td>
<td>Population differentiation</td>
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<td>10</td>
<td>Phenotypic Plasticity</td>
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<td></td>
<td>INTERACTIONS WITH OTHER TROPHIC LEVELS</td>
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<tr>
<td>11</td>
<td>Natural enemies</td>
<td></td>
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<tr>
<td>12</td>
<td>Natural enemies</td>
<td></td>
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<tr>
<td>13</td>
<td>Mutualisms</td>
<td>Willson 1983, Ch 2</td>
</tr>
<tr>
<td></td>
<td>INTRASPECIFIC INTERACTIONS</td>
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<tr>
<td>14</td>
<td>Density-yield relationships, self-thinning</td>
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<td>15</td>
<td>Size distributions</td>
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<td>16</td>
<td>Density-dependent population growth</td>
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<td></td>
<td>INTERSPECIFIC INTERACTIONS</td>
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<tr>
<td>17</td>
<td>Experimental approaches-substitutive designs</td>
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<td>18</td>
<td>Experimental approaches-additive designs</td>
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<td>19</td>
<td>Experimental approaches-field</td>
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<td>20</td>
<td>Limiting resources and functional constraints</td>
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<td>21</td>
<td>Competitive ability I</td>
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<td>22</td>
<td>Competitive ability II</td>
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<tr>
<td>23</td>
<td>Mechanisms of competition</td>
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<td>24</td>
<td>Allelopathy</td>
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<td>PLANT COMMUNITIES</td>
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<tr>
<td>25</td>
<td>Coexistence and maintenance of diversity I</td>
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</tr>
<tr>
<td>26</td>
<td>Coexistence and maintenance of diversity II</td>
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</tr>
<tr>
<td>27</td>
<td>Spatial and temporal heterogeneity</td>
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</tr>
<tr>
<td>28</td>
<td>Disturbance and succession</td>
<td></td>
</tr>
</tbody>
</table>

S = Chapters in Silverton and Lovett Doust
H = Chapters in Harper
General References:


Appendices:

Appendix 1: Detailed outlines for each lecture topic.

Appendix 2: Term paper assignment (for graduate credit).

Appendix 3: Plant competition laboratory exercise.

Appendix 4: Natural enemy laboratory.

Appendix 5: Pollination laboratory.
# Plant Ecology

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<td>S-2; H-2,3,4</td>
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<tr>
<td>3</td>
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<td>S-5; H-18,19,20</td>
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<td>17</td>
<td>Experimental approaches-substitutive designs</td>
<td>S-8</td>
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<td>S-9</td>
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<td>Coexistence and maintenance of diversity II</td>
<td>Chesson and Case 1986</td>
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<td>Disturbance and succession</td>
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S = Chapters in Silverton and Lovett Doust
H = Chapters in Harper
General References:


The paper should consist of a literature review attempting to answer a specific question or test alternative hypotheses about some aspect of plant population biology. Within 2 weeks you should turn in a brief (< 1 page) description of your paper topic. The paper (ca. 15 pp) is due the last day of class. A list of possible topics is given below; I can suggest starting references for these or other topics you are interested in.

correlates of seed size — documentation and consequences
germination requirements and demographic consequences
 genetic variation on a microscale
frequency-dependent competition in plants
male fitness components in hermaphrodites
density-dependent consumption of plants
pathogens and plant demography
microorganisms and plant-plant interactions
‘climax’ species and regeneration in gaps
stress tolerance and competitive ability
coevolution of competitors in plants
survivorship curves among habitats and/or growth form
population dynamics of clonal plants
allelopathy in natural communities
cost of reproduction
Plant Competition

Plants can compete for resources such as light, water and nutrients when their canopies or root areas overlap. Therefore, the density of plants in an area can affect resource availability and determine the growth rates of individuals. Competition may be within a species (intraspecific) or between individuals of different species (interspecific). Species differences in growth form (such as shape of leaves and their arrangement on a stem), root depth and development, rate and diurnal pattern of water and nutrient uptake from the soil may all influence the magnitude of the effect of competition.

In this project you will be measuring the effect of increasing density on the growth of plants. You will be able to design your own experiment to test hypotheses about expected differences in competitive effects of different species or under different environmental conditions.

The effect of intraspecific competition in plant populations is usually examined by planting the species over a range of densities. The most common result is that the mean weight per plant decreases as density increases (Fig. 1) so that total yield approaches some constant value (Fig. 2) (See Harper 1977, Chapter 6). This result is called the “Law of Final Yield”. We can think of this constant yield as the carrying capacity (in terms of biomass) of the particular environmental conditions of the experiment. Graphs such as Fig. 2 can be used to approximate the optimal planting density for a particular crop — the density at which increasing the planting density no longer results in an increase in total yield. It has generally been found that the best way to describe the results of a density experiment is the reciprocal yield equation: \( \frac{1}{w} = A + Bd \), where \( w \) = mean plant weight, \( d \) = density, and \( A \) and \( B \) are regression constants. In this equation, a large (positive) \( B \) value implies a strong competitive effect.

![Graph](image)

However, most plants do not occur in monocultures (even crops have weeds of various species) but experience interspecific competition from a number of other species. We will study the effects of interspecific competition by using an experimental design similar to the one described above for intraspecific competition. To measure the effect of the density of species \( j \) (the associated species or competitor) on the per-plant weight of species \( i \) (the indicator species), we keep the density of species \( i \) constant (intensity of intraspecific competition constant) and vary the density of species \( j \) (intensity of interspecific competition).
competition variable). This type of experiment is called an additive design because plants of the competitor are added to those of the indicator species so that total density of the mixture is varied. Harper (1977; pp. 249-255) discusses several examples of additive designs.

If density of the indicator species is kept low enough so that intraspecific competition is weak or nonexistent, we can use the reciprocal yield equation to describe interspecific competition \( \frac{1}{w_i} = A_i + B_{ij}d_j, \) where \( w_i = \) mean plant weight of the indicator species \( i, \) \( d_j = \) density of the competitor species, \( B_{ij} = \) the competitive effect of species \( j \) on \( i, \) and \( A_i = \) the reciprocal of the weight of the indicator species when no competitors are present \( (d_j = 0). \)

Using this basic design and analysis, each section will design their own experiment to test hypotheses about expected differences in competitive effects of different species or under different environmental conditions.

Each section will do one experiment consisting of four “treatments” (we should have 2 groups per treatment). A single treatment consists of one indicator species and one competitor species grown at seven different densities of the competitor with 2 replicate flats per density. The treatments can be different combinations of species or the same combination under different environmental conditions. Some suggested experiments are given below:

1. Compare intensity of competition \( (B_{ij}) \) for several competitor species on a single indicator species. Choose your species so that you can develop hypotheses about which species should be the strongest competitor from a knowledge of its morphology or physiology. For example, you could compare several species of similar growth form but different seed size. (If you include the same species as both indicator and associated species you can also compare the intensity of inter to interspecific competition.)
2. Compare intensity of competition for several indicator species with the same competitor species, again choosing species so that you can develop some hypotheses about the results.
3. Compare the same species pair but reversing which one is the indicator and which one is the competitor. Do species with a strong effect as competitor \( (\text{large } B_{ij}) \) not respond very much when they are the indicator species \( (\text{small } B_{ij})? \)
4. Compare the same pairs of species under various resource levels -- e.g., with different levels of fertilizer or amounts of water. Do you expect the B’s to be higher or lower at higher resource levels? For example, try a legume and a grass at low nitrogen and at high nitrogen.
5. Compare the same species pair with the competitor introduced at different times -- e.g., 1 week before the indicator, simultaneously with the indicator, 1 week after. You may be able to mimic different times of planting by choosing species which take different amounts of time to germinate (see germination data posted in lab).
Plant Species

The following species of plants will be available:

<table>
<thead>
<tr>
<th>Seed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamb's quarter <em>(Chenopodium)</em></td>
<td>Annual, C₃, erect, dicot</td>
</tr>
<tr>
<td>Annual rye <em>(Lolium)</em></td>
<td>Annual, C₃, grass, monocot</td>
</tr>
<tr>
<td>Thistle <em>(Cirsium)</em></td>
<td>Rosette, C₃, monocarpic, dicot</td>
</tr>
<tr>
<td>Red clover <em>(Trifolium)</em></td>
<td>Perennial, C₃, legume, dicot</td>
</tr>
<tr>
<td>Perennial ryegrass</td>
<td>Perennial, C₃, grass, monocot</td>
</tr>
<tr>
<td>Pigweed <em>(Amaranthus)</em></td>
<td>Annual, C₄, erect, dicot</td>
</tr>
<tr>
<td>Foxtail grass <em>(Setaria)</em></td>
<td>Annual, C₄, grass monocot</td>
</tr>
</tbody>
</table>

Look over the specimens of all the species and choose pairs suitable for the experiment you have designed. Foxtail grass has the C₄ photosynthetic pathway, while all the other grasses are C₃. How might this factor affect the outcome of competition? Legumes are nitrogen fixers -- they have symbiotic bacteria, *Rhizobium*, in root nodules that convert atmospheric nitrogen into a form usable by the plant. How might this affect the outcome of competition with a non-nitrogen fixing species? How about under conditions of low and high nitrogen fertilization? Another major consideration is seed size. The seeds of the nine species vary enormously. How might this factor affect competition?

**Methods**

**Planting Procedures**

1. Prepare 14 flats for each treatment: 7 densities of the competitor and 2 replicates at each density.

2. Indicator species should be at 9 plants per flat. Competitor species should be at densities of 0, 8, 16, 31, 62, 125, and 250/flat.

3. Count the appropriate number of seeds of the competitor species.

4. Plant the indicator species by placing the seeds in a regular pattern over the soil surface and place a plastic toothpick next to each seed. This will help you to find the indicator plants after the competitors germinate, especially in the higher density flats or where the competitor is the same species as the indicator. Check the flats every week: first for germination of the indicators and later for their survival.

5. For the low density competitor flats, you can also place individual seeds in a regular pattern distributed over the entire flat. For the higher density flats just try to spread the seeds evenly.
Harvest

The flats will be harvested after five weeks. Keeping indicators and competitors separate, count the number of surviving plants, clip at ground level, weigh the indicators and competitors for each flat and calculate mean indicator weight. Then put the indicators and competitors in a plant press and place the entire press into the oven at 65 for 48 hours so we can also obtain dry weights if needed.

Equipment

- flats
- planting medium
- metersticks
- seeds
- enamel trays for sorting seed
- plastic toothpicks
- hand counters
- Mettler balance for fine weighing
- Ohaus balances for coarse weighing
- markers and marking pens for labeling flats

Analysis

Draw the appropriate plots and calculate regression for the reciprocal yield equation. Try using both initial and final densities as well as final weights of the competitors as the independent variable. Which gives you the highest correlation coefficients? Also, try using both mean weight per indicator plant and number of surviving indicator plants as the dependent variable. Which gives you a better fit to the equation?

Questions to Think About

1. What hypothesis were you testing in your experiment? What reasoning led you to develop this hypothesis?
2. Is your hypothesis supported by the results? What conclusions can you draw? If so, why? Use statistics to support your answer.

References (all are on reserve in the library)


DISTRIBUTION OF A PLANT PARASITE ON ITS HOST PLANT

If bees are not foraging, we will do this field laboratory instead.

At the Botanical Gardens, we will examine the distribution of a plant parasite on its host species. This parasite makes galls that will be available regardless of the weather! Although we will not directly observe insect behavior, we can observe it indirectly by recording the galls made by the parasite. In this lab you will examine the distribution of galls on its host plant. You will test the patterns of distribution and propose possible causes of the pattern you find.

Plant Galls and Gall Makers

You will examine a plant parasite that causes its host plant to form galls in which the insect lives. Galls are produced by some insects, mites, nematodes, bacteria, and fungi. They can be formed on any plant part, including roots, stems, fruits, and leaves. The gall-maker derives protection and food from the gall, while the plant is often harmed by the presence of galls; thus gall-makers are parasites of plants.

Galls formed by insects and mites are particularly conspicuous and abundant. There are well over 1,000 species of gall-forming insect and mites in North America. Most of these can form galls on only one plant species or a few closely related species, and then only on a particular part of the plant.

We know little about the mechanisms by which gall-makers cause plant cells to divide abnormally to produce galls, but biochemical secretions of the gall-makers apparently play an important role. The growth of plant cells in galls may be similar to the growth of cancerous tissues in animals.

We will study galls formed on leaves of choke cherry, Prunus virginiana, by mites belonging to the family Eriophyidae (a different gall-maker and plant species may be substituted if necessary). Choke cherry is a common shrub in most areas of the Botanical Gardens. The mite galls are small, oblong, greenish to reddish structures on the upper surfaces of the leaves. The mites that form the galls are microscopic, so we will not be looking at them directly, only at the galls they form.

Life history of gall mites: A single adult female mite usually starts each gall which then supports the growth of her progeny. One female may initiate more than one gall in her lifetime, but information on this point is difficult to find. The galls can only form on young leaves, i.e., leaves that are still growing. Often, you can already see galls on leaves shortly after bud-break in spring. Gall mites disperse between plants primarily by floating on wind currents. Most gall mite species
Question 1. Distribution of mite galls within plants.

Select one choke cherry that has mite galls on an appreciable number of leaves; choose a plant between 1 and 3 meters tall. Randomly choose a branch or section of branch with about 40 - 70 leaves. To do this, first assign every branch a number from the random number table at the end of this lab write-up. If necessary, repeat this procedure for smaller branches or sections of a branch with a larger branch. Record the number of galls per leaf for each leaf.

Question 2. Distribution of galls among plants.

For this part, each group should study at least 5 plants between 1 and 3 meters in height. We will need to devise a technique to choose plants at random, or at least without regard to their density of mite galls. A suggested technique is to assign a number to all plants within a specified area (e.g. along a length of trail) and then choose plants for sampling from among them by using the random number table.

On each plant chosen for sampling, select 20 leaves at random. This can be done by first numbering branches mentally and choosing a branch with a random number table, then numbering leaves within branches, etc., repeating this entire procedure for each leaf. For each leaf, record the number of galls.

Also record the following information about the plant and its surroundings (we may not have time for all these; check with your T.A. for which to do):

1. Approximate height of plant and approximate number of leaves, to the nearest 10 (don't spend too long on this last one).

2. The number of other choke cherries over 1 m. tall within a 3m. radius of the plant being sampled.

3. Canopy cover over the plant (this will determine the amount of sunlight it receives). This can be done by standing by the plant and looking up through a mailing tube, recording the approximate percent of sky obstructed by leaves, to the nearest 20%. Do this looking straight over the plant, and at a 45° angle in each compass direction.

4. Anything else you can think of that might affect the distribution of mite galls on plants.
critical value, for the desired level of significance. A table of critical values is given at the end of this write-up.

**Question 2.** For each plant, calculate the mean number of galls per leaf. For the entire class' data, construct a histogram of the mean number of galls per leaf per plant (i.e. with the number of plants on the Y-axis and the average number of galls per leaf on the x-axis). Note that even if we repeatedly sampled twenty leaves from the same plant, we would not expect to come up with the same mean number of galls per leaf in each sample, because of sampling variation. Looking at the histogram, do you think there is more variability among plants in the mean number of galls per leaf than one would expect from sampling variation alone? We could use sophisticated statistical techniques such as analysis of variance to answer this question, but it probably won't be necessary.

To determine whether any of the factors we measured are related to the mean number of galls per leaf, make scatter plots for the whole class' data, with the factor on the x-axis and the mean number of galls per leaf for each plant on the y-axis. Do any of the factors measured seem to give a significant relationship, either positive or negative? To answer this objectively, you could use either correlation or regression analysis (described in the statistics handout).

**QUESTIONS TO THINK ABOUT**

1. **What biological processes might lead to a contagious distribution of galls within a plant?** A random distribution? An even distribution? Although you may come up with a plausible hypothesis to explain the observed type of distribution, you would have to have additional information to test your hypothesis. Choose one of the processes you thought of to explain the distribution we found and explain what information you would collect in order to test if the process actually occurs.

2. **What factors are good predictors of how heavily attacked a plant is?** What biological processes might account for these relationships? Choose one process and briefly describe an experiment to test your hypothesis. Just because we may observe a relationship between a certain factor and how heavily attacked a plant is, does this prove there is a direct cause-and-effect relationship between the two? Why or why not?
Distribution of galls among plants

<table>
<thead>
<tr>
<th>Plant height number m</th>
<th>No. of leaves</th>
<th>No. of conspecific neighbors &lt;3m away</th>
<th>Mean % canopy cover</th>
<th>other</th>
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</thead>
<tbody>
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<td>1</td>
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Leaf No. Plant 1 Plant 2 Plant 3 Plant 4 Plant 5

| 1 |               |               |               |               |
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| 20|               |               |               |               |

Total:               Mean:
Distribution of galls within plants

<table>
<thead>
<tr>
<th>Leaf # of galls</th>
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<th>Leaf # of galls</th>
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Total # galls =
Mean # galls per leaf =

# leaves sampled =
Variance =
THE FORAGING BEHAVIOR OF BEES

In this field laboratory at the Matthaei Botanical Gardens, you will watch the behavior of bees that visit flowers for food (nectar and pollen) and test an hypothesis based on optimal foraging theory. You will do this by experimentally manipulating the nectar in flowers. If bees are not foraging because it is too cold, you will do the next, "back-up" lab on an insect gallmaker. Bees gather pollen by collecting the pollen that falls onto their bodies into specialized sacs (corbiculi) attached to their hindmost legs. Bumblebees gather nectar by inserting their tongues into the base of the flower and ingesting the accumulated nectar. The flower is generally pollinated during nectar foraging. However, the length of the corolla of the flower limits the access of short-tongued bees to the nectar, and many bumblebees get around this difficulty by biting a hole in the base of the corolla. These bees act as thieves, and the flower may not get pollinated.

Bumblebees tend to forage on several flowers in an inflorescence and then leave before they have visited all the flowers. How do bees decide when to leave a particular inflorescence and move on? If bees are foraging optimally, then they have presumably been selected to forage so that they gather the most nectar in the least time or with the least effort. How the bee 'knows' when to leave has not yet been fully answered. Postulating that it knows that its nectar reward by continuing to forage on that inflorescence would be less than what it could get by moving to another inflorescence implies that it can assess what nectar rewards are elsewhere before actually probing flowers. The bee has some information about future flowers on the inflorescence it is probing because nectar production rates tend to be similar on all flowers of an inflorescence. But if a bee has already been to some of the flowers, can subsequent bees tell this? This question has also not been answered fully.

To answer the basic question of whether nectar rewards influence bee foraging behavior, we can manipulate nectar content of flowers and see if the bees change their foraging behavior. If the bees are foraging optimally, then the higher nectar rewards should cause the bees to probe more flowers on high-nectar inflorescences than on low-nectar inflorescences and to spend more time collecting the nectar.

Hypothesis 1: If bees are foraging optimally, then they will probe more flowers on inflorescences with higher nectar quantities than on inflorescences with lower nectar quantities.

Hypothesis 2: Bees will spend more time per probe on the high nectar flowers than on the low nectar flowers.

There are many variations that could be done with this kind of behavioral experiment. You could test whether a bee probes fewer flowers on a control inflorescence if the previous inflorescence was high-nectar than if it was a control. This prediction suggests
ANALYSIS

These data are means (number of probes per inflorescence in each kind of inflorescence or time per probe), so Student's t-test is appropriate. The null hypothesis in this case is that the nectar reward doesn't influence the number of probes per inflorescence so the expected means (under the null hypothesis) would be equal for the manipulated and control inflorescences. Test the null hypothesis using the observations made by the class. See the statistical appendix for computational details for the t-test.

QUESTIONS TO THINK ABOUT

1. Do the data support or contradict your hypothesis? Do bees alter their foraging behavior to take advantage of locally high nectar rewards? If they do, do they probe all of the flowers on a high-nectar inflorescence or do they leave before probing all the flowers? Can you suggest a reason why they might take a chance on a new inflorescence without probing all of the flowers on a high-nectar inflorescence? If they do not alter their behavior on high-nectar inflorescences, can you suggest a reason? For each of your postulated reasons, can you suggest a way to test it? Do you think it mattered that we counted a bee as "new" when it flew to another inflorescence in the experiment? Why or why not?

2. How might the differences in foraging behavior of the bees affect the pollination of the plant? Would increased nectar be advantageous to the plant? What factors might limit the amount of nectar per flower on a plant?

REFERENCES: (* on reserve at UGLi)


DATA SHEET FOR BEE FORAGING BEHAVIOR

Section ___________ Date ____________________

Names ______________ Plant Species: ___________

Weather: Temp ___ Sky ____________ Days since rain ____

Time of day: ______ Observation interval: ___________

<table>
<thead>
<tr>
<th>Treatment (H or C) and No.</th>
<th>Number of probes on each inflorescence</th>
<th>Time per probe (seconds)</th>
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Nectar measurements: Control _______ High nectar _______
Laboratory:
The laboratory will consist of both discussion (1/3) and field/greenhouse exercises (2/3). In addition to participating in the discussions, each student will moderate the discussion of one or more papers by presenting an introductory synopsis of a specific topic and by generating questions to be discussed. Discussion leaders will prepare and hand out a brief outline or summary of the topic and a short literature list. Additional assignments will include: two short (2 page) critiques on papers taken from the primary literature and written reports for each laboratory.

Discussion Topics/Readings (subject to modification):
1) Establishment and Demography

2) Breeding Systems

3) Natural Enemies

4) Resource Competition


5) Competition -- Experiments


6) Coexistence and Diversity


Field and greenhouse exercises (these are examples, this is not an exhaustive list. The ability to do certain field exercises depends on whether this course is taught in the fall or spring term.):

1) Demography:
-- This project will be set up the semester before the class is held or at the beginning of the semester (depends on the season). Randomly chosen control and experimental sites will be set up in an old field (e.g., on the Dill Estate). Experimental treatments would include, for example, the removal of standing plant biomass, soil surface litter, both and no removal controls. The influence of these treatments on recruitment, age structure, growth and reproduction of plants will be quantified.

2) Plant Competition: (NOTE: A completed lab exercise for this topic is included (Appendix 3))
-- a) Greenhouse studies: Example: Exploring competitive effect and response. Competitive ability can be compared between species in two ways: effect of different neighbor species on performance of a single target species or response of different target species to a single neighbor species. Greenhouse experiments can be performed to determine if there are consistent hierarchies in competitive effect and/or response, what traits of individuals determine the position in these hierarchies, and whether or not effect and response competitive ability are related during the early stages of competition.
--b) Field studies: Example: If the course is taught in the spring term, density manipulations of neighbors can be performed in old field sites on a variety of target species to explore competitive interactions between plants having different growth strategies, life-history characteristics etc.
3) **Phenotypic Plasticity:**

-- There are a number of local sites (e.g., Francis Marion Forest) where there are ongoing experiments exploring long-leaf pine/fire dynamics. In these experimental sites there are various fire regimes (e.g., 2 year, 5 year cycles). The effect of these different fire regimes on the architecture of a variety of target plant species could be examined with comparisons made between species having different growth forms and between those having and those lacking fire related life history adaptations.

-- The influence of different fire regimes on demographic parameters can also be examined in these systems.

4) **Natural Enemies:** (Note: An example of a lab exercise on this topic is included, (Appendix 4) this exercise if from a similar course that I taught at the Univ. of Michigan, the only modification needed is that the project would be performed using galls common to plants in coastal South Carolina as listed below)

-- Plants generally exhibit considerable variation in the degree to which certain individuals are attacked by herbivores. This variation will be quantified as will various plant (e.g., growth, reproduction, architecture) and habitat traits (shade, sun, etc.). Cause and effect relationships will be explored. Herbivore abundance can be measured both directly (e.g., gall-formers and leaf miners) and indirectly (e.g., quantifying leaf damage by leaf chewers). Several potential systems include the: gall forming fly *Eurosta*, aphids or chrysomelids on Goldenrod, holly leaf miners on American Holly and stem gall-formers on American Dogwood.

5) **Mutualisms/Pollination:** Note: An example of a lab exercise on this topic is included, (Appendix 5) this exercise if from a similar course that I taught at the Univ. of Michigan, the only modification needed is that the project would be performed at the Dill Estate on James Island using the abundant fall flowering plants growing there in the old fields)

-- Many plants with hermaphroditic flowers that are in spikes are protandrous (male parts mature before female parts) and have flowers that mature from the bottom to the top of the spike. Flowers at the bottom of the spike produce the most nectar and are female function whereas flowers near the top produce little nectar and are male function. This results in the transfer of pollen between individuals rather than within an inflorescence. This system (and similar systems) can be manipulated by either removing and/or adding nectar to flowers. How would such manipulations affect bee foraging behavior (i.e., pollen transfer)? Given enough time and the proper season such manipulations could also be related to seed set.
UNIVERSITY OF CHARLESTON, S.C.
Faculty Committee on Graduate and Continuing Education
New Graduate Course Proposal

1. Department: Biology

2. Course number and title: EVSS 629, Conservation Biology
   Number of credits: 3   Total hrs/week: 3   Lecture: 3   Lab: 0

3. Course will be offered first: Spring 1997

4. Catalog description (please limit to 50 words):
   A course exploring the origin, maintenance and preservation of biodiversity at all levels: genetic, population, community, ecosystem and biosphere. The focus will be on applying ecological, genetic and evolutionary principles to problems in conservation. Optional field trips will make use of the rich biota of the Charleston area.

5. Prerequisites (or other restriction):
   BIOL 341 (General Ecology) and either BIOL 311 (Genetics) or BIOL 350 (Evolution), or permission of the instructor.

6. Rationale/justification for course (consider the following issues):
   (a) What are the goals and objectives of the course?
   The goal of this course is to provide an in-depth understanding of the application of ecological, evolutionary and population-genetic theory to the maintenance of biodiversity. The course will investigate the scientific principles which underlie the establishment of sound conservation strategies, and will help students understand the links between basic and applied research.

   (b) How does the course support the mission statement of the department and the organizing principles of the major?
   Conservation Biology will provide students with the opportunity to explore the applications of genetic, ecological and evolutionary principles to an applied problem, the conservation of biodiversity. Conservation Biology thus is a “synthesis” course, one that cuts across taxonomic boundaries and demonstrates the interconnections between other biological subdisciplines. Conservation Biology also will expand the non-marine biology course offerings available to students in the graduate program in Environmental Studies, thus complementing an existing strength of this curriculum.

7. Are other Departments affected by this course? (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.)
   No.

8. Is this course part of joint program? _X_ Yes ___No. If “Yes,” what institution? MUSC
   Will the other institution use the same course number and title? _X_ Yes ___No. If “No” what will be the course number and title at the other school?

9. Method of teaching:
   Lecture (with discussion of the primary literature) plus in-class demonstrations that will emphasize simulations of population dynamics and population genetics. Guest speakers from within the Department of Biology, other departments, and from industry, agencies, and nongovernmental organizations will add expertise and breadth to lectures and in-class discussions. Optional field trips will introduce students to conservation solutions that are being effected in the Charleston area. Students will be required to write a grant proposal, a species-recovery plan, a proposal for listing, or a similar professional document.
10. (a) **Address potential enrollment pattern shifts in the department or University-wide as it relates to the offering of this course:**
(b) **Address potential shifts in staffing of the department as it relates to the offering of this course.**

We are offering a similar course at the 400-level. The Department of Biology struggles to offer enough space in all of its courses, especially upper division biology courses. This has been difficult due to the rapid growth of the College and the more rapid growth (with respect to the College) experienced by this department. During the past five years the sizes of lecture sections have risen in response to enrollment pressures. Furthermore, the number of sections we have offered has increased. Nonetheless, it is still a struggle to offer enough space. Our efficiency in filling upper division classes is very high; typically greater than 95% of the upper division slots are filled. While this may seem to be admirable, students complain they are not able to get the classes of their choice and they often must take required courses later rather than sooner. A comfortable margin would yield between 10 and 15% of the available spaces unfilled.

The department needs to offer more upper division biology courses to reduce overcrowding. Adding a new courses to our curriculum will enrich the curriculum and take advantage of the expertise of our newly-hired faculty members. By offering this course as a 400/600 level course, we can also enrich the graduate curriculum, fulfill our responsibilities to the graduate program in Environmental Studies, and provide extraordinary experiences for undergraduate students. This course requires shifts in staffing of upper division biology.

11. **Requirements for additional resources made necessary by this course:**

(a) **Staff**

We continue to be understaffed. However, offering this course will allow us to meet our obligations to the graduate program without sacrificing our undergraduate program.

(b) **Budget**

Optional field trips will require vans, which the department will pay for from its operating budget.

(c) **Library**

The department has requested a major journal, *Biological Conservation*. Some additional books will be purchased through the normal ordering process.

(Note: Course requiring additional resources will need special justification.)

12. Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).
REVIEW / APPROVAL PROCESS

13. Signature of Graduate Program Director: [Signature] Date submitted: 2/7/96
14. Signature of Department Chair: [Signature] Date submitted: 2/7/96
15. Signature of School's Dean: [Signature] Date submitted: 2/9/96
16. Signature of Budget Director, Business Affairs Office: [Signature] Date submitted: 
17. Signature of Chair of Faculty Committee on Graduate and Continuing Education: 
18. Signature of Chair of Graduate Council: 
Signature of Faculty Senate: 
19. Secretary: 

Completed forms should be sent by the Graduate Studies Office to the following:
1. Registrar (for entering course in SIS course inventory)
2. Department Chair
3. Graduate Program Director
4. Business Affairs Office (for establishing course for structure in SIS)
5. Academic Affairs Office
EVSS 629: CONSERVATION BIOLOGY

Class Times: Tuesday 7:00 PM - 10:00 PM
Final Examination - Tuesday, April 30, 7:30 - 10:30 PM

Lecture Room: SCIC 121

Honor Code: This course will be conducted in accordance with the Honor Code of the College of Charleston.

Instructor: Dr. Arch McCallum
Office SCIC 207
Phone 953-6557 (o), 883-9818 (h)
Office Hours: Mon 3:00-5:00, Th 3:00-5:00, by appt.

Text:


Attendance: Attendance at all lectures is expected. A class roll will be circulated for my information, but will not be used in assigning grades without my giving notice in advance. Frankly, you shouldn't be taking this class if you have difficulty attending.

Grading: A mid-term examination, covering the first half of the course, and a final examination, covering the second half, will each contribute 22.5% of your grade. Each exam will include both objectively graded and essay questions. 30% of the grade will be determined by the quality of a publication-quality research paper, which must be presented in format suitable for submission to the journal Conservation Biology. The topic of this paper must be approved in advance by the instructor. A fourth requirement, preparing a fundable grant proposal, will be worth 25% of your grade.

Grading scheme (there will be no curve):

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>92-100</td>
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<td>B+</td>
<td>85-91</td>
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<td>B</td>
<td>80-84</td>
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<td>C+</td>
<td>75-79</td>
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<td>C</td>
<td>70-74</td>
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Objectives: The goal of this course is to provide an in-depth understanding of the application of ecological, evolutionary and population-genetic theory to the maintenance of biodiversity. The course will investigate the scientific principles which underlie the establishment of sound conservation strategies, and will help students understand the links between basic and applied research.
<table>
<thead>
<tr>
<th>Lecture Session</th>
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<tbody>
<tr>
<td>Chapter</td>
</tr>
<tr>
<td>1. 1/16 1</td>
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<tr>
<td>Course organization</td>
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<tr>
<td>2. 1/23 2</td>
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<tr>
<td>Philosophical foundations of conservation. Guest speaker: Ned Hettinger, Dept. of Philosophy, CofC.</td>
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<tr>
<td>3. 1/30 3,5</td>
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<tr>
<td>4. 2/6 6</td>
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<tr>
<td>Fundamentals of microevolution. Adaptation, phenotypic plasticity, and specialization (including outbreeding depression).</td>
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<td>5. 2/13 6,7</td>
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<td>Problems for small populations. Genetic, demographic, and environmental stochasticity.</td>
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<td>6. 2/20 7,9</td>
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<tr>
<td>Metapopulation dynamics and habitat fragmentation.</td>
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<tr>
<td>7. 2/27</td>
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<tr>
<td>Midterm exam</td>
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<tr>
<td>8. 3/12 4,8</td>
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<tr>
<td>Patterns of diversity [4]. Community processes (competition, predation, mutualism, disturbance) [8].</td>
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<tr>
<td>9. 3/19</td>
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<tr>
<td>Ecosystem function and ecological services. Do the players matter? Ecosystems types (biomes) and their relative resilience. The Gaia hypothesis and global climate change [18]. Impacts of rapid climate change on biodiversity, past and present.</td>
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<tr>
<td>10. 3/26</td>
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<td>11. 4/2</td>
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<tr>
<td>Solutions: Preserves [10], Restoration of damaged ecosystems [14], recovery of endangered species [13], and Zoos and gene-banking.</td>
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<tr>
<td>12. 4/9 15,16</td>
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<tr>
<td>Public policy and its positive and negative impact on conservation of species, communities, and ecosystems. Possible guest speakers.</td>
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<tr>
<td>13. 4/16 17,18</td>
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<tr>
<td>The future: Sustainable development and human population dynamics.</td>
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<tr>
<td>14. 4/23</td>
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<tr>
<td>Conservation Practice in the Low Country. Possible guest speakers.</td>
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<td>4/30</td>
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<tr>
<td>Final Exam (7:30-10:30 pm).</td>
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</table>
Course number and title: EVSS 681; Capstone Seminar
Number of Credits: 2
Total hrs/week: 2
Lectures: 2
Lab: 0

Course will be offered first: Spring 1996

Catalog description (please limit to 50 words): The capstone seminar provides an opportunity for students to synthesize concepts in scientific, policy, and risk assessment disciplines, and to apply these concepts to solve a problem presented by the faculty. Students will define a semester-long project, which culminates in oral and written presentations.

Prerequisites (or other restrictions): EVSS 680

Rationale/justification for course (consider the following issues): (Note: If more space is needed, attach additional sheets to this form.)

(a) What are the goals and objectives of the course? Students will synthesize relevant scientific, policy, and risk assessment concepts, and will apply these to solve a problem presented as the case study. Each student's project will focus on a topic appropriate to his/her track in the MES program.

(b) How does the course support the mission statement of the department and the organizing principles of the graduate program? The mission of the MES program is to prepare students for the interdisciplinary study of the environment. Students are taught science, risk assessment, and policy concepts earlier in the degree program. EVSS 681 requires students to apply these areas to a case study.

Are other Departments affected by this course? (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.)

No

Is this course part of joint program? Yes No If "Yes", what institution? MUSC

Will the other institution use the same course number and title? Yes No If "No" what will be the course number and title at the other school?

Method of teaching: Introductory lectures followed by independent study by the students under faculty supervision, capped by oral, poster, and written presentation by the student.
10. (a) Address potential enrollment pattern shifts in the department or University-wide as it relates to the offering of this course: 

NONE

(b) Address potential shifts in staffing of the departments as it relates to the offering if this course. (Note: If more space is needed, attach additional sheets to this form.)

NONE. Faculty have already been hired by MUSC and the University for this program.

11. Requirements for additional resources made necessary by this course:

(a) Staff None; faculty have already been hired by MUSC and the University.

(b) Budget None; faculty have already been hired by MUSC and the University.

(c) Library Faculty will search out needed documents, and will place these on reserve in the library.

(Note: Course requiring additional resources will need special justification.)

12. Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory). Syllabus is attached.

REVIEW / APPROVAL PROCESS

13. Signature of Graduate Program Director: __________________ Date submitted: 11/14/95

14. Signature of Department Chair: __________________ Date approved 11/14/95

15. Signature of School’s Dean: __________________ Date approved 11/14/95

16. Signature of Budget Director, Business Affairs Office: ______________ Date reviewed: 11/14/95

17. Signature of Chair of Faculty Committee on Graduate and Continuing Education: ______________ Date approved: 2/19/96

18. Signature of Chair of Graduate Council: __________________ Date approved: 

19. Signature of Faculty Senate Secretary: __________________ Date approved: 

Completed forms should be sent by the Graduate Studies Office to the following:

1. Registrar (for entering course in SIS course inventory)
2. Department Chair
3. Graduate Program Director
4. Business Affairs Office (for establishing course fee structure in SIS)
5. Academic Affairs Office

This form was last revised November 16, 1994 and replaces all others.
EVSS 681  CAPSTONE SEMINAR  SPRING 1996

WHEN/WHERE:  4:30-5:30pm MW in Room 126 of the Science Center; University of Charleston

INSTRUCTORS:  B. Lee Lindner, Pam Morris, Tony Artuso, Nicholas Lawryk, June Mirecki, and Eberhard Voit

OFFICE:  Room 143, Science Center; University of Charleston (Lindner) and Room 224, Basic Science Building, MUSC (Morris)

PHONE:  953-8288 (Office; Lindner) 792-8259 (Office, Morris)

EMAIL:  Lindnerb@cofc.edu; Pam_Morris@smtpgw.musc.edu

OFFICE HOURS:  1:00-2:00pm MWF; Other times by appointment.

SITE:  Changes every year. For 1996: Koppers Co. Inc. This site is an abandoned wood-treating facility located in North Charleston, and is now a superfund site. Principal contaminants on-site include lead and arsenic in soils and non-aqueous liquids in ground water. Because this site is located in an urban area, there are potential risks and impacts to the community of North Charleston and to the natural resources of the Ashley and Cooper Rivers.

GRADING POLICY:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status Reports</td>
<td>25% of Total</td>
</tr>
<tr>
<td>Paper</td>
<td>25% of Total</td>
</tr>
<tr>
<td>Poster</td>
<td>25% of Total</td>
</tr>
<tr>
<td>Presentation</td>
<td>25% of Total</td>
</tr>
</tbody>
</table>

ATTENDANCE POLICY: Students are required to attend class. During the first two weeks, lectures and a site visit are scheduled. During the remainder of the semester, students are expected to meet with an appropriate faculty member weekly to develop and execute the proposed project.

CATALOG DESCRIPTION: The capstone seminar provides an opportunity for students to synthesize concepts in scientific, policy and risk assessment disciplines, and to apply these concepts to solve a problem presented by the faculty. Students will define a semester-long project, which culminates in oral and written presentations.

PREREQUISITES: EVSS 680.

GOALS/OBJECTIVES:

1. Apply knowledge obtained in earlier coursework.
2. Provide experience in written and oral presentations.
3. Develop independent thinking and analysis.
4. Prepare students for entry into the job market.

APPROXIMATE TIMELINE:

- Weeks 1 and 2: Introductory Lectures and Site Visits.
- Weeks 3 and 4: Students review material and propose a project.
- Weeks 5 to 12: Students provide weekly status reports.
- Weeks 13 to 14: Oral and poster presentations.
UNIVERSITY OF CHARLESTON, S.C.
Faculty Committee on Graduate and Continuing Education
New Graduate Course Proposal

1. Department: Public Administration

2. Course number and title: PUBA 650 The Essential Elements of Non Profit Administration

3. Course will be offered first: Fall 1995

4. Catalog description (please limit to 50 words): Orients students to the history, values and issues of the third sector in American society; and to the leadership and management challenges peculiar to the administration of nonprofit organizations. The latter include board relations; fundraising; program advocacy and lobbying; legal frameworks; human resource management in volunteer settings; financial management; and grants administration.

5. Prerequisites (or other restrictions): Graduate standing. (Completion of at least one semester in MPA program preferred.)

6. Rationale/justification for course (consider the following issues): (Note: If more space is needed, attach additional sheets to this form.)
   (a) What are the goals and objectives of the course? At least half of the students in the MPA program are currently in nonprofit organization careers, or enter such careers upon graduation. While there are important common ingredients with administration in the traditional public sector, some of the most crucial management and leadership tasks in nonprofit organizations are unique. Current courses offer no preparation for meeting these unique challenges confronted in the nonprofit sector.
   (b) How does this course support the mission statement of the department and the organizing principles of the graduate program? At present, PUBA has a Grants Administration (PUBA 724) course which has too narrow a focus and is to be dropped from the curriculum. This course will expand that course by examining in detail the role of nonprofit organizations in the United States.

7. Are other Departments affected by this course? (Please attach letters of support from the chairs of each department indicating that the Department has discussed the proposal and supports it.)
   NO

8. Is this course part of joint program? X Yes _No If "Yes", what institution? U.S.C._
   Will the other institution use the same course number and title? _Yes _No If "No" what will be the course number and title at the other school? curriculums are separate


OVER
10. (a) Address potential enrollment pattern shifts in the department or university-wide as it relates to
the offering of this course: Course is an elective course and will expand and incorporate
an existing course (Grants Administration PUBA 724)

(b) Address potential shifts in staffing of the departments as it relates to the offering if this course.
(Note: If more space is needed, attach additional sheets to this form.)

None. Staff member in Institute for Public Affairs and Policy Studies will teach the course.

11. Requirements for additional resources made necessary by this course:

(a) Staff None

(b) Budget None

(c) Library None

(Note: Course requiring additional resources will need special justification.)

12. Attach course syllabus, reading lists, or any additional documentation that can help the committee evaluate this proposal (a syllabus is mandatory).

REVIEW / APPROVAL PROCESS

13. Signature of Graduate Program Director: [Signature] Date submitted: 4/10/95

14. Signature of Department Chair: [Signature] Date approved: 5/16/91

15. Signature of School's Dean: [Signature] Date approved: 5/16/91

16. Signature of Budget Director: [Signature] Date reviewed: 4/20/95

17. Signature of Chair of Faculty Committee on Graduate and Continuing Education: [Signature] Date approved: 10/4/95

18. Signature of Chair of Graduate Council: Date approved:

19. Signature of Faculty Senate Secretary: Date approved:

Completed forms should be sent by the Graduate Studies Office to the following:

1. Registrar (for entering course in SIS course inventory)
2. Department Chair
3. Graduate Program Director
4. Business Affairs Office (for establishing course fee structure in SIS)
5. Academic Affairs Office

This form was last revised November 16, 1994 and replaces all others.
PUBA 502: THE ESSENTIAL ELEMENTS
OF NONPROFIT ADMINISTRATION

INSTRUCTOR:
Edgar L. Barnett

TIME AND PLACE:
Wednesday: 7pm - 9:45pm
ECTR Rm 112

COURSE DESCRIPTION:

This is an elective offered to those MPA students interested in pursuing a career in the nonprofit field, or those interested in learning about the responsibilities and challenges peculiar to nonprofit leadership and management. The course will be a survey of all of the topics that are considered most important and unique to those involved in the nonprofit environment. Key among those topics are the role of philanthropy and the third sector in American society; relations between boards of directors and executive management; resource development and fundraising; program advocacy, promotion, lobbying, and marketing; the legal framework of nonprofit organizations; and human resource management in a volunteer setting. At least two class sessions will be devoted to grant proposal development and writing.

COURSE TEXTS:


Other Selected Readings on specific topics. (See attached listing of available sources at C of C Library, plus two new journal holdings: "Nonprofit and Voluntary Sector Quarterly" and "Nonprofit Management and Leadership").

MODE OF INSTRUCTION:

Instruction will be primarily lecture. Since this is a course on a topic area not addressed in any other coursework, an added degree of non-passive learning will be imposed. This will include some case analysis, and more extensive library research and class presentation in order to become intimately familiar with available sources on the subject.

COURSE REQUIREMENTS:

In-class presentations / contributions: 20%
Research Papers: 40%
Mid-Term and Final Exams: 40%
## CLASS SCHEDULE
(TENTATIVE)

<table>
<thead>
<tr>
<th>SESSION</th>
<th>DATE</th>
<th>STUDY TOPIC AND ASSIGNMENTS</th>
</tr>
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<tbody>
<tr>
<td>I.</td>
<td></td>
<td><strong>History / Role of the 3rd Sector in American Society</strong></td>
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<tr>
<td>#1</td>
<td>Aug 24</td>
<td>Introduction, Overview of the Field of Study</td>
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<tr>
<td>#2</td>
<td>Aug 31</td>
<td>History of Philanthropy and the Nonprofit Sector</td>
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<td>#3</td>
<td>Sep  7</td>
<td>Philosophical, Ethical and Value Issues.</td>
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<tr>
<td>II.</td>
<td></td>
<td><strong>Program Development / Advocacy</strong></td>
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<tr>
<td>#4</td>
<td>Sep 14</td>
<td>Entrepreneurship, Marketing, Promotion, Lobbying</td>
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<tr>
<td>#5</td>
<td>Sep 21</td>
<td>Public Relations, Public Education, Community Leadership</td>
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<tr>
<td>#6</td>
<td>Sep 28</td>
<td>Resource Development / Fund Raising</td>
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<tr>
<td>#7</td>
<td>Oct  5</td>
<td>Planning and Policy Formulation</td>
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<tr>
<td>#8</td>
<td>Oct 12</td>
<td>Elements of Successful Grant Proposals / Writing</td>
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<tr>
<td>#9</td>
<td>Oct 19</td>
<td>Analysis of Student Grant Proposals</td>
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<tr>
<td>III.</td>
<td></td>
<td><strong>Governing, Leading, Managing Nonprofit Organizations</strong></td>
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<tr>
<td>#10</td>
<td>Oct 26</td>
<td>Governing Boards' Operations</td>
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<tr>
<td>#11</td>
<td>Nov  2</td>
<td>Executive Leadership and Management</td>
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<td>#12</td>
<td>Nov  9</td>
<td>Legal provisions, Tax Status, Financial Mgmt, Evaluation</td>
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<td>#13</td>
<td>Nov 16</td>
<td>Human Resource / Volunteer Management</td>
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<td>#14</td>
<td>Nov 23</td>
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<td>#15</td>
<td>Nov 30</td>
<td>Evaluation, Accountability, Course Summation</td>
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<td>#15</td>
<td>Dec  7</td>
<td>Final Exam</td>
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