# PROPOSAL SUMMARY AND ROUTING FORM

**Proposal Title: BIOL490: Research Design and Methods**

Initiating Unit or Individual: Dr. Clifton Franklund  
Contact Person's Name: Dr. Clifton Franklund  
e-mail: franklc@ferris.edu  
phone: 591-2552  
Date or Term of Proposal Implementation: Fall 2012

- [ ] Group I - A – New degree/major or major, redirection of a current offering, or elimination of a degree, major or minor
- [ ] Group I - B – New minors or concentrations
- [ ] Group II - A – Minor curriculum clean-up and course changes
- [x] Group II - B – New Course
- [ ] Group III - Certificates
- [ ] Group IV – Off-Campus Programs

<table>
<thead>
<tr>
<th>Group/Individual</th>
<th>Signature</th>
<th>Date</th>
<th>Vote/Action *</th>
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<tbody>
<tr>
<td>Program or Academic Unit Faculty</td>
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<td>Department Faculty</td>
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<td>2/22/12</td>
<td>Support</td>
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<td>Department Head</td>
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<td>College Curriculum Committee</td>
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<td>3/16/12</td>
<td>Support</td>
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<td>Dean</td>
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<td>University Curriculum Committee</td>
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<td>Academic Affairs</td>
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* Support with Concerns or Not Support must include a list of specific concerns. Votes must be shown for faculty groups. Administrators check appropriate action taken.

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To be completed by Academic Affairs

<table>
<thead>
<tr>
<th>President (Date Approved)</th>
<th>Board of Trustees (Date Approved)</th>
<th>President's Council (Date Approved)</th>
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VPAA  
MAR 12 2012  
PROVOST
1. **Proposal Summary**
   (Summary is generally less than one page. Briefly: state what is proposed with a summary of rationale and highlights. Additional rationale may be attached.)

   **Course summary** – This course is designed as an upper-division elective class for majors in the biological sciences. The material will emphasize the practical implementation of the scientific method through experimental design and data analysis. All levels of biological research (ecology, organismal biology, cell biology, molecular biology, and biochemistry) will be addressed. This class was designed to address a perceived weakness in our graduates with respect to experimental design and the application of statistics to biological problems. Although statistics will be a major component of this course, their correct and accurate implementation (rather than their derivation) will be emphasized. It is not meant to replace MATH 251. The course will be offered as an upper division elective that may be used to complete the requirements for degrees in our programs. The computer lab nature of this course will allow a great deal of flexibility for advanced students to move at their own pace and to complete independent research projects as a part of their course grade. These projects may eventually become part of a programmatic portfolio to document (assess) our programmatic outcomes.

2. **Summary of All Course Action Required**
   
   a. Newly Created Courses to FSU:
      
      | Prefix | Number | Title                        |
      |--------|--------|------------------------------|
      | BIOL   | 490    | Research Design and Methods  |

   b. Courses to be Deleted From FSU Catalog:
      
      | Prefix | Number | Title |
      |--------|--------|-------|

   c. Existing Course(s) to be Modified:
      
      | Prefix | Number | Title |
      |--------|--------|-------|

   d. Addition of existing FSU courses to program
      
      | Prefix | Number | Title |
      |--------|--------|-------|

   e. Removal of existing FSU courses from program
      
      | Prefix | Number | Title |
      |--------|--------|-------|

3. **Summary of All Consultations**

<table>
<thead>
<tr>
<th>Form Sent (B or C)</th>
<th>Date Sent</th>
<th>Responding Dept.</th>
<th>Date Received &amp; by Whom</th>
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<tbody>
<tr>
<td>C</td>
<td></td>
<td>Library</td>
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</tbody>
</table>

4. **Will External Accreditation be Sought?** (For new programs or certificates only)

   [ ] Yes  [ ] No

   If yes, name the organization involved with accreditation for this program.

5. **Program Checksheets affected by this proposal.**

   N/A
FLITE SERVICES CONSULTATION FORM

To be completed by the liaison librarian and approved by the Dean of FLITE. All returned forms should be included in the proposal. FLITE must respond within 20 calendar days of receipt of this form to insure that the form is included in the final proposal.

FAILURE TO RESPOND IS CONSIDERED AS SUPPORT OF THE CHANGE.

RE: Proposal Title: New Course: Research Design and Methods

Projected number of students per year affected by proposed change: 30

Initiator(s): Dr. Clifton Franklund

Proposal Contact: Dr. Clifton Franklund Date Sent: 

Department: Biological Sciences Campus Address: ASC 2004

(Please print)

Liaison Librarian Signature: __________________________ Date: __________

Dean of FLITE Signature: __________________________ Date Returned: __________

Based upon our review on __________ (date), FLITE concludes that:

☐ Library resources to support the proposed curriculum change are currently available.

☐ Additional Library resources are needed but can be obtained from current funds.

☐ Support, but significant additional Library funds/resources are required in the amount of $__________.

☐ Does not support the proposal for reasons listed below.

Comment regarding the impact this proposal will have on library resources, collection development, programs, etc. Use additional pages if necessary.
NEW COURSE INFORMATION FORM
See Sample – Limit to Two Pages Please

Course Identification: Research Design and Methods

Prefix:   Number  Title
BIOL     490    Research Design and Methods

Course Description:
Overview of the proper implementation of the scientific method including formation of a research hypothesis, careful experimental design, and appropriate statistical analysis of empirical data. An emphasis is placed on experimental design and the correct use and interpretation of statistical tests rather than the underlying mathematical theory.

Course Outcomes and Assessment Plan:
Biology program learning outcomes addressed:

1. Cell Biology - Graduates will recognize, analyze, and explain the physiological properties, environmental interactions, life cycle, division, and death of cells at both a microscopic and molecular level.

2. Molecular Genetics - Graduates will recognize, analyze, and explain the structure, flow, regulation, and manipulation of genetic information encoded in the DNA, RNA, and proteins of biological systems.

3. Organismal Biology - Graduates will recognize, analyze, and explain the diversity living organisms with regard to how they are identified and classified within groups, how organisms are structured, and how they function.

4. Ecology and Evolution - Graduates will recall, apply, and explain the fundamental tenets of ecology and evolution as they pertain to the interactions of individuals or populations with other organisms and their environment at the

5. Scientific Literature - Graduates will evaluate, analyze, and synthesize information from the scientific literature and communicate their findings in written and/or oral forms.

6. Scientific Method - Graduates will formulate hypotheses, perform careful observations, analyze data, make inferences, and draw conclusions that either support or disprove their initial premise.

7. Biological Techniques - Graduates will safely and correctly follow protocols to collect and record experimental data while performing laboratory and field techniques appropriate for their discipline.

Depending upon the topic for the project selected, one of the four content areas will need to be mastered to complete this course (BS in Biology outcomes 1-4).
BS in Biology outcome 5, scientific literature use, will be reinforced through a research project that the students will independently design and perform as a part of this course.
BS in Biology outcomes 6 and 7 will be emphasized and mastered. They are scientific method and biological techniques, respectively.

Course learning objectives: By the conclusion of this course, students will be able to:
1) Design biological experiments using proper controls and appropriate sampling methodologies.
2) Recognize the number and type of variables in biological experiments and select statistical tests appropriate for their analysis.
3) Correctly perform and interpret the results of statistical tests on biological data.
4) Accurately report, both orally and in written form, the results of an independent research project that uses the scientific method and appropriate statistical analyses.
Course assessment: Course assessments will be worth a total of 600 points. The grade breakpoints are calculated using the standard university.

- There will be ten, online problem sets. These will consist of hypothetical research situations wherein the students will need to evaluate the validity of an experimental design, select an appropriate statistical test, analyze hypothetical biological data, and/or interpret the results of statistical analyses.
- Two midterm exams will be given to determine the class’ progress in attaining the course learning objectives.
- A comprehensive final exam will be given to assess the retention of concepts and practices presented over the semester and used in the problem sets.
- Each student will select a biological hypothesis to test during the semester. They will design an experiment capable of addressing their hypotheses, collect data, perform appropriate statistics, and interpret their findings. These projects will culminate in the generation of a research article that will be “published” in a class journal. These projects will be evaluated as an initial and final draft by both the course instructor and student peers.

Proposed Course Outline including Time Allocation:

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Course Topic List</th>
<th>Readings</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Introduction to biostatistics</strong></td>
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<td>01.</td>
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<td>Why do biologists need statistics?</td>
<td>Chapter 1</td>
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<td>02.</td>
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<td>Basic experimental design</td>
<td>Chapter 2</td>
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<td>03.</td>
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<td>Variables, populations, and samples</td>
<td>Chapter 3</td>
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<td><strong>Characteristics of biological samples</strong></td>
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<td>04.</td>
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<td>Describing samples</td>
<td>Chapter 4</td>
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<td>05.</td>
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<td>Binomial distributions</td>
<td>Chapter 5</td>
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<td>06.</td>
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<td>Poisson distributions</td>
<td>Chapter 5</td>
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<td>07.</td>
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<td>Normal distributions</td>
<td>Chapter 5</td>
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<td><strong>When you only have a single sample</strong></td>
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<td>08.</td>
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<td>Model-testing with Chi squared</td>
<td>Chapter 6</td>
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<td>09.</td>
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<td>Reliability of estimates</td>
<td>Chapter 7</td>
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<td>10.</td>
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<td>Chi squared test of association</td>
<td>Chapter 8</td>
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<td>11.</td>
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<td>Pearson product-moment correlation</td>
<td>Chapter 8</td>
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<td>12.</td>
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<td>Spearman rank correlation</td>
<td>Chapter 8</td>
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<td><strong>When you have two independent samples</strong></td>
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<td>13.</td>
<td></td>
<td>Using nominal data</td>
<td>Chapter 9</td>
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<tr>
<td>14.</td>
<td></td>
<td>Using ordinal data</td>
<td>Chapter 9</td>
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<td>15.</td>
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<td>Using continuous data the T-tests</td>
<td>Chapter 9</td>
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<td><strong>When you have two interrelated samples</strong></td>
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<td>16.</td>
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<td>Using non-parametric data</td>
<td>Chapter 10</td>
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<td>17.</td>
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<td>Using continuous data</td>
<td>Chapter 10</td>
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<td><strong>When you have three or more samples</strong></td>
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<td>18.</td>
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<td>Using Chi squared and Kruskal-Wallis</td>
<td>Chapter 11</td>
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<td>19.</td>
<td></td>
<td>Introduction to ANOVA</td>
<td>Chapter 11</td>
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Time allocation:

One class period will be devoted to each topic in the schedule above. The materials will be presented online with interactive FerrisConnect resources. The first 15 to 20 minutes of each period will be used as a pre-activity lecture to address the main points of each exercise and to address questions. The remainder of the time will be spent with students working independently on working problem sets and taking online assessments. Time will also be allocated for the students to design, perform experiments to test a hypothesis of their choosing and appropriately analyze their results. The product of this research will be posted online in the learning management system.

Due to the nature of the individualized projects involved in this course, a cap size of 15 is requested. Additional students will limit the pedagogical approaches that would be practical in this course.
CREATE NEW COURSE
Course Data Entry Form

FORM F

I. ACTION TO BE TAKEN: CREATE A NEW COURSE

Notes
1. Complete each item in Section I and Section II.
2. If this course is to be used as a prerequisite for other university courses, Form Fs that reflect the prerequisite change must be submitted for those courses as well.

Term Effective (6 digit code only): 201208 Examples: 200801(Spring), 200805(Summer), 200808(Fall)
Note: The first four digits indicate year, the next two digits indicate month in which term begins.

II. PROPOSED FOR NEW COURSE: Complete all sections a through r. See manual for clarification.

a. Course Prefix

b. Number

Biol

490

Lecture 3 Lab 0 Independent Study – Check (x) □
Practicum: □ Seminar: □

d. Course Title: Research Design and Methods (Limit to 30 characters/spaces.)

e. College Code □ A.S. □ f. Department Code □ BIOL
Credit Hours: Check (x) type and enter maximum and minimum hours in boxes.

g. Type: □ Variable □ Fixed h. Minimum Credit Hours 3 i. Maximum Credit Hours 3

j. May Be Repeated for Added Credit: Check (x) Yes □ No

k. Levels: Check (x) □ Undergraduate □ Graduate □ Professional

l. Grade Method: Check (x) □ Normal Grading □ Credit/No Credit only (Pass/Fail)

m. Does proposed new course replace an equivalent course? Check (x) □ Yes □ No

n. Equivalent course: Prefix □ Number □ See instructions on Replacement courses.

o. CATALOG DESCRIPTION – Limit to 75 words – PLEASE BE CONCISE.
Overview of the proper implementation of the scientific method including formation of a research hypothesis, careful experimental design, and appropriate statistical analysis of empirical data. An emphasis is placed on experimental design and the correct use and interpretation of statistical tests rather than the underlying mathematical theory.

p. Term(s) Offered: □ F, Sp (See instructions for listing.) q. Max. Section Enrollment: □ 10

r. Prerequisites/Co-requisites/Restrictions: (If none, leave blank.) Limited to 100 spaces. MATH 251.

UCC Chair Signature/Date: ________________________ 1/1

Academic Affairs Approval Signature/Date: ________________________ 3/1/11

To be completed by Academic Affairs Office: - Standard & Measures Coding and General Education Code
□ Basic Skill (BS) □ General Education (GE) □ Occupational Education (OC) □ G.E. Codes

Office of the Registrar use ONLY

Date Rec'd: ___ Date Completed: ___ Entered: SCACRSE _ SCADTL _ SCARRES _ SCAPREQ _
March 12, 2012

TO: Don Flickinger, Associate Provost of Academic Affairs  
Meral Topcu, Chair, College Curriculum Committee

FR: J. Andy Karafa, Interim Dean

RE: BIOL 490 – Research Design and Methods

Enclosed for your information is the proposal for BIOL 490 – Research Design and Methods which I have approved to be offered Fall 2012.

Thank you.

Cc: Joe Lipar  
   Amy Truong