

NON-GENERAL EDUCATION - CURRICULUM PROPOSAL  
LEARNER RESOURCE FORM REQUIRED

SCC #04-05- 1112

Deadlines

ROWAN UNIVERSITY, October 8, 2004 to be implemented Fall 2005 - February 11, 2005 to be implemented Spring 2005

PROPOSAL TITLE: Biometry

Sponsor(s): Dexter Whittinghill / Christopher Lucke E-Mail: whittinghill, luche Ext: 3879, 3877  
Courtney Richmond / Michael Grace E-Mail: richmond, grace Ext: 3555, 3579

DEPARTMENT: Mathematics

COLLEGE: L.A. & S.

If Liberal Arts & Sciences CHECK:  History/Humanities  Math/Sciences  Social/Behavioral Sciences

UNDERGRADUATE  GRADUATE

THE ATTACHED NON-GEN-ED PROPOSAL IS BEST DESCRIBED BY THE ITEM(S) CHECKED

- New non-gen-ed course
- Short-term non-gen-ed course
- Minor curricular changes (fewer than three) to
- Existing non-gen-ed course
- Non-gen-ed degree requirements
- Major
- Minor, specialization, concentration, track, certificate program

THE FOLLOWING SIGNATURES REPRESENT APPROVAL

Department Chair: Ronald J. Golan Date: 9/30/04  
 Department Curriculum Chair: Arvid Hensen Date: 10/1/04  
 Academic Dean: [Signature] Date: 10/7/04

COLLEGE CURRICULUM COMMITTEE

OPEN HEARING Date: 1/11/05 Approved  Not Approved

COLLEGE CURRICULUM CHAIR: [Signature]

Senate Curriculum Chair Signature: [Signature] Date: Senate Announcement: 12/20/04

Comments: \_\_\_\_\_

EXECUTIVE VICE PRESIDENT/PROVOST Signature: [Signature] Date: 2/1/05

Approved  Not Approved

Date: 2/11/05 REGISTRAR Course Description Received & Approved - Regis Taxonomy & Course # 1702280

Registrar Signature: [Signature]

NOTIFICATION FORWARD

- SCC Chair  Academic Dean  Department Chair  Registrar  IR  CAP
- VP Student Affairs  Others

DB/B

## New Course Proposal BIOMETRY

### 1. DETAILS

- a. **Course title:** Biometry
- b. **Sponsors:** Michael Grove, Biological Sciences  
Christopher Lacke, Mathematics  
Courtney Richmond, Biological Sciences  
Dexter Whittinghill, Mathematics
- c. **Credit hours:** 4 s.h.
- d. **Course level:** Undergraduate sophomore (1702-200-level HEGIS number is recommended (1702.280))
- e. **Prerequisites:** Calculus I (1701.130) ~~with a grade of C- or better.~~ *Cliff*  
*Bio I (1701.100) and Bio II (1701.101)*
- f. **Suggested time and scale of implementation:** Beginning with Fall 2005, this course will be offered every fall and spring semester, one section each semester, unless future demand calls for a third section. The course will meet two times a week for a 1 hour and 15 minute class and once per week for a 2 hour and 45 minute laboratory session.

### 2. CURRICULAR EFFECT

**Offerings:** No Mathematics course will be dropped from the books as a result of this proposal. Several sections of Statistics I are offered each semester, and at most one section of Statistics I would be lost, being replaced by the one section of the Biometry course.

Currently some Biology majors take Statistics I (1702.260), about 10% of those taking Statistics I (29 of 278) in spring 2004. We anticipate that most of these Biology majors will be taking Biometry instead of Statistics I, because the Biological Sciences Department will begin a policy of strongly recommending the course (currently Biology majors have three choices, only one of which is Statistics I). While we expect to fill one section of Biometry each semester (24 students), the number of Statistics I sections offered will not likely change (usually 35 students each), as the Biology majors will come out of different sections of Statistics I. Although a few of the Biology majors taking Biometry will represent those who previously would not have elected to take Statistics I, there will also be some Biology majors who are not able to schedule Biometry.

**Adequacy of the present staff, resources, space needs, etc.:** This course will be team-taught by a member of the Mathematics Department and a member of the Biological Sciences Department. The Mathematics instructor would teach the classes and attend the lab (over 5 contact hours), and the Biological Sciences instructor would direct the lab. Two faculty in the Mathematics Department who have formal training in statistics, and who regularly teach statistics, are supportive of Biometry and willing to teach it. Two faculty in the Biological Sciences Department that have experience with statistical analyses are supportive of Biometry and willing to direct the labs.

This course represents 4 credit hours of preparation for the Mathematics instructor, compared to 3 for Statistics I, because s/he would be involved with the lab. This will be a different course than Statistics I in content because of its concentration on biological topics. Therefore the Biological Sciences instructor will be involved in determining the lecture content, as well as the preparation of the weekly 2.75 hour lab, and directing the lab (2 contact hours). In the first year, the Mathematics Department is willing to assign 4 credit hours for the lecturer, and the Biological Sciences Department is willing to assign 2 credit hours to the laboratory instructor. Separate letters, showing that the added cost will be minimal, are attached. After the first year, to fairly distribute the 5 allowable credit hours among the two faculty, the Mathematics Department and the Biological Sciences Department will be asked to give, by semester, alternately 3-and-2 hours and 4-and-1 hours, respectively, to the Mathematics Instructor and the Biological Sciences instructor, starting with 3-and-2.

This course will incorporate statistical analyses, computer-based simulations and demonstrations into all class times. For this reason, the lectures would need to be offered in a smart classroom such as Science 254 or Robinson 324. (There are many of these on campus with more appearing each semester.) The course is designed with a lab component in an extended session each week that will require every pair of students to collect and analyze data. Therefore the laboratory meetings need to be scheduled in Science 334, a laboratory with adequate computing facilities. (This room fits the needs exactly and would likely be available.)

**Recommended Library Resources:** It is anticipated that this new course will not require additional library resources to implement, beyond the resources we currently possess. The *Library Resources Form* is attached.

## RATIONALE

This course enhances the offerings for the Mathematics and Biological Sciences departments. For the Mathematics Department, this course represents an exploration of more topics than are traditionally covered in the Statistics I course. The addition of a laboratory creates both added time to cover the additional, necessary topics, and more importantly, an opportunity to teach in a computer laboratory environment where students can learn statistics in hands-on experiments coupled with data manipulation and analysis. The opportunity for students to be engaged in statistical applications within the biological context, with data collected 'on the spot,' makes this a qualitatively different course than Statistics I. Biometry will have laboratory periods in which students learn the basic principles of experimentation, run short experiments, collect data, and conduct the appropriate statistical analyses. This extends the concepts that will be learned in a classroom setting to a learning environment that encourages hands-on learning, critical thinking, and the direct application of new knowledge.

From the perspective of the Biological Sciences Department, this course will address several needs that have been identified for their majors: namely, statistical literacy, application of statistical methods to real-world biological experimentation, and the interpretation and presentation of statistical results (all enhanced by the laboratory component). Many biological careers today require at least a baseline level of familiarity with statistics. With the facilities now available in Science Hall, many biology students are now engaged in independent research projects that require statistical literacy. As Rowan moves increasingly in this direction, it will be even more imperative that our students are fluent in the manipulation, analysis, and presentation of biological data. We anticipate that the design of this class, coupled with the need for experimental and statistical skills in today's scientific workplace, will motivate and interest Rowan students.

Students taking this course will use the JMP software package. This software is available in a student version for an affordable price. Upon completion of the course, students will have experience in conducting statistical analyses with this software, and they will own the software, which will be useful in later science courses at Rowan.

## ESSENCE OF THE COURSE

- a. **Objectives of the course in relation to student outcomes:** This course will serve as an introduction to statistical methods. We anticipate that most Biology majors will take this course, so while the subject matter is statistics, we will draw from biologically relevant examples and data sets. Students will be exposed to more topics than in a traditional Statistics I course, which at 3 credit hours does not have the time to cover many important statistical techniques for the biology student. Upon completion of this course, the

students will have learned, in addition to statistics, how to use a powerful statistical software package for their data analyses in future courses.

**b. Topical Outline / Content:** The statistical topics we will cover in this course are listed below.

Types of data and graphing techniques (bar graphs, pie charts, etc.)  
Distributions and histograms  
Measures of center and variability  
The normal distribution  
Scatterplots  
Correlation  
Least squares line and descriptive simple linear regression  
Basic probability (complementary events and the additive rule)  
Conditional probability and independence  
Random sampling  
Sampling distributions  
The central limit theorem  
Confidence intervals for means (for known and unknown s.d.)  
Hypothesis tests for means (for known and unknown s.d.)  
Type I and II errors  
Tests for normality  
Confidence intervals and hypothesis tests for population proportions  
1-sample, 2-sample, and paired t-tests  
Chi-square tests (including goodness of fit, independence and homogeneity)  
Inference in simple linear regression  
One-way ANOVA  
Nonparametric tests

*Examples of textbooks suitable for this course:*

Finney, D.J., 1980. *Statistics for Biologists*, Chapman & Hall

Quinn, G.P. & Keough, M.J., 2002. *Experimental Design and Data Analysis for Biologists*, Cambridge University Press

Samuels, ML and Witmer, JA. 2003. *Statistics for the Life Sciences*, Third Edition. Pearson Education, Inc.

Watts, T.A. 1997. *Introductory Statistics for Biology Students*, 2nd edition, Chapman & Hall/CRC.

**c. Evaluation of students and grading procedures:** Students will be evaluated in this course through the use of written laboratory reports or projects, tests, quizzes, and class participation.

- d. Course evaluation:** The Mathematics Department periodically reviews each course to assess its success in meeting the stated goals and objectives. The Biological Sciences Department also routinely reviews each of its course offerings to assess their success in meeting stated goals and objectives.

## RESULTS OF CONSULTATIONS

- a. Letters of consultation:** the members of the Biological Sciences Department have been solicited for comments on the course proposal, and they have confirmed that this course would meet the standards of their department. A letter of consultation from the department chair is attached.
- b. Implicit consultation:** the members of the Mathematics Department have been consulted by first presenting this proposal to their curriculum committee. The department Curriculum Committee chair and the department Chair have signed the *Process A* form.
- c. Letters of consultation regarding the extra instructor-credits in the first year:** A letter from the chair of Biological Sciences, expressing that department's willingness to commit 4 credits over the first year for the lab instructor, is also attached. A letter from the chair of Mathematics, expressing that department's willingness to commit 8 credits over the first year for the instructor, is also attached.

We do not anticipate any impact of this course on other departments at Rowan.

## CATALOG DESCRIPTION

**1702.280 (recommended HEGIS #)**

**4.0 s.h.**

*(Prerequisites: Calculus I (1701.130), with a grade of C or higher; Biology I (0401.100) and Biology II (0401.101))*

### **Biometry**

This laboratory course considers elementary data analysis, probability and sampling distributions. It uses the normal and  $t$ -distributions to introduce estimation and hypotheses testing. It includes descriptive techniques and inference for simple linear regression and correlation. Analyses of variance, nonparametric tests and chi-square tests are covered in this course. Emphasis is placed on experimentation and the application of statistical methods to the biological sciences. Computer software is used regularly in data manipulation, statistical analyses, and formal presentation of results.

**(Note:** we are recommending a Mathematics/Statistics HEGIS number)

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Rowan University  
**CURRICULUM PROPOSAL  
 LIBRARY RESOURCE FORM**

The purpose of this form is to provide a channel of communication between the library and faculty changing and designing new courses/programs. The information will be used to assess the resources available in the library, and to identify resources the library should acquire to support the course/program. The information will also provide rationale for institutional support for library acquisitions.

This form should be completed in a coordinated effort between the course sponsor(s) and the academic department liaison librarian. **THIS FORM MUST BE COMPLETED FOR ALL CURRICULUM PROPOSALS.**

- The sponsor(s) complete parts A & B  
 If assistance is required to complete parts A & B, please notify the liaison librarian.
- Forward this form to the librarian who will complete parts C, D & E

*This form must be completed and attached to the original curriculum proposal before being approved by the Senate Curriculum Committee*

A. College L.A. & S. Department Mathematics  
 Proposed by Dexter Whittinghill, et. al Date September 24, 2004  
 Course Title Biometry (critical in Math for Biological Sciences)  
 Anticipated Date for Course/Program Offering: fall 2005, and all semesters thereafter

B. List specific resources that should be acquired to support this course.

C. Describe the resources available in the library to support this course/program, including reference, monographic, electronic databases, audio-visual materials, etc. A summary statement is sufficient.

D. List key periodicals available in the library to support this course/program.

E. Librarian comments and recommendations:



Name: LIBRARIAN LIAISON \_\_\_\_\_ Librarian Signature: \_\_\_\_\_

**Rowan University**  
Campbell Library

Library Resources Form

Department/School: College of Liberal Arts & Sciences/ Dept. of Mathematics

Proposed by: Drs. Grove, Lacke, Richmond, and Whittinghill

Program Title: Biometry (offered by Mathematics Dept. for Biological Sciences)

Anticipated Date for Course/Program Offering: Fall 2005

**Resources that should be acquired**

No additional resources are needed at this time.

**Resources available in Campbell Library**

The library has 7,279 book and multimedia resources on mathematics (Books: 7,123; Reference Materials: 112; Videos: 44). In addition, the library has over 350 titles in statistics, and over 50 titles in Biometrics. With vendor approval plans in place for both education and university presses, the library captures new imprints across all areas of mathematics.

**List key periodical resources**

Campbell Library is fortunate to have access to online journal databases in a large number of academic subjects, including mathematics, the physical and natural sciences, and the social sciences. Access to worldwide, regional, and local newspapers is also provided, including alternative press publications. The library subscribes to Biometrics (journal) and the Journal of Agricultural, Biological, and Environmental Statistics.

Of particular significance is the Math-Science database (MathSci +), produced by the American Mathematical Association. This online database contains information from the printed publications of Mathematical Reviews and Current Mathematical Publications. MathSci + provides comprehensive coverage of international research in mathematics and mathematically related research in statistics, computer science, physics, operations research, engineering, biology, and related disciplines. Almost 2,000 journals are represented.

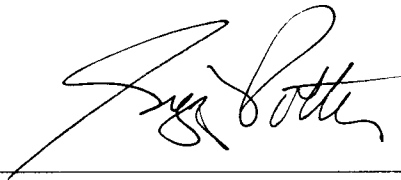
In addition, the library subscribes to the Elsevier Science Direct database. Included in this comprehensive online journal database are 128 titles in mathematics, computer

science, logic, operations research, computer-aided design, and statistics, as well as key journals in biochemistry, genetics, and molecular biology.

Other important databases include the Biological and Agricultural Index and General Science Fulltext.

**Librarian remarks**

Given the library's current book holdings and online journal access, this course can be supported.

A handwritten signature in black ink, appearing to read "Greg Potter", is positioned above a horizontal line.

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Gregory C. Potter  
Library Liaison

9/30/04



*Biological Sciences*

June 2, 2004

Dr. Courtney Richmond  
Department of Biological Sciences  
Rowan University

Dear Courtney:

Members of my department and I have reviewed your proposal for the Biometry course, and we strongly endorse the proposal. The course content is unique, and it will be of unsurpassed value to biology students.

As you specify in the proposal, laboratory sessions will include mini-biological experiments and data collection that the students will analyze to present the results. This is a much needed tool for biology majors, and as we discussed in our department, we will be considering making Biometry a requirement for all our majors. Our new science facilities will be an ideal place to teach this course due to its lab period, so students can have as many computers as possible, as well as benches around the perimeter of the room, where experiments can be run.

The department also strongly supports the interdisciplinary teaching between Biology and Mathematics.

Please do not hesitate to contact me if I can be of further assistance.

Sincerely,

A handwritten signature in black ink, appearing to read "Patricia Mosto", written over a horizontal line.

Dr. Patricia Mosto  
Chair and Professor  
Biology Department  
Rowan University  
856-256-4834  
mosto@rowan.edu

cc: Dr. Dex Whittinghill, Department of Mathematics

October 4, 2004

Dr. Jay Harper, Dean CLAS  
Rowan University  
Glassboro, NJ 08028

Dear Jay,

This letter is to confirm that in the first year of the Biometry course, the Biological Sciences Department is willing to assign 2 credit hours to the laboratory instructor, for a total of 4 credits annually (teach the course 1 session in the Fall and one in the Spring). After the first year, to fairly distribute the 5 allowable credit hours among the two faculty, the Biological Sciences Department will give, by semester, alternately 2 hours and 1 hours, respectively in Fall and Spring.

In the first year, the biology instructor will be Dr. Courtney Richmond. In subsequent years, Dr. Richmond and Dr. Grove will alternately teach the laboratory section of the course.

For Fall 05, Spring 06, Dr. Richmond is scheduled to teach, assuming that she will have 6 credit-hours (3 per semester) of reallocated time through the new Re-assigned time program or SBR (Dr. Richmond has been extremely successful in securing SBR's since her arrival to Rowan), the following schedule:

Fall 05	Spring 06
Marine Biology (5)	General Biology: Environmental (5)
Invertebrate Zoology (5)	General Biology: Environmental (5)
Research (3)	Research (3)
	Lab/Field (1)
Total 13 (1 cr overload)	Total 14 (2 cr overload) 3 overload credits

If she teaches Biometry with one/two credits split

Fall 05	Spring 06
Marine Biology (5)	General Biology: Environmental (5)
Invertebrate Zoology (5)	Lab/Field (1)
Research (3)	Research (3)
Biometry (1)	Biometry (2)
Total 14 (1 credit overload)	Total 11 1 overload credit

If she teaches Biometry with 2 credits

Fall 05	Spring 06	
Marine Biology (5)	General Biology: Environmental (5)	
Invertebrate Zoology (5)	Lab/Field (1)	
Research (3)	Research (3)	
Biometry (2)	Biometry (2)	
Total 15 (2 cr overload)	Total 11	2 overload credits

For Courtney to teach Biometry in this reallocated time model will reduce the number of overload hours from 3 to either 2 or 1.

A similar model can be done if she does not have reallocated time for research (very unlikely scenario)

Fall 05	Spring 06	
Marine Biology (5)	General Biology: Environmental (5)	
Invertebrate Zoology (5)	General Biology: Environmental (5)	
Lab/Field (1)	Natural Resources (3)	
Total 11	Total 13	

If she teaches Biometry with one/two credits split

Fall 05	Spring 06	
Marine Biology (5)	General Biology: Environmental (5)	
Invertebrate Zoology (5)	General Biology: Environmental (5)	
Lab/Field (1)		
Biometry (1)	Biometry (2)	
Total 12	Total 12	

If she teaches Biometry with 2 credits

Fall 05	Spring 06	
Marine Biology (5)	General Biology: Environmental (5)	
Invertebrate Zoology (5)	General Biology: Environmental (5)	
Lab/Field (1)		
Biometry (2)	Biometry (2)	
Total 13 (1 cr overload)	Total 12	

For Courtney to teach Biometry in the non-reallocated model for 2 credits will only impact the department in one overload hour.

Given that the Department has voted to make Biometry mandatory when the new Biology Model (in preparation to be submitted to the College of LAS & the University Curriculum Committee next Spring) starts in Fall 06, we feel that we need to support the first year of a 2/2 for our faculty to have time to develop well planned laboratories to benefit our students in a field of high need and priority.

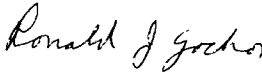
If you need further information, please do not hesitate to call me

Dr. Patricia Mosto  
Chair and Professor  
Department of Biological Sciences  
Rowan University



*Mathematics Department*

**TO:** Sponsors of Biometry course (M. Grove, C. Lacke, C. Richmond, and D. Whittinghill)

**FROM:** Ronald J. Czochoz, Chairman   
Mathematics Dept.

**DATE:** October 7, 2004

**RE:** Consultation on Proposal for new course entitled *Biometry*

For the first year that the above course is offered, the Mathematics Department will be able to support the teaching of this course for 4 credits per semester. This will be necessary for the first two times this team-taught course is taught. Subsequent years would be at the recommended rate of faculty compensation.

We plan to support the teaching of this course through adjunct or overload pay.