**FLORIDA ATLANTIC UNIVERSITY**

Graduate Programs—**NEW COURSE PROPOSAL**

<table>
<thead>
<tr>
<th>DEPARTMENT:</th>
<th>COLLEGE:</th>
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<tbody>
<tr>
<td>MATHEMATICAL SCIENCES</td>
<td>SCIENCE</td>
</tr>
</tbody>
</table>

**RECOMMENDED COURSE IDENTIFICATION:**

**PREFIX:** STA  
**COURSE NUMBER:** 6901  
**LAB CODE (L or C):**

*(TO OBTAIN A COURSE NUMBER, CONTACT BSHUMAN@FAU.EDU)*

**COMPLETE COURSE TITLE:** STATISTICAL COMPUTING

**EFFECTIVE DATE:** (First term course will be offered)

**CREDITS:** 3

**TEXTBOOK INFORMATION:**


**GRADING (SELECT ONLY ONE GRADING OPTION):**

- [X] REGULAR
- [ ] SATISFACTORY/UNSATISFACTORY

**COURSE DESCRIPTION, NO MORE THAN THREE LINES:**

Algorithms in statistical computing: random number generation, generating other distributions, random sampling and permutations. Matrix computations in linear models. Non-linear optimization with applications to statistical procedures. Other topics of current interest may be introduced if time allows.

**PREREQUISITES**:

STA 4443 or equivalent

**COREQUISITES**: NONE

**REGISTRATION CONTROLS (MAJOR, COLLEGE, LEVEL)**

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*PREREQUISITES, COREQUISITES AND REGISTRATION CONTROLS WILL BE ENFORCED FOR ALL COURSE SECTIONS.*

**MINIMUM QUALIFICATIONS NEEDED TO TEACH THIS COURSE:**

**PH.D. IN MATHEMATICS OR PH.D. IN STATISTICS**

Faculty contact, email and complete phone number:

Lianfen Qian  
qian@fau.edu  
297-2436

Please consult and list departments that might be affected by the new course and attach comments.

N/A

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Approved by:

Department Chair:  
[Signature]

College Curriculum Chair:  
[Signature]

College Dean:  
[Signature]

UGPC Chair:  
[Signature]

Graduate College Dean:  
[Signature]

UFS President:  
[Signature]

Provost:  
[Signature]

Date:  
4/9/13  
4/12/13  
9-11-13  
9-12-13

1. Syllabus must be attached; see guidelines for requirements:  

2. Review Provost Memorandum:  
[Definition of a Credit Hour](www.fau.edu/provost/files/Definition_Credit_Hour_Memo_2012.pdf)

3. Consent from affected departments (attach if necessary)

Email this form and syllabus to UGPC@fau.edu one week before the University Graduate Programs Committee meeting so that materials may be viewed on the UGPC website prior to the meeting.

FAUnewdocGrad—Revised September 2012
Syllabus

1. Course Name
   Statistical Computing
   Course Number: STA 6901
   Credit Hours: 3

2. Course prerequisites
   STA 4443 or equivalent

3. Instructor
   Lianfen Qian, Office SE 244
   Phone: (561) 297-2486, fax (561) 297-2436
   E-mail address: lqian@fau.edu

4. Course description
   Algorithms in statistical computing: random number generation, generating other
distributions, random sampling and permutations. Matrix computations in linear models.
Non-linear optimization with applications to statistical procedures. Other topics of current
interest, such as issues of efficiency, and use of graphics.

5. Course objectives
   Upon completing this course students can expect to be able to conduct simulation studies
using R language for research projects. In details, students will be able to write R language
program for optimization problem, EM algorithm, Markov Chain Monte Carlo and
Bootstrap methods.

6. Lecture Schedule
   - Introduction to R (ca. 1 week)
     - Homework: Read intro pdf and learn to write R simple program for functions
   - Random number generation (ca. 1 week)
     - Homework: Using R to generate random samples for given distributions
   - Visualization of multivariate data (ca 2 weeks)
     - Homework: Conduct exploratory data analysis using R language for multivariate
data
   - Monte Carlo integration and variance reduction (ca 2 weeks)
     - Homework: Conduct simulation study and choose efficient methods
   - Numerical solution for non-linear optimization problems (ca. 2 weeks)
     - Homework: Write R program to solve non-linear system from maximum
likelihood method and analyze real data sets
   - Monte Carlo Methods in inference (ca 2 weeks)
     - Homework: Conduct simulation studies for different model settings and begin
final project
   - EM algorithm (ca. 2 weeks)
     - Homework: Analyze data with missing values using EM algorithm and continue
final project
Markov Chain Monte Carlo methods (ca 2 weeks)
- Homework: Simulate data using MCMC method, analyze real data and continue final project
- Bootstrap methods (ca 1 week)
  - Homework: Using bootstrap method to obtain bootstrap sampling distribution, make bootstrap inference and complete final project

7. Required Text


8. Supplementary/recommended readings


9. Assessment Procedure and Grading

There will be graded homework assignments accounting for 40% of your cumulative performance, a midterm exam accounting for 30% of your cumulative performance, and a final project that accounts for 30% of your cumulative performance. Your overall grade in the course is derived from your cumulative performance according to the following table.

<table>
<thead>
<tr>
<th>Cumulative Performance</th>
<th>Grade</th>
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<tbody>
<tr>
<td>&gt; 94%</td>
<td>A</td>
</tr>
<tr>
<td>&gt; 90% - 94%</td>
<td>A−</td>
</tr>
<tr>
<td>&gt; 87% - 90%</td>
<td>B+</td>
</tr>
<tr>
<td>&gt; 83% - 87%</td>
<td>B</td>
</tr>
<tr>
<td>&gt; 80% - 83%</td>
<td>B−</td>
</tr>
<tr>
<td>&gt; 75% - 80%</td>
<td>C+</td>
</tr>
<tr>
<td>&gt; 65% - 75%</td>
<td>C</td>
</tr>
<tr>
<td>&gt; 60% - 65%</td>
<td>C−</td>
</tr>
<tr>
<td>≥ 57% - 60%</td>
<td>D+</td>
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<tr>
<td>&gt; 53% - 57%</td>
<td>D</td>
</tr>
<tr>
<td>≥ 50% - 53%</td>
<td>D−</td>
</tr>
<tr>
<td>&lt;50%</td>
<td>F</td>
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10. Incomplete Grades

A grade of I (incomplete) will only be given under certain conditions and in accordance with the academic policies and regulations put forward in FAU’s University Catalog. The student has to show exceptional circumstances why requirements cannot be met. A request for an incomplete grade has to be made in writing with supporting documentation, where appropriate.

11. Makeup Tests and Extra Credit
If you cannot attend an exam or hand in a homework project in time due to a relevant reason like significant health problems or being involved in a major traffic accident, and you document this, then you can make up the respective assignment.

Extra credit work is not possible.

12. Method of Instruction

The course is conducted in lectures combined with lab sessions. Assignments may require the use of a statistical software package such as Minitab or R language. Unless otherwise specified, for those assignments you can use statistical package of your choice.

13. Disability policy statement

In compliance with the Americans with Disabilities Act (ADA), students who require special accommodations due to a disability to properly execute coursework must register with the Office for Students with Disabilities (OSD) located in Boca Raton - SU 133 (561-297-3880), in Davie - MOD I (954-236-1222), in Jupiter - SR 117 (561-799-8585), or at the Treasure Coast - CO 128 (772-873-3305), and follow all OSD procedures.

14. Honor Code policy statement

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty, including cheating and plagiarism, is considered a serious breach of these ethical standards, because it interferes with the University mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the University community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001 at http://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf