CAS/GRS Course Revision Proposal Form

This form is to be used when proposing a revision of an existing CAS or GRS course.

Once completed, this form should be submitted to Senior Academic Administrator Peter Law (617-353-7243) as a PDF file to pgl@bu.edu.

For further information or assistance, contact Associate Dean Joseph Bizup (617-353-2409; jbizup@bu.edu) about CAS courses or Associate Dean Jeffrey Hughes (617-353-2690; hughes@bu.edu) about GRS courses.

DEPARTMENT OR PROGRAM: Mathematics and Statistics, MSSP

DATE SUBMITTED: 03.13.17

CURRENT COURSE NUMBER: GRS MA 684 B1

CURRENT COURSE NAME: Applied Multiple Regression & Multivariable Methods

CURRENT 40 WORD COURSE DESCRIPTION:

Graduate Prerequisites: one year of statistics.

Application of multivariate data analytic techniques. Multiple regression and correlation, confounding and interaction, variable selection, categorical predictors and outcomes, logistic regression, factor analysis, MANOVA, discriminant analysis, regression with longitudinal data, repeated measures, ANOVA. This course cannot be taken for credit in addition to the course with the same title that was previously numbered CAS MA 684.

Currently, there exists two sections of MA 684, A1 and B1. The A1 section is for non-MSSP students and the B1 section is restricted to MSSP students only. This change **only** pertains to the MSSP version of the course, MA 684 B1. MA 684 section A1 will remain unchanged.

CURRENT CROSS-LISTING DEPARTMENT/PROGRAM, if any:

TO BE OFFERED NEXT: Sem./Year: ___FALL___ / ___2017___

INSTRUCTOR(S): MASANAO YAJIMA

DEPARTMENT CONTACT NAME AND POSITION: MARISA DISARNO, GRADUATE PROGRAM ADMINISTRATOR

DEPARTMENT CONTACT EMAIL AND PHONE: mdisarno@bu.edu, 617-353-2564

ITEMS PROPOSED FOR REVISION (check all that apply):

<table>
<thead>
<tr>
<th>X Course Number</th>
<th>X 40 Word Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X Title</td>
<td>X Prerequisites</td>
</tr>
<tr>
<td>X Short Title</td>
<td>X Prerequisites</td>
</tr>
<tr>
<td>[] Credits</td>
<td>[] Divisional Studies Credit</td>
</tr>
<tr>
<td></td>
<td>[] Other (Explain)</td>
</tr>
</tbody>
</table>
Notes: The "short title" appears in the course inventory and on student transcripts and must be 15 characters maximum including spaces. The "40 word description" appears in the CAS/GRS Bulletin.

PROPOSED REVISIONS: For each item checked above, provide the current information, then the proposed information, then a brief explanation for the proposed change, including the intended impact of the change.

1. [Course Number]
   a. Current information:
      GRS MA 684 B1
   b. Proposed Information:
      GRS MA 678
   c. Explanation & impact
      New course number required
      [This change **only** pertains to the MSSP version of the course, MA 684 B1. MA 684 section A1 will remain unchanged.]

2. [Title]
   a. Current information:
      Applied Multiple Regression and Multivariable Methods
   b. Proposed information:
      Applied Statistical Modeling
   c. Explanation & impact:
      More defined course names and new numbers will not only alleviate confusion with current students about course restrictions (MSSP only courses), but it will also be more effective for students entering industry to have more accurate and updated course names
      [This change **only** pertains to the MSSP version of the course, MA 684 B1. MA 684 section A1 will remain unchanged.]

3. [Short Title]
   a. Current information:
      APPL MULT REGR
   b. Proposed information:
      APPL STAT MODEL
   c. Explanation & impact:
      Change required to reflect new course title

4. [40 Word Description]
   a. Current information:
      Graduate Prerequisites: one year of statistics.
Application of multivariate data analytic techniques. Multiple regression and correlation, confounding and interaction, variable selection, categorical predictors and outcomes, logistic regression, factor analysis, MANOVA, discriminant analysis, regression with longitudinal data, repeated measures, ANOVA. This course cannot be taken for credit in addition to the course with the same title that was previously numbered CAS MA 684.

b. Proposed information:
Prerequisites: Admission to the MSSP program.
Application of multivariate data analytic techniques. Topics include ANOVA, multiple regression, logistic regression, generalized linear models, generalized linear mixed effect models, and Bayesian hierarchical models, experiment design, multiple comparison, and variable selection. Students who take MA 678 are not permitted to receive credit for MA 684 A1.

c. Explanation & impact:
The proposed change are minor perturbations of the original course material and we are taking the opportunity to evolve the description accordingly
(This change **only** pertains to the MSSP version of the course, MA 684 B1. MA 684 section A1 will remain unchanged.)

IMPACT ON OTHER DEPARTMENTS/PROGRAMS: Will any of these changes have an impact on students pursuing the degree requirements or expectations of other departments, programs, or schools?
Check one: □ Yes  X No

If YES, please identify impacts and attach cognate comment from the appropriate department/program/school.

RESOURCE NEEDS: STAFFING, FACILITIES, AND EQUIPMENT: As a result of the proposed changes, will there be any changes in the staffing, special facilities or equipment needs of the course (e.g. laboratory, library, instructional technology, technical resources, etc)?
Check one: □ Yes  X No

If YES, explain further and indicate whether currently available staffing, facilities, and equipment are adequate for the proposed course. (NOTE: Approval of proposed revisions does not imply a change in resource commitments on the part of CAS.)

FURTHER INFORMATION THAT MUST BE SUBMITTED IN ORDER FOR THIS PROPOSAL TO BE CONSIDERED:

1. A complete week-by-week SYLLABUS with student learning objectives, readings, and assignments that reflects the proposed changes (see guidelines on “Writing a Syllabus” on the Center for Teaching & Learning website. Be sure that syllabus includes your expectations for academic honesty, with URL for pertinent undergraduate or GRS academic conduct code(s).
2. Cognate comment from chairs or directors of relevant departments and/or programs. Use the form available here. You can consult with Joseph Bizup (CAS) or Jeffrey Hughes (GRS) to determine which departments or programs inside and outside of CAS would be appropriate.

DEPARTMENT APPROVAL: [Signature]  
Department Chair  

Date: 4/13/17

Other Department Chair(s) (for cross-listed courses)  

Date: 
DEAN'S OFFICE CURRICULUM ADMINISTRATOR USE ONLY

CAS/GRS CURRICULUM COMMITTEE APPROVAL:

☐ Approved  Date:  
☐ Tabled  Date:  
☐ Not Approved  Date:  

Divisional Studies Credit:

☐ Endorsed

☐ HU
☐ MCS
☐ NS
☐ SS

☐ Not endorsed

________________________
Curriculum Committee Chair Signature and Date

Comments:

PROVISIONAL APPROVAL REQUESTED for Semester/Year  

________________________
Dean of Arts & Sciences Signature and Date

Comments:

CAS FACULTY: Faculty Meeting Date:  

☐ Approved  ☐ Not Approved

________________________
Curriculum Administrator Signature and Date

Comments:
# Syllabus: MA 678
## Applied Statistical Modeling
### Fall 2017

| Instructor | Masanao Yajima  
Office: 64 Cummington Mall, Room 229  
Class: TBA  
Office hours: TBA  
E-mail: yajima@bu.edu |
|-------------|---------------------------------------------------------------|
| TA          | TBA  
Office: TBA  
Discussion: Tuesday TBA  
Office hours: Thursday TBA  
E-mail: TBA |
| Textbooks   | Data Analysis Using Regression and Multilevel/Hierarchical Models Gelman and Hill  
Applied Regression Analysis and Generalized Linear Models 3rd Edition by Fox |
| Requirements | In class participation, Weekly homework, including computer work. Midterm exam, Final project, and weekly in class quiz.  
Course Website: [http://learn.bu.edu/](http://learn.bu.edu/) |

**Overall Course Objectives:**
This is the methodological leg of the MSSP program where we aim to equip students with basic statistical models. Students are expected to enter the course with a solid understanding of linear algebra and sufficient knowledge of statistics and probability. This course is about doing and understanding multivariate statistical analysis. Theory will be used as a logical foundation to support the understanding but will not be emphasized. The analyses will be conducted through statistical computing package R in combination with necessary packages that are publicly available.

After completing this course, students will have a thorough understanding of multiple linear regression, logistic regression, hierarchical models, and Bayesian Hierarchical models. Meantime students will also be introduced to the concepts of design of experiments and how to handle missing data. Using statistical software, students will be able to formulate, carry out, and present results from a statistical analyses.

**Course Requirements**

**Weekly Reading.** Every week chapters in the text book will be assigned.

**Weekly Homework exercises.** Weekly assignments will involve both interpretation of statistical results, involving discussion of results presented in published articles and manipulating summary information from analyses, and carrying out analyses from computerized research study data sets. Exercises will involve using the R statistical package to carry out analyses from research data, focusing on presentation and interpretation of the analysis. Exercises are assigned each week, due the following week.

**Midterm Project.** The in-class exam will focus on identifying appropriate statistical approaches to research questions, interpretation of results presented in analytic summaries, and manipulating results of statistical analyses. The format of the midterm exam will be announced later in the semester.
**Final Project.** For the final project, students will be given the design, aims, and computerized data from one or two research studies, and asked to determine an appropriate statistical analysis plan, carry out the analysis using R, summarize their findings using appropriate tables and figures, and provide an interpretation of their findings. The project is to be done independently over two weeks.

**Policies:** Assignments will be posted to Blackboard with due dates/times and submission instructions. Overall, course policies are governed by [Graduate School of Arts & Sciences (GRS)]. See [GRS Policies], especially the GRS academic conduct code.

**Grades.** Course grades will be determined based on the following: class participation 10%, weekly quiz 10%, homework 20%, midterm exam 30%, final take-home project 30%. The lowest homework score and quiz score will be dropped in calculating the overall homework score and quiz score. Final course grades will be rounded to the nearest whole number and converted to letter grades using the following:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>94-100</td>
</tr>
<tr>
<td>A-</td>
<td>90-93</td>
</tr>
<tr>
<td>B+</td>
<td>85-89</td>
</tr>
<tr>
<td>B</td>
<td>80-84</td>
</tr>
<tr>
<td>B-</td>
<td>75-79</td>
</tr>
<tr>
<td>C+</td>
<td>70-74</td>
</tr>
<tr>
<td>C</td>
<td>65-69</td>
</tr>
<tr>
<td>C-</td>
<td>60-64</td>
</tr>
<tr>
<td>D</td>
<td>50-59</td>
</tr>
<tr>
<td>F</td>
<td>&lt;50</td>
</tr>
</tbody>
</table>

Note: This syllabus may change throughout the semester. Changes will be announced by email and the revision date will be updated.

**Preliminary Schedule:**

<table>
<thead>
<tr>
<th>Date</th>
<th>Week</th>
<th>Topic</th>
<th>Reading*</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/5</td>
<td>1</td>
<td>Introduction to regression</td>
<td>1-2</td>
</tr>
<tr>
<td>9/12</td>
<td>2</td>
<td>Interpreting linear regression models</td>
<td>3</td>
</tr>
<tr>
<td>9/19</td>
<td>3</td>
<td>Model checks and transformations</td>
<td>4</td>
</tr>
<tr>
<td>9/26</td>
<td>4</td>
<td>Statistical Inference for Regression</td>
<td>7-8</td>
</tr>
<tr>
<td>10/3</td>
<td>5</td>
<td>Logistic regression for binary data</td>
<td>5</td>
</tr>
<tr>
<td>10/10</td>
<td></td>
<td>Columbus day no class</td>
<td></td>
</tr>
<tr>
<td>10/12</td>
<td>6</td>
<td>Logistic regression for binary data</td>
<td>5</td>
</tr>
<tr>
<td>10/17</td>
<td>7</td>
<td>Generalized Linear Model</td>
<td>6</td>
</tr>
<tr>
<td>10/24</td>
<td>8</td>
<td>Generalized Linear Model</td>
<td>6</td>
</tr>
<tr>
<td>10/31</td>
<td>9</td>
<td>Linear Mixed Effect Models</td>
<td>11-12</td>
</tr>
<tr>
<td>11/7</td>
<td>10</td>
<td>Linear Mixed Effect Models</td>
<td>13</td>
</tr>
<tr>
<td>11/14</td>
<td>11</td>
<td>Generalized Linear Mixed Effect Models</td>
<td>14</td>
</tr>
<tr>
<td>11/21</td>
<td>12</td>
<td>Generalized Linear Mixed Effect Models</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Thanksgiving No class</td>
<td></td>
</tr>
<tr>
<td>11/28</td>
<td>13</td>
<td>Bayesian Hierarchical models</td>
<td>16</td>
</tr>
<tr>
<td>12/5</td>
<td>14</td>
<td>Bayesian Hierarchical models</td>
<td>17</td>
</tr>
<tr>
<td>12/12</td>
<td>15</td>
<td>Last day</td>
<td></td>
</tr>
</tbody>
</table>