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 pel@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 681 B1

CURRENT COURSE NAME: Accelerated Introduction to Statistical Methods for Quantitative Research

CURRENT 40 WORD COURSE DESCRIPTION:
Undergraduate Prerequisites: CAS MA 225 and CAS MA 242; or their equivalents.
Introduction to statistical methods relevant to research in the computational sciences. Core topics include probability theory, estimation theory, hypothesis testing, linear models, GLMs, and experimental design. Emphasis on developing a firm conceptual understanding of the statistical paradigm through data analyses.

{Please Note: 681 is run for both MSSP-only and non-MSSP audiences; this change **only** pertains to the MSSP versions of these courses; and the regular versions will remain unchanged.}

CURRENT CROSS-LISTING DEPARTMENT/PROGRAM, if any:

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

INSTRUCTOR(S): HAVILAND WRIGHT

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>□ Divisional Studies Credit</td>
</tr>
<tr>
<td>□ Credits</td>
<td>□ Other (Explain)</td>
</tr>
<tr>
<td>□ Cross-listing</td>
<td></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 681

b. Proposed information:
GRS MA 677

c. Explanation & impact
   New course number required
   *(Please Note: 681 is run for both MSSP-only and non-MSSP audiences; this change **only**
   pertains to the MSSP versions of these courses; and the regular versions will remain unchanged.)*

2. [Title]

a. Current information:
   Accelerated Introduction to Statistical Methods for Quantitative Research

b. Proposed information:
   Conceptual Foundations of Statistics

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
   *(Please Note: 681 is run for both MSSP-only and non-MSSP audiences; this change **only**
   pertains to the MSSP versions of these courses; and the regular versions will remain unchanged.)*

3. [Short Title]

a. Current information:
   AC STAT METHODS

b. Proposed information:
   CONCEPT FDN STAT

c. Explanation & impact:
   Change required to reflect new course title

4. [40 Word Description]

a. Current information:
   Undergraduate Prerequisites: CAS MA 225 and CAS MA 242; or their equivalents.
   Introduction to statistical methods relevant to research in the computational sciences. Core topics
   include probability theory, estimation theory, hypothesis testing, linear models, GLMs, and
   experimental design. Emphasis on developing a firm conceptual understanding of the statistical
   paradigm through data analyses.

b. Proposed information:
   Prerequisites: Admission to the MSSP program.
   Introduction to statistical methods relevant to research in the computational sciences. Core topics
   include probability theory, estimation theory, hypothesis testing, linear models, GLMs, and
   experimental design. Emphasis on developing a firm conceptual understanding of the statistical
   paradigm through data analyses.
c. Explanation & impact:
   The proposed changes are minor perturbations of the original course material and we are taking
   the opportunity to evolve the description accordingly.

   {Please Note: 681 is run for both MSSP-only and non-MSSP audiences; this change **only**
   pertains to the MSSP versions of these courses; and the regular versions 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   ☒ 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    ☒ 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:                      4/43/17

______________________________
Department Chair

______________________________
Other Department Chair(s) (for cross-listed courses)
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:
Conceptual Foundations of Statistics
GRS MA 677
Version 2017-03-08

Instructor: Haviland Wright
64 Cummington Mall, Room 233
hav1126@bu.edu
808-651-5683
skype: havilandw

Class Meetings time,
room Discussion time,
room Office Hours time
Prereqs: Admission to the MS program in Statistical Practice

Textbooks:
2012 Larry Wasserman, All of Statistics, Springer, 2004

Course Description:
This course surveys foundation topics in statistical reasoning and methods, including
parametric and nonparametric inference, and Bayesian analysis. For each topic, we will
review of the analytic foundations of the topic, discuss relevant applications and practice
implications, and deepen our understanding by with modeling and simulation. The goal of
the course is to give you theoretical background and tools that will help you establish an
ongoing process of personal and professional development.

Assignments Assignments will be posted to Blackboard with due date/time and
submission instructions. Assignments will focus on the topic areas covered during the
semester and include both textbook problems and data analysis projects. We will use the
discussion sections to review course material, work on assignments, and discuss the hands-
on aspects of the course.

Grading: In addition to assignments, we will have two one-hour examinations and a
two-hour final exam. Grading will reflect performance on both written assignments and exams. 60 percent of your grade will be based on assignments. 40 percent of your grade will be based on exams.

Please note:
The one-hour examinations are currently scheduled during discussion meetings on
TK and TK. You must take the exam as scheduled. There will be no exceptions.

Policies
Course policies are governed by Graduate School of Arts & Sciences. See GRS Policies, especially the GRS Academic Conduct Code.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reading</th>
<th>Assignment</th>
</tr>
</thead>
</table>
| 1    | Probability inequalities  
Convergence  
Law of Large Numbers | W: Ch 4  
D&S: 6 | Problem set |
| 2    | Central Limit Theorem  
Delta method | W Ch 5 | Delta method project |
| 3    | Introduction to Statistical Inference  
Empirical CDF  
K-S test | W: Ch 6  
D&S: Ch 10.6 | Empirical CDF, K-S test project |
| 4    | Fitting distributions  
K-S test  
The Bootstrap | W Ch 8 | Data analysis project |
| 5    | Estimation  
Prior and Posterior Distributions  
Conjugate Prior Distributions | D&S 7 | Problem set |
| 6    | MLE  
Sufficiency | W Ch 9 | Project |
| 7    | Sampling distributions  
Chi-square, t, unbiased estimators, Fisher Information | D&S 8 | Problem set |
| 8    | Hypothesis testing | D&S 9  
W ch 10 | Hyposesis Testing  
Problem set |
| 9    | Hypothesis testing  
Nonparametrics | D&S 10 | Nonparametrics Project |
| 10   | Nonparametrics | D&S 10 | Nonparametrics Project |
| 11   | Simulation | D&S 12 | Simulation Problem Set  
R |
| 12   | Selected Topic | TBD | Selected Topic Problem set |
| 13   | Final Project | TBD | Final Project |
| 14   | Review | TBD | Final Project |