CM-2026

COVER SHEET - NEW and REVISED COURSES

Commission on Undergraduate Studies and Policies/ Commission on Graduate Studies and Policies/ University Curriculum Committee For Liberal Education
Effective September 2010

ENTERED 3/30/15 GSK

APPROVED GCC 2/26/15 GGSP 3/4/15 GSK CM

SEE I - VIII for Basic Course Proposal Guidelines
SEE APPENDIX FOR NOTES, EXPLANATIONS AND ADDITIONAL GUIDELINES
PRINT CLEARLY, TYPE or COMPLETE ELECTRONICALLY

PROPOSAL DATE: 10/22/2014 **15-DAY REVIEW END DATE:** 2-13-15 2026

DEPARTMENT: Agricultural and Applied Economics

COURSE DESIGNATOR AND NUMBER: AAEC 6564 (ECON 6564/STAT 6564)

TITLE OF COURSE: Bayesian Econometric Analysis

TRANSCRIPT (ADP) TITLE (MAX-30 Characters): Bayesian Econometric Analysis

INSTRUCTOR and/or DEPARTMENTAL CONTACT: Klaus Moeltner **CONTACT MAILCODE:** 0401

CONTACT PHONE: 540-231-8249 **CONTACT E-MAIL:** moeltner@vt.edu

Please count this course toward the following scorecard metrics area:
☐ **Study Abroad** ☐ **Service Learning** ☐ **Experiential** ☐ **Undergraduate Research**

CHECK **ONLY ONE** OF THE FOLLOWING BOXES

☒ **NEW COURSE** ☐ **REVISED COURSE** [Revision>20%____ Revision<20%____]

☐ **NEW COURSE & INCLUSION IN THE CLE** [Area_____] ☐ **OTHER:** _____
Include Attachment, If Needed

☐ **REVISED COURSE FOR INCLUSION IN THE CLE OR CLE AREA CHANGE**

*Courses routed directly to the University Curriculum Committee For Liberal Education MUST be endorsed by the appropriate Department Head or Dean.
*The Chair of the University Curriculum Committee For Liberal Education shall inform the appropriate college curriculum committee of all courses under review by the University Curriculum Committee For Liberal Education.

*A **Attach Statement from Dean or Departmental Representative as to whether Teaching this Course will Require or Generate the Need for *Additional* Departmental Resources.**

*B **Attach Appropriate Letters of Support from Affected Departments and/or Colleges.**

*C **Effective Semester:** Spring 2016

*D **Change in Title From:**

To:

*E **Change in Lecture and/or Lab Hours From: To:**

*F **Change in Credit Hours From: To:**

*G **Percentage of Revision from Current Syllabus: Revision Summary:**

*H **Course Number(s) and Title(s) to be Deleted from the Catalogue with APPROVAL of course:**
N/A

APPROVAL SIGNATURES

Department Representative _____ Date: 11/3/14
College Curriculum Committee Representative _____ Date: 12-15-14
College Dean _____ Date: 12/18/14

Rev 04-20-2012

Bayesian Econometric Analysis
AAEC 6564 (ECON 6564/STAT 6564)

I. Catalog Description

Bayesian estimation of economic models, with focus on Gibbs sampling, hierarchical modeling, data augmentation, and model search. Strong emphasis on programming and computational implementation. Pre: 5126 or ECON 5126 or STAT 5304 or STAT 5444. (3H, 3C).

Course Number: 6564 (ECON 6564/STAT 6564)

ADP Title: Bayesian Econometric Analysis

II. Learning Objectives

Having successfully completed this course, the student will be able to:

- Combine disparate pieces of data to derive more informative estimates of parameters and economic constructs of interest.
- Write and execute computer programs for common Bayesian simulation tools, such as the Gibbs Sampler and the Metropolis-Hastings algorithm.
- Specify conditional, marginal, and joint probabilities and corresponding likelihood functions.
- Design professional graphics and figures to present final results to a general audience.
- Compare and choose models based on relative probabilities.
- Incorporate model uncertainty into the estimation process.

III. Justification

This course is needed because (i) Bayesian methods are rapidly gaining popularity for economic analysis with the advent of faster computers and cluster computing, (ii) Bayesian methods bring multiple computational and analytical advantages over the methods the students traditionally learn in a PhD course in economics, and (iii) a Bayesian methods course geared towards tackling economic questions and problems does not exist at Virginia Tech.

This course logically follows the first-year sequence of econometric courses that are mandatory for our AAEC/ECON PhD students. As such, it is best served as an upper-level graduate course with a 6XXX – designation. It also constitutes a mandatory field course within our PhD program in economics for students who wish to specialize in econometric methods. The other mandatory field course is AAEC 6554 (Panel data econometrics), which further justifies a 6XXX designation.

IV. Prerequisites and Corequisites

Pre: 5126 or ECON 5126 or STAT 5304 or STAT 5444

V. Texts and Special Teaching Aids

A. Required Text:
None. There is no single text that covers all relevant topics for this course. The background material for this course will consist of seminal journal articles and the following recommended texts.

B. Recommended Texts:
Gelman, Andrew, John B. Carlin, Hal S. Stern, and Donald B. Rubin. BAYESIAN DATA ANALYSIS, ii, Boca Raton / London / New York / Washington, D.C.: Chapman & Hall/CRC, 2004, 668.

Koop, Gary. BAYESIAN ECONOMETRICS, Chichester, England: Wiley, 2003, 360.

Koop, Gary, Dale J. Poirier, and Justin L. Tobias. BAYESIAN ECONOMETRIC METHODS, Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo: Cambridge University Press, 2007, 357.

Examples of background material:

Chib, S. 2001. "Markov Chain Monte Carlo Methods: Computation and Inference," in J. J. Heckman and E. Leamer (eds), Handbook of Econometrics: Elsevier: 3570-3649.

Chib, S. and E. Greenberg, Understanding the Metropolis-Hastings algorithm, The American Statistician 49 (1995): 327-335.

George, E. and R. McCulloch, Approaches for Bayesian variable selection, Statistica Sinica 7 (1997): 339-373.

Geweke, J. 1992. "Evaluating the Accuracy of Sampling-based Approaches to the Calculation of Posterior Moments," in J. M. Bernardo, J. O. Berger, A. P. Dawid and A. F. M. Smith (eds), Bayesian Statistics 4 Oxford, UK: Oxford University Press: 169–193.

Kass, R.E. and A.E. Raftery, Bayes factors, Journal of the American Statistical Association 90 (1995): 773–795.

Tanner, M.A. and W.H. Wong, The calculation of posterior distributions by data augmentation (with discussion), Journal of the American Statistical Association 82 (1987): 528–550.

VI. Syllabus

Topic	Percent of course
Introduction to Bayesian Inference	5
Gibbs Sampling	15
Coverage and Prediction in Bayesian Analysis	10
Models with General Error Structure / Model Comparison	10
Data Augmentation, Latent Variable Models	10
Hierarchical Models	10
Metropolis-Hastings Algorithm	10
Bayesian Model Search and Model Averaging	10
Selection, Treatment, and Switching Models	10
Finite Mixture Models	10
Total	*100*

VirginiaTech
College of Agriculture and Life Sciences

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October 31, 2014

To whom it may concern:

The purpose of this letter is to confirm that the proposed new course, AAEC/ECON/STAT 6564 "Bayesian Econometric Analysis" being developed by Dr. Klaus Moeltner, will require no additional resources to be offered.

Sincerely,

Steven C. Blank, Ph.D.
Department Head and Professor

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October 31, 2014

TO: Graduate School

FROM: Steven C. Blank, Head, Agricultural and Applied Economics
Nicolaus Tideman, Head, Economics
Eric P. Smith, Head, Statistics

RE: Cross listing

We support *Bayesian Econometric Analysis* as a cross-listed course in all three departments, with the course label AAEC/ECON/STAT 6564. This course will be valuable to PhD students in the joint AAEC/ECON PhD program in economics, and complements existing graduate courses in statistics.

The home department for the course will be AAEC. The instructor for the course will also be a faculty member of AAEC. A separate letter assuring that no new resources are required for this course will be provided by Dr. Steven C. Blank, head of AAEC.

Sincerely,

Steven C. Blank, Ph.D.
Department Head and Professor

Sheryl Ball, Ph.D.
Associate Department Head and Associate Professor

Eric P. Smith, Ph.D.
Department Head and Professor

VirginiaTech

Eric P. Smith
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November 7, 2014

TO: Graduate School

FROM: Eric P. Smith, Head, Statistics

RE: Prerequisites for new course

This letter is to confirm that the Department of Statistics agrees to have two of its courses, STAT 5304 and STAT 5444, listed as valid prerequisites for the new proposed course AAEC/ECON/STAT 6564 *Bayesian Econometric Analysis*. To be specific, either course by itself will be a valid prerequisite, so the catalog verbiage will be "STAT 5304 OR STAT 5444."

Sincerely,

Eric P. Smith, Ph.D.
Department Head and Professor