University of Wisconsin-Whitewater

Curriculum Proposal Form #3

## New Course

**Effective Term:**

**Subject Area - Course Number:** **ECON 760 Cross-listing:**

(See Note #1 below)

**Course Title:** (Limited to 65 characters) ECONOMETRIC THEORY

**25-Character Abbreviation:** ECONOMETRIC THEORY

**Sponsor(s):** David Welsch

**Department(s):** Economics

**College(s):**

# **Consultation took place**: [x]  NA [ ]  Yes (list departments and attach consultation sheet)

Departments:

**Programs Affected:** **None**

**Is paperwork complete for those programs?** (Use "Form 2" for Catalog & Academic Report updates)

[x]  NA [ ]  Yes [ ]  will be at future meeting

**Prerequisites:** ECON 733 - Econometrics I and ECON 743: Econometrics II with a B- or higher

**Grade Basis:** [x]  Conventional Letter [ ]  S/NC or Pass/Fail

**Course will be offered:** [x]  Part of Load [ ]  Above Load

 [x]  On Campus [ ]  Off Campus - Location

**College:**  **Dept/Area(s):** ECON

**Instructor:** David Welsch

 *Note: If the course is dual-listed, instructor must be a member of Grad Faculty.*

**Check if the Course is to Meet Any of the Following:**

[ ]  Technological Literacy Requirement [ ]  Writing Requirement

[ ]  Diversity [ ]  General Education Option:

Note: For the Gen Ed option, the proposal should address how this course relates to specific core courses, meets the goals of General Education in providing breadth, and incorporates scholarship in the appropriate field relating to women and gender.

**Credit/Contact Hours:** (per semester)

Total lab hours: 0 Total lecture hours: 48

Number of credits: 3 Total contact hours: 48

**Can course be taken more than once for credit? (Repeatability)**

[x]  No [ ]  Yes If "Yes", answer the following questions:

No of times in major:       No of credits in major:

No of times in degree:       No of credits in degree:

Proposal Information: ([***Procedures for form #3***](http://acadaff.uww.edu/UCC/Curriculum_Handbook_09/Procedures_form3.docx))

**Course justification:**

This proposed course will be an elective for students in the MS Economics program. This course is intended for those students who want to develop a greater understanding of the underlying theory utilized in the first two econometric classes in our program.

**Relationship to program assessment objectives:**

This will give students a greater understanding of derivations and consequences of assumptions in all econometric models and allow them to estimate models that are not available with canned programs.

One of the key objectives of the MS Economics degree is to allow students to gain Quantitative and Statistical Proficiency. This course addresses the Statistical Proficiency aspect of this Learning objective and the specific student learning outcomes (traits) that this course will address are:

* Students are able to prove Gauss-Markov Theorem in the multivariate regression model
* Students are able to understand what the consequences are of relaxing the assumptions in the Gauss-Markov Theorem
* Students are able to write computer programs to estimate models that are not available in canned programs

**Budgetary impact:**

* **Staffing**:- the course will be staffed by a Economics Department faculty that is Academically Qualified (AQ) and has Grad Faculty status.
* **Academic unit library and service & supply budget:** - no budgetary impact.
* **Campus instructional resource units**:- impact is minimal; students will be required to use Stata and Matlab; There are 10 licenses of Stata available on campus computers and Matlab is available in the General Access labs in the Library and McGraw. In addition, Matlab is available in the computer labs in Hyland Hall where the course is anticipated to take place
* **Laboratory/studio facilities:**- No budgetary impact
* **Classroom space:**- A classroom is anticipated to be required in Hyland Hall to teach the class. The class will meet for 1hour 15 minute session, twice per week.
* **Evaluation of adequacy of current library holdings, recommendations for acquisitions, and impact of the course on the academic unit library allocation budget:** - No impact. The course will be taught using a graduate textbook which students will be required to obtain.
* **Explanation if the course is simply replacing another course, either entirely or in the cycle:**- This is a new course for the MS Economics degree, and does not replace any other courses.

**Course description:** (50 word limit)

This course is intended for those students who want to develop a greater understanding of the underlying theory utilized in the first two econometric classes in our program. Key topics include investigating distributional properties and asymptotic theory.

**If dual listed, list graduate level requirements for the following:**

1. **Content** (e.g., What are additional presentation/project requirements?)

N/A

2. **Intensity** (e.g., How are the processes and standards of evaluation different for graduates and undergraduates? )
N/A

3. **Self-Directed** (e.g., How are research expectations differ for graduates and undergraduates?)
N/A

**Course objectives and tentative course syllabus:**

ECON760 ECONOMETRIC THEORY

University of Wisconsin-Whitewater, Department of Economics

Summer 2015

MWF 12-2

In Hyland 1301 (Some days we will meet in a computer lab Hyland 3101)

**Instructor:** David Welsch

**Email:** welschd@uww.edu

**Class Web Page:** <http://facstaff.uww.edu/welschd/Econometrics734F2014/Home.htm>

**Office:** Hyland 4400 (telephone: 4715)

**Office Hours:** MW 7:30-8:30AM, 12:30-2:00PM, 3:35-4:05

Thursdays from 9:30-12:00

 **Also by appointment (Just email me or talk to me after class to set something up)**

**Required texts:** Greene, W. H. (2011). *Econometric analysis* . (7th ed.). Upper Saddle River, New Jersey: Prentice Hall.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. (2nd ed.). Cambridge, Massachusetts: The MIT Press.

**Other Resources:** The class web page will have notes that will allow you to follow along with the lectures and “fill-in-the-blank”.

Prerequisites

ECON 733 - Econometrics I; ECON 743 - Econometrics II, and ECON 738- Quantitative Methods in Economics

Course Description

This course is intended for those students who want to develop a greater understanding of the underlying theory utilized in the first two econometric classes in our program. Key topics include investigating distributional properties and asymptotic theory. There will be extensive use of calculus and matrix algebra in this class. In addition we will use Matlab and Stata to write programs to derive many of the estimators that were used in the first two econometric courses. The course begins with a brief review of statistics and matrix algebra; we then move on to prove the Gauss Markov Theorem and examine what happens when we relax the key assumptions. The second half of the course includes exploring the theory behind more advanced estimation techniques. We also compare maximum likelihood estimation to other estimators such as generalized method of moments. Students who take this class will have the ability to estimate any new models they encounter that are not available with canned programs, and they will have a richer theoretical understanding for many of the models.

**Grading Policy:** In this class we will have midterm and a final exam along with 5-6 homework assignments. The highest 4 homework assignments turned in will be worth 100 points each. The midterm and the final are worth 250 and 350 points respectively.

**Grade distribution:** A 93-100% C 71-74.9%

A- 90-92.9% C- 68-70.9%

B+ 87-89.9% D+ 65-67.9%

B 81-86.9% D 61-64.9%

B- 78-80.9 D- 58-60.9%

 C+ 75-77.9 F Below 58

**Additional**

**Information:** 1. If you are in need of special help in taking exams, please inform me early in the semester.

 2. The University of Wisconsin-Whitewater is dedicated to a safe, supportive and nondiscriminatory learning environment.  It is the responsibility of all undergraduate and graduate students to familiarize themselves with University policies regarding Special Accommodations, Academic Misconduct, Religious Beliefs Accommodation, Discrimination and Absence for University Sponsored Events.  For details please refer to the Undergraduate and Graduate timetables; the “Rights and Responsibilities” section of the Undergraduate Bulletin; the Academic Requirements and Policies and the Facilities and Services sections of the Graduate Bulletin; and the “Student Academic Disciplinary Procedures” (UWS Chapter 14); and the “Student Nonacademic Disciplinary Procedures” (UWS Chapter 17).

 3. *As members of the University of Wisconsin – Whitewater College of Business & Economics community, we commit ourselves to act honestly, responsibly, and above all, with honor and integrity in all areas of campus life. We are accountable for all that we say and write. We are responsible for the academic integrity of our work. We pledge that we will not misrepresent our work nor give or receive unauthorized aid. We commit ourselves to behave in a manner that demonstrates concern for the personal dignity, rights and freedoms of all members of the community. We are respectful of college property and the property of others. We will not tolerate a lack of respect for these values.*

\*Originated by: Wheaton College: Honor Code and Statement on Plagiarism.

<http://www.wheatoncollege.edu/StudentLife/honorCode/>

**Schedule**

Section 1 Probability, probability distribution functions, and important theorems and lemmas Week 1

* Random variables and probability distributions
* Univariate distributions
* Bivariate distributions
* Relationship between the normal, chi-square, student-t, and F distributions
* Central Limit Theorem and The Law of Large Numbers

Section 2 Review of important ideas from matrix algebra Weeks 1-2

* Determinants, Inverses, Eigenvalues and eigenvectors, Idempotent matrixes etc.

Section 3 Relationship between two variables Weeks 2-3

* Correlation coefficient
* Probability models for two variables
* Bivariate regression model
* Gauss-Markov and inference
* Asymptotic Theory (convergence in probability, convergence in distribution)
* Maximum likelihood estimators

Section 4 Multivariate linear estimation Week 4

* Matrix algebra of least squares
* Gauss-Markov Theorem
* Hypothesis testing

Section 5 Maximum Likelihood (ML), Generalized Least Squares (GLS), and Instrumental variable (IV) estimators Week 5

* Maximum Likelihood Estimators (ML) and their properties
* ML Estimation of the Linear Model
* Asymptotic Properties of ML
* Likelihood Ration, Wald, and Lagrange Multiplier Tests
* Two-step and Pseudo-ML
* Applications of ML
* ML Estimation of the Linear Model with Nonspherical disturbances
* IV estimators

Section 6 Nonlinear, Semiparametric, and Nonparametric Regression Week 6

* Nonlinear regression models
* Median and Quantile regression
* Nonparametric regression

Section 7 Simulation-based estimation Weeks 6-7

* Random number generation
* Bootstrapping Standard Errors and Confidence intervals
* Monte Carlo Simulation
* Simulation-based estimation
* Hierarchical linear models

Section 8 Limited Dependent variable models Week 8

* Logit and Probit models
* Poisson and negative binomial models

Section 9 Bayesian Estimation and Inference Week 8

If time allows

* Prior and Posterior Distributions
* Gibbs Sampling
* Introduction to Markov Chain Monte Carlo Methods
* Metropolis Hastings Algorithm

**Bibliography:** (Key or essential references only. Normally the bibliography should be no more than one or two pages in length.)

Angrist, J. D., & Pischke, J. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton, NJ: Princeton University Press.

Cameron, A. C., & Trivedi, P. K. (2005). *Microeconometrics: Methods and applications*. Cambridge, NY: Cambridge University Press.

Cameron, A. C., & Trivedi, P. K. (2009). *Microeconometrics: Using Stata*. College Station, Texas: Stata Press.

Greene, W. H. (2011). *Econometric analysis* . (7th ed.). Upper Saddle River, New Jersey: Prentice Hall.

Johnston, J., & DiNardo, J. (1997). *Econometric methods*. (4th ed.). McGraw Hill, Inc

Kennedy, P. (2008). *A guide to econometrics*. (6th ed.). Cambridge, MA: The MIT Press.

Koop, G. (2003). *Bayesian Econometrics* (1st edition). Wiley-Interscience

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. (2nd ed.). Cambridge, Massachusetts: The MIT Press.

Wooldrigde, J. M. (2012). *Introductory econometrics: A modern approach*. (5th ed.). Mason, OH: South-Western Cengage Learning.