Graduate Council Report
December 1, 2011

Course Change Requests:

AERO 625. Digital Control of Aerospace Systems

Title:

FROM: Digital Control of Aerospace Systems

TO: Modern Control of Aerospace Systems

Description:

FROM: Analysis and design of discrete and sampled-data controllers unique to aircraft and spacecraft; modeling of aircraft and spacecraft, sources of uncertainties; requirements and specifications; direct digital design using MIMO optimal techniques; sample rate selection, multi-rate controllers; robustness.

TO: Linear and nonlinear controllers for aircraft and spacecraft; state and output feedback of sampled-data control systems; feedback linearization and dynamic inversion; direct sampled-data design using optimal MIMO techniques; sensing considerations, sources and modeling of uncertainties unique to aircraft and spacecraft, robustness analysis.

AGEC 605. Rural Real Estate Appraisal and Organization

Course Hours:

FROM:

(2-2). Credit 3.

TO:

(3-0). Credit 3.

ARCH 601. Design Fundamentals I

Prerequisite(s):

FROM:

Graduate classification; career change program

TO:

Graduate classification in Architecture or approval of instructor; career change program, ARCH 600 and concurrent enrollment in ARCH 610
ARCH 610. Visual Communications
Prerequisite(s):
FROM: Graduate classification
TO: Graduate classification or approval of instructor; and concurrent enrollment in ARCH 601

ARCH 619. Applied Solar Energy
Prerequisite(s):
FROM: ARCH 333, 334 or 615 or approval of instructor
TO: Graduate classification or approval of instructor; ARCH 335 or 615 or equivalents

ARCH 621. Energy Optimization in Building Design
Prerequisite(s):
FROM:
ARCH 633; CSCE 203 or equivalent
TO:
Graduate classification or approval of instructor; ARCH 633 or 615 or equivalents
Description:
FROM: Optimum energy use strategies for buildings, energy audit methods, life-cycle cost analysis of building energy systems, solar system applications, building system optimization by computer simulation techniques; case studies in passive energy and solar applications.
TO: Optimum energy use strategies for commercial buildings, hourly energy simulation methods, building envelope and HVAC system energy optimization by computer simulation techniques; life-cycle cost analysis of building energy systems; case studies in commercial building applications.

ARCH 625. Sustainable Housing Design
Prerequisite(s):
FROM:
ENDS 233; ARCH 334
TO:
Graduate classification or approval of instructor; ARCH 335 or equivalent
ARCH 631. Architectural Structures III

Prerequisite(s):
FROM: ARCH 431 or approval of instructor

TO: Graduate classification or approval of instructor

ARCH 633. Environmental Systems III

Prerequisite(s):
FROM: ARCH 334

TO: Graduate classification or approval of instructor; ARCH 335 or 615 or equivalents

ARCH 634. Architectural Lighting

Prerequisite(s):
FROM:
ARCH 449 or equivalent

TO:
Graduate classification or approval of instructor; ARCH 335 or equivalent

ARCH 647. Recording Historic Buildings

Prerequisite(s):
FROM: Graduate classification; appropriate background in architectural drawing; approval of instructor

TO: Graduate classification or approval of instructor
GENE 643.

Title:

FROM: Quantitative Genetics and Plant Breeding

TO: Molecular Quantitative Genetics and Plant Breeding

Description:

FROM: Applied aspects of quantitative genetics in plant breeding; examination of methodologies to analyze quantitative variation in crop species; genetic phenomena (inbreeding, heterosis and epistasis); quantitative trait loci (QTL) mapping and marker-assisted selection (MAS); genotype by environment interaction, heritability multiple traits and selection theory with implications in plant breeding.

TO: Classical, applied and molecular aspects of quantitative genetics in plant breeding; genetic relationships; genetic diversity; genetic phenomena (linkage, heterosis and epistasis); genotype by environment interaction; mapping quantitative trait loci (QTL); genomic and marker-assisted selection; application of statistical software.

Prerequisite(s):

FROM: SCSC 641, GENE 613, STAT 619 and 652

TO: STAT 651, SCSC 642 or GENE 613 or approval of instructor

Cross-List with: SCSC 643

SCSC 643. Quantitative Genetics and Plant Breeding

Title:

FROM: Quantitative Genetics and Plant Breeding

TO: Molecular Quantitative Genetics and Plant Breeding

Description:

FROM: Applied aspects of quantitative genetics in plant breeding; examination of methodologies to analyze quantitative variation in crop species; genetic phenomena (inbreeding, heterosis and epistasis); quantitative trait loci (QTL) mapping and marker-assisted selection (MAS); genotype by environment interaction, heritability multiple traits and selection theory with implications in plant breeding.

TO: Classical, applied and molecular aspects of quantitative genetics in plant breeding; genetic relationships; genetic diversity; genetic phenomena (linkage, heterosis and epistasis); genotype by environment interaction; mapping quantitative trait loci (QTL); genomic and marker-assisted selection; application of statistical software.
Prerequisite(s):

FROM: SCSC 641; GENE 613; STAT 619 and 652

TO: STAT 651, SCSC 642 or GENE 613; or approval of instructor

Cross-List with: GENE 643
Texas A&M University  
Departmental Request for a Change in Course  
Undergraduate • Graduate • Professional  
• Submit original form and attachments •

Form Instructions
1. Request submitted by (Department or Program Name):  
   Aerospace Engineering

2. Course prefix, number and complete title of course:  
   AERO 625-Digital control of Aerospace Systems

3. Change requested  
   a. Prerequisite(s): From:  
      To:
   b. Withdrawal (reason):  
   c. Cross-list with:  

   Cross-listed courses require the signature of both department heads.

   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.

   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked:

5. Complete current course title and current catalog course description:  
   Digital Control of Aerospace Systems. Analysis and design of discrete and sampled-data controllers unique to aircraft and spacecraft; modeling of aircraft and spacecraft, sources of uncertainties; requirements and specifications; direct digital design using MIMO optimal techniques; sample rate selection, multi-rate controllers; robustness.

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):  
   Modern Control of Aerospace Systems. Linear and nonlinear controllers for aircraft and spacecraft; state and output feedback of sampled-data control systems; feedback linearization and dynamic inversion; direct sampled-data design using optimal MIMO techniques; sensing considerations, sources and modeling of uncertainties unique to aircraft and spacecraft; robustness analysis.

7. a. As currently in course inventory:

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b. Change to:

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Approval recommended by:  
Rodney D. Bowerman, Assoc Head  
Department Head or Program Chair (Type Name & Sign) Date

Department Head or Program Chair (Type Name & Sign) Date  
(if cross-listed course)

Submitted to Coordinating Board by:  
Associate Director, Curricular Services  
Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.  
Curricular Services – 02/11

Robin Autenrieth  
Chair, College Review Committee  
Date

Robin Autenrieth  
Chair, College Review Committee  
Date

Mark J. Zoran  
Chair, GC or JCC  
Date
AEROSPACE ENGINEERING
AERO 625 – Modern Control of Aerospace Systems
Fall 2012
Day/Time/Place - TBA

Course Description and Prerequisites

Linear and nonlinear controllers for aircraft and spacecraft; state and output feedback of sampled-data control systems; feedback linearization and dynamic inversion; direct sampled-data design using optimal MIMO techniques; sensing considerations, sources and modeling of uncertainties unique to aircraft and spacecraft, robustness analysis.
Prerequisite: AERO 422 or equivalent.

Learning Outcomes

To provide engineering graduate students with the analytical and computational tools necessary to synthesize, analyze, and implement sampled-data controllers for higher-order, coupled, MIMO systems subject to uncertainties, disturbances, and sensor noise. The course will particularly emphasize:
1. Properties of and analysis techniques for discrete and sampled-data MIMO systems.
2. Linear and nonlinear control techniques for both regulation and tracking.
3. Synthesis and robustness of controllers which satisfy given requirements, using modern direct digital design methods.
4. Nonlinearities, sensor requirements/limitations, and uncertainties unique to aircraft and spacecraft.
5. Implementation and simulation of digital and sampled-data control systems, including effects of roundoff error, truncation, and finite wordlength.

Instructor Information

Name: Dr. John Valsak
Telephone number: 979-845-1685
Email address: valasek@tamu.edu
Office hours: TBA
Office location: 727D Bright
TA name: TBA

Textbook and/or Resource Materials


RECOMMENDED TEXTS


READING ASSIGNMENTS
Reading assignments are listed for each block of topics. As graduate students, you are expected to read more than just the material to clarify and broaden the understanding you start to acquire during the lecture hour. On the examinations you will be expected to have gone deeper into the material than just a superficial reading of the required text; you are strongly encouraged to use all of the recommended texts and references to obtain that depth of understanding.

Grading Policies

Method of Evaluation:
Quizzes 25%
Homework 25%
Project 25%
Mid-term exam 25%
Final exam 0%
Total 100%

HOMEWORK: Homework is due in class on the date assigned.
LECTURES: The student is responsible for all lectures, announcements and assignments given during class.

Grades: Grades are based on the weighted average following the schedule above.
A 90 – 100%
B 80 – 89%
C 70 – 79%
D 60 – 69%
F below 60%

Attendance Policy and Exam Schedules

The University views class attendance as the responsibility of an individual student. Attendance is essential to complete the course successfully. University rules related to excused and unexcused absences are located on-line at http://student-rules.tamu.edu/rule07.

All semester examinations are given in accordance with the schedule published by the Office of the Registrar. Currently available at: http://admissions.tamu.edu/Registrar/General/FinalSchedule.aspx

Course Topics

Block 1 INTRODUCTION AND MATHEMATICAL MODELING OF DIGITAL COMPUTERS (1 lecture)
Characteristics of Discrete Systems Franklin C-3
Discretization of Continuous Systems
Data Reconstruction Franklin C-5
- Zero Order Hold
- First Order Hold
- Second Order Hold
- Frequency Response

Block 2 ABSTRACT VECTOR SPACES AND SIGNALS (3 lectures)
  Vector Fields Antsaklis A.1 - 4
  Vector Spaces
  Linear Dependence and Independence
  Bases
  Rank and Degeneracy
  Norms
  Subspaces and the Projection Theorem
  Range and Null Spaces Bay 3.1
  Norms and Lp, Spaces

Block 3 LINEAR SYSTEM THEORY FOR DISCRETE SYSTEMS (4 lectures)
  Reachability, Controllability, and Stabilizability for discrete systems Antsaklis 5.1,2,3
  Detectability, Observability for Discrete systems
  Canonical Forms
    - Reachable
    - Observable
    - Minimal Realizations
  Singular Values and Singular Value Decomposition Antsaklis A.9
  Non-Minimum Phase Systems
  Transmission Zeros

Block 4 MIMO DIRECT DIGITAL DESIGN (6 lectures)
  Discrete Linear Quadratic Regulator (DLQR) Lewis 3.2
  Sampled Data Regulator (SDR)
  Sub-Optimal Output Feedback Lewis 3.3
  State Estimation
  Limited State Output Feedback LQR Lewis 4.1
  Deterministic Observers Lewis 9.1
  Random Variables, Probability, and Stochastic Systems Lewis Apx C
  Stochastic Observers
  Variational Kalman-Bucy Filters Lewis 9.3
  Discrete Linear Quadratic Gaussian (LQG) Control Lewis 10.1

Block 5 TRACKING STRUCTURES FOR DISCRETE SYSTEMS (2 lectures)
  Discrete Nonzero Setpoint (DNZSP)
  Feedback Linearization Slotine C-6
  Dynamic Inversion

Block 6 ADVANCED STRUCTURES FOR DISCRETE SYSTEMS (2 lectures)
  Proportional Integral Regulator (PI)
  Proportional Integral Filter (PIF)
  Control Rate Weighting (CRW)

Block 7 ROBUSTNESS ANALYSIS, SENSOR AND IMPLEMENTATION CONSIDERATIONS
  (4 lectures)
    Uncertainty Modeling
      - Sources of Uncertainty in Aerospace Systems
      - Sensor Noise and Errors
- Structured
- Unstructured
Complex Multivariable Loop Gain and Sensitivity Lewis 8.1
Multivariable Bode Plot Lewis 8.2
Frequency Domain Specifications Lewis 8.3
- Bandwidth
- Low & High Frequency Specs
- Weighting Functions
Robustness Bounds for Plant Parameter Variations
Controller Fragility Istepanian C-2

**Americans with Disabilities Act (ADA) Policy Statement**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodations of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit [http://disability.tamu.edu](http://disability.tamu.edu)

**Academic Integrity Statement and Policy**

1) As commonly defined, plagiarism consists of passing off as one's own the ideas, words, writings, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you have the permission of that person. Plagiarism is the worst of academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated.

2) If you use the work of another person of persons in your reports or presentations, then reference the person so that due credit may be given.

3) If you are not sure about whether a particular action could be considered plagiarism or academic dishonesty on your part, then ask the instructor.

**POLICY:** Cheating will not be tolerated. The student will be automatically dropped from the course with a grade of F assigned by the instructor.

For additional information, please visit: [http://www.tamu.edu/aggiehonor](http://www.tamu.edu/aggiehonor)

"An Aggie does not lie, cheat, or steal, or tolerate those who do."
MEMORANDUM

DATE: November 1, 2011

TO: Dr. Karen Butler-Purry
    Associate Vice President for Graduate Studies
    Office of Graduate Studies
    302 J.K. Williams Administration

THRU: Dr. Robin Autenrieth
       Associate Dean for Graduate Programs
       College of Engineering
       204 Zachry

FROM: Dr. Rodney D. Bowersox
       Professor and Associate Head for Graduate Programs & Infr.
       Department of Aerospace Engineering
       611C H. R. Bright

RE: Request to Change Title/Description of Course:
    AERO 625 - Digital Control of Aerospace Systems

Approval of a new title and course description is requested for an active Aerospace Engineering course, ‘AERO 625 – Digital Control of Aerospace Systems’. New title to be: Modern Control of Aerospace Systems, to be effective Fall 2012. The revised title and description is requested to allow updating the course for modern terminology and advances in the field.

AERO 625 was taught for the first time in Fall 2001 and has been taught annually by the same professor. It was last taught in the Fall 2010 semester (CRN#10136). A screenshot of SCACRSE for this course is attached.

Thank you for your consideration of this request.

Attachments: Compass screen print
cc: Dr. David Reed, Graduate Council Chair
    Ms. Sandra Williams, Assoc. Director, Curricular Services file
Course Description

Subject: AERO - Aerospace Engineering
Course Title: DIG CONTROL AERO SYSTEMS
Course: 625
Term: 999999

Description

Digital Control of Aerospace Systems. (3-0). Credit 3. Analysis and design of discrete and sampled-data controllers unique to aircraft and spacecraft; modeling of aircraft and spacecraft, sources of uncertainties; requirements and specifications; direct digital design using HILCO optimal techniques; sample rate selection, multi-rate controllers; robustness. Prerequisite: AERO 412 or equivalent.
## Course Information

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Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
Submit original form and attachments •

1. Request submitted by (Department or Program Name): Department of Agricultural Economics

2. Course prefix, number and complete title of course: AGEC 605 Rural Real Estate Appraisal and Organization

3. Change requested
   a. Prerequisite(s): From: ____________________________ To: ____________________________
   b. Withdrawal (reason): ____________________________
   c. Cross-list with: ____________________________

   Cross-listed courses require the signature of both department heads.

d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.

e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked: ____________________________

5. Complete current course title and current catalog course description:

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):

7. a. As currently in course inventory:

   Prefix Course # Title(excluding punctuation)
   AGEC 605 RRL RLL EST APRSL ORGT

   Lect Lab SCH CIP and Final Code Admin Unit HICE Code Level
   0 2 0 2 3 5 2 1 5 0 1 0 0 1 6 0 1 4 0 0 0 3 6 3 2 6

   b. Change to:

   Prefix Course # Title(excluding punctuation)
   AGEC 605 RRL RLL EST APRSL ORGT

   Lect Lab SCH CIP and Final Code Admin Unit Acad Year HICE Code Level
   0 3 0 0 3 5 2 1 5 0 1 0 0 1 6 0 1 4 0 1 2 1 3 0 0 3 6 3 2

Approval recommended by:

John P. Nichols
Department Head or Program Chair (Type Name & Sign) Date 11/12/11

Department Head or Program Chair (Type Name & Sign) Date 11/12/11

Department Head or Program Chair (Type Name & Sign) Date 11/12/11

Submitted to Coordinating Board by:

Associate Director, Curricular Services

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu
Curricular Services - 02/11
Rural Real Estate Appraisal and Organization
Agricultural Economics 605
Spring Semester 2011

Instructor:
Dr. David J. Leatham
Office: 213 AGLS
Phone: 845-5806 email: d-leatham@tamu.edu

Teaching Assistant:
Reagan Freudenberg
RTFreudenberg@ap.tamu.edu

Office hours:
Open door policy. (If unavailable, schedule an appointment with Ashley or email me for an appointment)

Schedule appoints with Ashley in room 212A AGLS or can be reached at 845-5800.

I. Course Description:

Rural Real Estate Appraisal and Organization. (3-0). Credit 3. Concepts of property rights and their valuation; factors affecting the value of these rights are related to general economic theory to explain real estate market process; specific applications of appraisal techniques in valuing urban and rural real properties.

Course Objectives:

This course is designed primarily for students who are pursuing a career in the broad areas of Land and Real Estate Economics with special emphases on real property valuation, real estate investment and appraisal. This includes careers in real estate financing, development, investment, taxation, management, marketing, feasibility consulting, asset management, evaluation, estate planning, and valuation. The overall objective is to provide the student with a framework or skills to understand rural asset valuation and to be able to use this information for real estate investments and to perform and prepare full narrative appraisals of suburban and rural real properties with special consideration given to farm and ranch properties.

Some of the specific objectives are:

A. To become proficient in the use of economic principles relevant to rural to real estate valuation, appraisal and investment.

B. To become familiar with the appraisal, and the real estate profession.

C. To develop skills to appraise real properties, especially farms and ranches.
D. To become familiar with real estate investment including investment analysis, leverage, taxation, and risk analysis.

III. Text and Other Required Materials:


Important References:

B. "Real Estate Development: Principles and Process" by Miles, et al.

Computer Skills and Calculators

1. Lotus 1-2-3 or Excel spread sheet analyses on PC
2. Financial Calculator is Required

IV. Process

The primary purpose of the classroom presentation and discussion will be to clarify any confusing material in the text. You will be responsible for all reading assignments and homework and well as the material presented in class. Many of the detailed "facts" will be learned working the homework problems. You will need to become familiar with new terminology and principles as well as the logic and process of addressing real estate valuation and investment. Assigned problems and projects will help develop your thought processes when addressing financial management problems in the "real world". Keeping current in problem assignments will greatly enhance the learning process and reduce frustrations.

V. Prerequisite

The prerequisite for this course is AGEC 422.

VI. Calculators

A financial calculator is required for this course. Students are not allowed to use programmable calculators to retrieve alphanumeric notes during quizzes or exams. In fairness
to all students the following policy is in effect:

Students with calculators that can store alphanumerics must show the calculator to the person proctoring the exam and temporarily (2 minutes) remove the batteries before the exam starts. Failure to do this will result in a zero on the exam. Students who prefer not to remove the batteries may, with the consent of the exam proctor, sit on the front row.

VII. Elearning

Students are required to access Elearning at http://Howdy.TAMU.Edu. Course material and information will be posted to Elearning. A guide for lectures will be posted showing the lecture topic and corresponding reading assignment for each lecture. Homework assignments and projects will be posted with due dates. Exam keys and grades will be posted. You also will find a sheet listing useful websites relating to real estate. If you find interesting websites that are not listed, please email them to the instructor to be posted for all students.

VIII. Grading

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<td>Quizzes</td>
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Homework and Projects

Assignments and projects will be given regularly throughout the semester. Homework will be discussed in depth at review sessions. Assignments turned in one day late will be penalized 50%. If the homework assignment includes documentation that it was late due to a University approved absence and it is turned in within one week of the due date, it will not be penalized. Assignments turned in after assignment has been graded, without documentation of a University approved absence, will not be accepted.

Projects will be assigned that require the use of FLIPSIM/SIMETAR and ARGUS software.

Quizzes

Quizzes will be given for each lecture. You will be tested over material covered in the textbook and lecture. The quizzes will be given via Elearning after each lecture and you will
have until the next lecture to take the quiz; otherwise, the quiz score will be zero.

Examinations

First exam, Thursday, February 25

Second exam, Thursday, April 1

Final Examination is scheduled for Wednesday, May 12, from 1:00 to 3:00 p.m.

Missed exams

If a student misses an exam because of university-approved absences, the final exam will count for the missed exam. If a student misses more than one exam because of university-approved absences, the final exam will count for all missed exams.

Confidentiality of Graded Assignments

Graded assignments including quizzes and exams will be handed back by row. If you wish to keep your score confidential you may put your class-assigned student number on the assignment in lieu of your name. If you feel that this procedure still does not provide sufficient confidentiality, please tell the instructor immediately.

Religious exemption

Students who wish to reschedule final exams for religious reasons should inform their instructor by the deadline date for Q drops.

IX. Optional Instruction

Review sessions will be conducted by the instructor or teaching assistant to work with you as needed on any problem related to the course or homework. Students with inadequate background in accounting and economics are especially encouraged and expected to participate in these review sessions. The instructor and teaching assistant will not lecture at review session. They will respond to your questions and may ask others in the class to work problems to help generate discussion.

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If students are not present by 15 minutes of starting time or soon after, the review session will be canceled.
X. Course Topics

Part I. The Foundation of Rural and Agricultural Property Valuation

1. Property and Property Rights
2. Concepts of Value
3. The Valuation Process for Rural and Agricultural Properties
4. Rural Rights and Interests

Part II. Data Collection and Analysis

5. Data Collection-- Sources for Subject and Sales
6. Regional and Neighborhood Data and Analysis
7. Legal Descriptions
8. Land Descriptions
9. Site Improvements
10. Building Descriptions
11. Highest and Best Use Analysis
12. Sales and Data Analysis

Part III. Valuing Rural Property

13. The Cost Approach
14. The Sales Comparison Approach
15. The Income Capitalization Approach
16. Reconciliation and the Final Opinion of Value
17. Writing Appraisal Reports

Part IV. Introduction to Real Estate Finance and Investment

18. Introduction and Legal Concepts
19. The Interest Factor in Real Estate

Part V. Financing Income Properties (Debt and Income)

20. Introduction to Income-Producing Properties: Leases, Rents and the Market for Space
22. Investment Analysis and Taxation of Income Properties
23. Financial Leverage and Financing Alternatives
24. Risk Analysis

XI. Related Reading Material

A. Other Important Books for AGEC 605

1. "Dictionary of Real Estate Terms" by Jack P. Friedman
2. "The Appraisal of Farm Real Estate" by R. C. Suter, 2nd Edition
3. "Real Estate Appraisal Terminology" by B. N. Boyce
4. "Land Resource Economics" by Raleigh Barlowe
5. "Income Property: Appraisal and Analysis" by Jack Friedman et al.

B. Other Reference and Materials

1. Publications from the Real Estate Center, TAMU
2. Texas Agrilife Extension Services, "Crops and Livestock Budgets"
3. "Journal of Farm Managers and Rural Appraisers"
4. "American Journal of Agricultural Economics"
5. "The Appraisal Journal"
6. "The Real Estate Appraiser"
7. "TExAS Soil Survey Reports"
8. The Wall Street Journal

XII. Copyrights Statement: Please note that all handouts and supplements used in this course are copyrighted. This includes all materials generated for this class, including but not limited to syllabi, exams, in-class materials, review sheets, and lecture outlines. Materials may be downloaded or photocopied for personal use only, and may not be given or sold to other individuals.

XIII. Scholastic Dishonesty Statement: As commonly defined, plagiarism consists of passing off as one's own ideas, work, writings, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. If you have questions regarding plagiarism, please consult the latest issue of the Texas A&M University Student Rules, under the section "Scholastic Dishonesty."

VX. ADA Policy Statement: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room 126 of the Koldus Building. The phone number is 845-1637.
Scholastic Honesty and Classroom “Rules.”

A note on cheating. It is not tolerated! If you are caught in the act, you will automatically receive a zero on the work in question. Your instructor will then proceed in completing the Honor Code Violation Report form and report you, through the Department of Agricultural Economics Undergraduate Office, to the Honor Council.

For many years Aggies have followed a Code of Honor, which is stated in this very simple statement:

An Aggie does not lie, cheat or steal
or tolerate those who do.

The Aggie Code of Honor is an effort to unify the aims of all Texas A&M men and women toward a high code of ethics and personal dignity. For most, living under this code will be no problem, as it asks nothing of a person that is beyond reason. It only calls for honesty and integrity, characteristics that Aggies have always exemplified. The Aggie Code of Honor functions as a symbol to all Aggies, promoting understanding and loyalty to truth and confidence in each other.

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the Texas A&M University community from the requirements or the processes of the Honor System. For additional information, please visit: www.tamu.edu/aggiehonor.

On all course work, assignments, and examinations at Texas A&M University, the following Honor Pledge shall be preprinted and signed by the student:

“On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work.”

_________________________   ____________________
Student’s Signature                Date

_________________________   ____________________
Student’s Printed Name                UIN
Texas A&M University

Departmental Request for a Change in Course
Undergraduate • Graduate • Professional

Submit original form and attachments

Form Instructions

1. Request submitted by (Department or Program Name): ARCHITECTURE

2. Course prefix, number and complete title of course: ARCH 601 - Design Fundamentals

3. Change requested

   a. Prerequisite(s): From: Graduate classification; career change program To: ARCH 600 and concurrent enrollment in ARCH 610

   b. Withdrawal (reason):

   c. Cross-list with:

   Cross-listed courses require the signature of both department heads.

   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.

   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked:

5. Complete current course title and current catalog course description:

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):

7. a. As currently in course inventory:

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Approval recommended by:

Ward V. Wells

Department Head or Program Chair (Type Name & Sign) Date 10/25/11

Leslie Feigenbaum

Chair, College Review Committee Date 10/25/11

Dean of College

Mark Zora

Chair, GC or UCC Date DEC 1 2011

Submitted to Coordinating Board by:

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Curricular Services – 02/11
Supporting Statement for ARCH 601 – Design Fundamentals I

Request for Change in Course Prerequisites:
From: Graduate classification; career change program
To: Graduate classification in Architecture or approval of instructor; career change program, ARCH 600 and concurrent enrollment in ARCH 610

Supporting Statement:
ARCH 600 is an introductory course for the career change program that takes place at the end of summer before the fall studio (ARCH 601), in which case students cannot register in ARCH 601 without this introduction (ARCH 600). The concurrent enrollment in ARCH 610 is based on the necessity of the communications course (ARCH 610) in order for a better understanding and performance in design studio (ARCH 601)
Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional

Submit original form and attachments

**Form Instructions**

1. Request submitted by (Department or Program Name): ARCHITECTURE
2. Course prefix, number and complete title of course: ARCH 610 - Visual Communications

   Attach a brief supporting statement for changes made to items 3a thru 3d and 6 below.

3. Change requested
   a. Prerequisite(s): From: Graduate classification To: Graduate classification or approval of instructor; and concurrent enrollment in ARCH 601
   b. Withdrawal (reason):
   c. Cross-list with: Cross-listed courses require the signature of both department heads.
   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.
   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked:

5. Complete current course title and current catalog course description:

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):

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   Approval recommended by:
   Ward V. Wells 1/15/2011
   Department Head or Program Chair (Type Name & Sign)

   Leslie Feigenbaum 1/25/11
   Chair, College Review Committee

   Mark Zoran 12/1/2011
   Chair, GC or UCC

   Submitted to Coordinating Board by:
   Associate Director, Curricular Services

   Date

   Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
   Curricular Services – 02/11
Supporting Statement for ARCH 610 – Visual Communications

Request for Change in Course Prerequisites:
From: Graduate classification
To: Graduate classification or approval of instructor; and concurrent enrollment in ARCH 601

Supporting Statement:
The concurrent enrollment in ARCH 601 is based on the necessity of the communications course (ARCH 610) in order for a better understanding and performance in design studio (ARCH 601)
Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
• Submit original form and attachments •

Form Instructions
1. Request submitted by (Department or Program Name): ARCHITECTURE
   
2. Course prefix, number and complete title of course: ARCH 619 - Applied Solar Energy
   
Attach a brief supporting statement for changes made to items 3a thru 3d and 6 below.

3. Change requested
   a. Prerequisite(s): From: ARCH 333, 334 or 615 or approval of instructor
      To: ARCH 335 or 615 or equivalents
   b. Withdrawal (reason):
   c. Cross-list with:
      Cross-listed courses require the signature of both department heads.
   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.
   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked:

5. Complete current course title and current catalog course description:

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):

7. a. As currently in course inventory:

Prefix | Course # | Title (excluding punctuation) | Lect. | Lab | SCH | CIP and Fund Code | Admin. Unit | EICE Code | Level
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ARCH | 619 | APPLIED SOLAR ENERGY | 0300003040404010000602900036326 |

b. Change to:

Prefix | Course # | Title (excluding punctuation) | Lect. | Lab | SCH | CIP and Fund Code | Admin. Unit | Acad. Year | FICE Code
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---

Approval recommended by:
Ward V. Wells
Department Head or Program Chair (Type Name & Sign) Date

Leslie Feigenbaum
Chair, College Review Committee Date

Dean of College
Department Head or Program Chair (Type Name & Sign) Date
(if cross-listed course)

Mark Lott
Chair, GC or UCC Date

Submitted to Coordinating Board by:
Associate Director, Curricular Services Date Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Curricular Services – 02/11
Supporting Statement for ARCH 619 – Applied Solar Energy

Request for Change in Course Prerequisites:
From: ARCH 333, 334 and 615, or approval of instructor
To: Graduate classification or approval of instructor; ARCH 335 or 615 or equivalents

Supporting Statement:
ARCH 333 and 334 are no longer taught in the undergraduate degree program. They were replaced with ARCH 335. In addition, the change request is to clarify and make more consistent the offering of courses and prerequisites.
Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional

Form Instructions

1. Request submitted by (Department or Program Name): ARCHITECTURE

2. Course prefix, number and complete title of course: ARCH 621 - Energy Optimization in Building Design

3. Change requested
   a. Prerequisite(s): From: ARCH 633; CSCE 203 or equivalent
   b. Withdrawal (reason):
   c. Cross-list with:
   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.
   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked:

5. Complete current course title and current catalog course description: Energy Optimization in Building Design - Optimum energy use strategies for buildings, energy audit methods, life-cycle cost analysis of building energy systems, solar system applications, building system optimization by computer simulation techniques; case studies in passive energy and solar applications

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words): Energy Optimization in Building Design - Optimum energy use strategies for commercial buildings, hourly energy simulation methods, building envelope and HVAC system energy optimization by computer simulation techniques; life-cycle cost analysis of building energy systems; case studies in commercial building applications

7. a. As currently in course inventory:

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   Approval recommended by:

   Ward V. Wells
   Department Head or Program Chair (Type Name & Sign)
   Date

   Leslie Feigenbaum
   Chair, College Review Committee
   Date

   Dean of College
   Date

   Mark Zoran
   Chair, GC or UOC
   Date

   Date

   Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Curricular Services – 02/11
Supporting Statement for ARCH 621 – Energy Optimization in Building Design

Request for Change in Course Prerequisites and Course Description:
From: ARCH 633; CSCE 203 or equivalent
- Optimum energy use strategies for buildings, energy audit methods, life-cycle cost analysis of building energy systems, solar system applications, building system optimization by computer simulation techniques; case studies in passive energy and solar applications.

To: Graduate classification or approval of instructor; ARCH 335 or 615 or equivalents
- Optimum energy use strategies for commercial buildings, hourly energy simulation methods, building envelope and HVAC system energy optimization by computer simulation techniques; life-cycle cost analysis of building energy systems; case studies in commercial building applications.

Supporting Statement:
The CSCE 203 course is no longer needed as a prerequisite for this class. Graduate classification or approval of instructor has been added to prevent undergraduates from registering without instructor approval. The course description has been changed clarify and make more consistent the offering of course.
Texas A&M University
Departmental Request for a Change in Course
Undergraduate * Graduate * Professional
* Submit original form and attachments *

Form Instructions
1. Request submitted by (Department or Program Name): ARCHITECTURE
2. Course prefix, number and complete title of course: ARCH 625 - Sustainable Housing Design
   Attach a brief supporting statement for changes made to items 3a thru 3d, and 6 below.
3. Change requested
   a. Prerequisite(s): From: ENDS 233; ARCH 334 To: Graduate classification or approval of instructor, ARCH 335 or equivalent
   b. Withdrawal (reason): 
   c. Cross-list with: Cross-listed courses require the signature of both department heads.
   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.
   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.
4. For informational purposes only, please indicate course number if this course will be stacked:
5. Complete current course title and current catalog course description:

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):

7. a. As currently in course inventory:

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Approval recommended by:

Ward V. Wells
Department Head or Program Chair (Type Name & Sign) Date

Department Head or Program Chair (Type Name & Sign) Date
(if cross-listed course)

Submitted to Coordinating Board by:

Associate Director, Curricular Services

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Curricular Services – 02/11
Supporting Statement for ARCH 625 – Sustainable Housing Design

Request for Change in Course Prerequisites:
From: ENDS 233; ARCH 334
To: Graduate classification or approval of instructor; ARCH 335 or equivalent

Supporting Statement:
ENDS 233 and ARCH 334 are no longer taught in the undergraduate degree program. They were replaced with ARCH 335. In addition, the change request is to clarify and make more consistent the offering of courses and prerequisites.
Texas A&M University

Departmental Request for a Change in Course

Undergraduate + Graduate + Professional

- Submit original form and attachments -

Form Instructions

1. Request submitted by (Department or Program Name): ARCHITECTURE

2. Course prefix, number and complete title of course: ARCH 631 - Architectural Structures III

3. Change requested
   a. Prerequisite(s): From: ARCH 431 or approval of instructor To: Graduate classification or approval of instructor
   b. Withdrawal (reason): 
   c. Cross-list with: 
   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.
   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked:

5. Complete current course title and current catalog course description:

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):

7. a. As currently in course inventory:

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Approval recommended by:

Ward V. Wells
Department Head or Program Chair (Type Name & Sign) Date: 10/25/11

Leslie Feigenbaum
Chair, College Review Committee Date: 11/25/11

Dean of College
Date: DEC 1 2011

Mark Zoran
Chair, GC or UCC Date: 11/25/11

Submitted to Coordinating Board by:

Associate Director, Curricular Services

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services - 02/11
Supporting Statement for ARCH 631 – Architectural Structures III

Request for Change in Course Prerequisites:
From: ARCH 431 or approval of instructor
To: Graduate classification or approval of instructor

Supporting Statement:
Removed ARCH 431 because when admitted to the M.Arch program, they are admitted having the equivalent undergraduate requirements.
Texas A&M University
Departmental Request for a Change in Course
Undergraduate ♦ Graduate ♦ Professional
* Submit original form and attachments *

Form Instructions
1. Request submitted by (Department or Program Name): ARCHITECTURE
2. Course prefix, number and complete title of course: ARCH 633 - Environmental Systems III
3. Change requested
   a. Prerequisite(s): From: ARCH 334 To: ARCH 335 or 615 or equivalents
   b. Withdrawal (reason):
   c. Cross-list with:
   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.
   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.
4. For informational purposes only, please indicate course number if this course will be stacked:
5. Complete current course title and current catalog course description:

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):

7. As currently in course inventory:

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Approval recommended by:
Ward V. Wells
Department Head or Program Chair (Type Name & Sign) Date

Leslie Feigenbaum
Chair, College Review Committee Date

Dean of College Date
Mark Zoran
Chair, GC or UCC Date

Submitted to Coordinating Board by:
Associate Director, Curricular Services Date

Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Supporting Statement for ARCH 633 – Environmental Systems III

Request for Change in Course Prerequisites:
From: ARCH 334
To: Graduate classification or approval of instructor; ARCH 335 or 615 or equivalents

Supporting Statement:
ARCH 334 is no longer taught in the undergraduate degree program. It was replaced with ARCH 335. ARCH 615 is being added. In addition, the change request is to clarify and make more consistent the offering of courses and prerequisites.
Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
Submit original form and attachments •

Form Instructions

1. Request submitted by (Department or Program Name): ARCHITECTURE
   Course prefix, number and complete title of course: ARCH 634 - Architectural Lighting
   Graduate classification or approval of instructor:

2. Change requested
   a. Prerequisite(s): From: ARCH 449 or equivalent To: ARCH 335 or equivalent
   b. Withdrawal (reason):
   c. Cross-list with:
   Cross-listed courses require the signature of both department heads.
   d. Change in course title and description. Enter current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for course change in title.
   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

3. For informational purposes only, please indicate course number if this course will be stacked:

4. Complete current course title and current catalog course description:

5. Complete proposed course title and proposed catalog course description (not to exceed 30 words):

6. Complete proposed course title and proposed catalog course description (not to exceed 30 words):

7. a. As currently in course inventory:
   Prefix: ARCH
   Course #: 634
   Title (excluding punctuation): LIGHTING
   Lect., Lab, SCH, CIP and Fund Code: 020304020100060290003632
   Admin. Unit: 06
   FICE Code: 003632
   Level: 6

   b. Change to:
   Prefix: ARCH
   Course #: 634
   Title (excluding punctuation): LIGHTING
   Lect., Lab, SCH, CIP and Fund Code: 020304020100060290003632
   Admin. Unit: 06
   FICE Code: 003632
   Level: 6

   Approval recommended by:
   Ward V. Wells
   Department Head or Program Chair (Type Name & Sign) Date
   Leslie Feigenbaum
   Chair, College Review Committee Date
   Dean of College
   Date

   Submitted to Coordinating Board by:
   Mark Zoran
   Chair, GC or UCC Date
   Date

   Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
Curricular Services – 02/11
Supporting Statement for ARCH 634 – Architectural Lighting

Request for Change in Course Prerequisites:
From: ARCH 449 or equivalent
To: Graduate classification or approval of instructor; ARCH 335 or equivalent

Supporting Statement:
ARCH 449 is no longer taught in the undergraduate degree program. In addition, the change request is to clarify and make more consistent the offering of courses and prerequisites.
Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
• Submit original form and attachments •

Form Instructions

1. Request submitted by (Department or Program Name): ARCHITECTURE

2. Course prefix, number and complete title of course: ARCH 647 - Recording Historic Buildings

3. Change requested
   a. Prerequisite(s): From:_________ To:_________
   b. Withdrawal (reason):_________
   c. Cross-list with:_________

   Cross-listed courses require the signature of both department heads.

d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.

e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked:_________

5. Complete current course title and current catalog course description:

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):

7. a. As currently in course inventory:

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Approval recommended by:

Ward V. Wells
Department Head or Program Chair (Type Name & Sign) Date

Leslie Feigenbaum
Chair, College Review Committee Date

Dean of College
Date

Mark Zoran
Chair, GC or UCC

Submitted to Coordinating Board by:

Associate Director, Curricular Services

Date Effective Date

Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra-williams@tamu.edu.
Curricular Services – 02/11
Supporting Statement for ARCH 647 – Recording Historic Buildings

Request for Change in Course Prerequisites:
From: Graduate classification; appropriate background in architectural drawing; approval of instructor
To: Graduate classification or approval of instructor

Supporting Statement:
This course is taught in the Department of Architecture for graduate students primarily in Architecture. The change request is to clarify and make more consistent the offering of courses and prerequisites.
Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
• Submit original form and attachments •

1. Request submitted by (Department or Program Name): ____________________________
   Select or Type Department/Program Name

2. Course prefix, number and complete title of course:
   GENE 643 Quantitative Genetics and Plant Breeding

3. Change requested
   a. Prerequisite(s): From: ____________________________ To: ____________________________
   b. Withdrawal (reason): __________________________________________________________________
   c. Cross-list with: SCSC 643

   Cross-listed courses require the signature of both department heads.

d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.

e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked: ____________________________

5. Complete current course title and current catalog course description:
   Title: Quantitative Genetics and Plant Breeding
   Applied aspects of quantitative genetics in plant breeding; examination of methodologies to analyze quantitative variation in crop species; genetic phenomena (inbreeding, heterosis and epistasis); quantitative trait loci (QTL) mapping and marker-assistant selection (MAS); genotype by environment interaction, heritability multiple traits and selection theory with implications in plant breeding.

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):
   Title: Molecular Quantitative Genetics and Plant Breeding
   Classical, applied and molecular aspects of quantitative genetics in plant breeding; genetic relationships; genetic diversity; genetic phenomena (linkage, heterosis, and epistasis); genotype by environment interaction: mapping quantitative trait loci (QTL); genomic and marker-assisted selection; application of statistical software

7. a. As currently in course inventory:

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Approval recommended by:

Department Head or Program Chair (Type Name & Sign) ____________________________ Date ____________________________

Dean of College ____________________________ Date DEC 1 2011

Questions regarding this form should be directed to Sandra Williams at 845.8201 or sandra.williams@anmu.edu.
Curricular Services – 02/11
Texas A&M University
Departmental Request for a Change in Course
Undergraduate + Graduate + Professional
Submit original form and attachments

1. Request submitted by (Department or Program Name):
Interdisciplinary Program in Genetics

2. Course prefix, number and complete title of course:
GENE 843; Quantitative Genetics and Plant Breeding

3. Change requested
a. Prerequisite(s) From:
   SCSC'641, GENE 813, STAT 619 and 652
   STAT 651; SCSC 642 or GENE 613, or approval of instructor
   To:

b. Withdrawal (reason):

   Cross-list with: SCSC 643

   Cross-listed courses require the signature of both department heads.
   (Signature)

   Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.
   Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus

4. For informational purposes only, please indicate course number if this course will be stacked:

5. Complete current course title and current catalog course description:
Quantitative Genetics and Plant Breeding

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):
Molecular Quantitative Genetics and Plant Breeding

7. a. As currently in course inventory:

   Course Title: GENE 643 QUANT GENE PLANT BREEDING
   Text: 030003260805000204200036326
   E/C: 0

   Change to:

   Course Title: GENE 643 MOL QUANT GENE PLANT BREED
   Text: 0300032608050002042012-13003632
   E/C: 0

   Approval recommended by:
   Craig Coates  11-17-11

   Department Chair or Program Chair (Type Name & Sign) Date

   Department Chair or Program Chair (Type Name & Sign) Date
   (if cross-listed course)

   Submitted to Coordinating Board by:
   Date

   Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.
   Curricular Services – 02/11
Rationale:
I am proposing minor changes of the course title, prerequisites and course description for class SCSC 643/GENE 643 to reflect the niche the course has evolved to fill. This course was initially developed by my predecessor over 8 years ago. After he left, much of the classical quantitative genetic material was incorporated into the SCSC 642 course (a prerequisite for SCSC 643). Since I have taught the class, student evaluations (both formal and informal) have suggested that increased emphasis is needed on applying recent molecular findings and tools to quantitative genetics, such as quantitative trait loci (QTL) mapping and studies of genetic diversity. The way in which the findings are now presented directly relates to the application of molecular quantitative genetics to plant breeding and plant improvement. These changes are a realignment of the title and description to what is actually being taught now.

The prerequisite change is necessitated in that STAT 619 is no longer offered to my knowledge, STAT 652 requires a set of tools that is unnecessary for students to succeed and STAT 651 (STAT 652’s prerequisite) provides a sufficient introduction to statistics. SCSC 641 provides a background on applied plant breeding and basic genetics theory. SCSC 641 does not provide sufficient quantitative genetics background alone so this has been replaced by SCSC 642 (which has SCSC 641 as a prerequisite) that provides advanced genetic background especially in classical quantitative genetics as applied to plant breeding. For students interested in the molecular tools without needing an advanced classical quantitative genetics background, GENE 613 provides grounding in advanced genetics.

Although not required for this proposed change the course syllabus may be found below.
Spring 2012 Quantitative Genetics in Plant Breeding  
SCSC 643/ GENE 643

When and where:  
Tue. / Thur. 9:35 am – 10:50 am  
Room 224, Heep Building

Instructor:  
Dr. Seth C. Murray  
Agronomy Field Lab – 111  
Office (979) 845-3469, Lab (979) 845-4195  
sethmurray@tamu.edu

Office hours:  
To be decided in class.  
(Appointments are always possible)

Website:  
Lectures will be available via TAMU eLearning Vista http://elearning.tamu.edu/  
Static website http://maizeandgenetics.tamu.edu/SethCMurray/Teaching.html

Course description:  
Graduate education in quantitative genetics is critical for success as a modern scientific plant breeder or geneticist. This course focuses on the understanding of current quantitative and population genetics for plant breeding scientists. It covers both theory and applied approaches and encourages you to reach across both commodity and discipline for interdisciplinary thinking and creative approaches. The course attempts to translate modern scientific findings and theories to application of traditional field breeding, molecular locus identification, and ultimately marker assisted breeding. A lot of material and approaches are covered briefly to reinforce different ways of viewing a few core concepts: population genetic diversity, gene effects, linkage, and epistasis always mindful of the end goal: crop improvement.

Prerequisites:  
STAT 651, SCSC 642 (Plant Breeding II) or GENE 613, or approval of instructor.

Textbooks and resource material listing:  
There is no textbook required. Class notes, journal articles and presentations will be posted on eLearning before we discuss them. Other pertinent material will be handed out in class. Software required for this course includes ‘R’, Mapmaker, QTL cartographer, Structure and TASSEL, all freely available.

Recommended helpful texts that were consulted in designing this class:  


Lynch, M., and J. B. Walsh. 1998. Genetics and Analysis of Quantitative Traits. Sinauer Associates, Sunderland, MA. (Nice reference but terminology and writing make it very difficult to read in my opinion – if you take a summer institute in statistical genetics course it may be included freely.)

Ross, S. 2002. A First Course in Probability, sixth edition. Pearson Education, India. (There is a probability basis behind all phenomenon you will observe and all decisions you will make – this helps to understand this a little better.)


Schedule: There are 15 weeks in the semester and 12 sections below, relative emphasis of each section will be dictated by student interests.

**Phenotypic Quantitative Genetics**

*(some understanding of molecular markers and techniques will be needed)*

1: **Introduction**
- Syllabus overview
- Review: genetics concept, statistics concepts
- Quantitative genetics: historical overview, basic concepts
- Population genetics: historical overview, basic concepts
- Probability theory and statistics
- Introduction to R (http://www.r-project.org/)
- Introduction / review of molecular markers

2: **Genetic models**
- Genetic models for means
- Genetic models for variances

3: **Genetic and environmental variances**
- Genetic and environmental variances
- Heritability
- Yield stability
- Genetic gain from selection

4: **Relationships and genetic diversity**
- Covariances among relatives
- Heterosis
- Combining ability
- Inbreeding coefficients
- Genetic distance

5: **Recurrent selection & linkage**
- Synthetic populations
- Genetic drift
- Introgression
- Linkage and linkage disequilibrium (LD)

6: Epistasis
- Advanced epistasis
- Testers
- Hemizygosity
- Multiple trait selection

Molecular Quantitative Genetics

7: Bi-parental QTL mapping I.
- What is a QTL, why do they matter, and how do they connect to what we have covered?
- Genetic map construction
- Single marker analysis

8: Bi-parental QTL mapping II.
- Interval mapping, composite interval mapping
- Bayesian mapping
- Reality situations (tetraploid, half sib, unknown parents, etc.)

9: Association mapping
- Linkage disequilibrium (pt. II)
- Population structure, sub-structure, kinship, genetic distance
- TASSEL

10: Selection mapping (identifying temporal selection)
- Recurrent selection revisited

11: QTL MAS & genomic Selection
- Marker assisted selection in the phenotypic quantitative genetics model
- Genomic selection (the next big thing)

12: Putting it all together
- Team research project proposal presentations

Course rationale
I assume that in your previous courses you have learned how to be a good scientific plant breeder: how to identify and use genetic diversity, how to select, how to minimize GxE, how to evaluate field data, etc. The scientific goals of this class include reinforcing these previously learned concepts, adding relevant statistical and molecular technologies, relating recent scientific discoveries to plant breeding and finally helping you synthesize new concepts. A major focus is to help you understand the complexity of what is going on in the genome and how four main concepts: population genetic diversity, gene effects, linkage, and epistasis should affect how you breed and research plants (i.e. crop improvement). Internalizing these four concepts are the learning goals of the class, not how to use specific software or perform specific calculations (but this is good too).

In this course we will first review topics with traditional (phenotypic) quantitative genetics, both the basic theory of genetic models and application for estimating the effects within these genetic models, calculating heritability, and combining ability.

We will then cover molecular quantitative genetics as it applies to scientific breeding. Although some people stress a difference between `field` and `molecular` breeding, these are already integrated in
many breeding programs. You can think of markers as one more way we are able to partition variance. Molecular breeding is not about spending all day in a lab genotyping, it is a tool providing biologically relevant information for selection and understanding of your organism of interest. If you went to a large corporate corn or soybean program today you would see marker assisted selection for known QTL on a massive scale being done by people who are field breeders. If you went to another large company you would see complex molecular genetics models predicting which crosses will be the most successful; this has let the breeders spend more time evaluating the best plants rather than simply making crosses to determine which plants are best. In public sector breeding you will also be much more successful understanding and even applying some of these same molecular techniques. The $100 genome sequence is coming quickly. In both the public and private sector molecular breeding is becoming increasingly automated. To be most successful as a PhD breeder and/ or geneticist you must understand these tools and how to design a good experiment to take advantage of them (or at the very least understand the implications of others work). We no longer will be working with tens of markers on a few genes of interest; we will be working with thousands or millions that move towards predicting and designing the biology we want to see. Organizing, protecting, interpreting and using this data is a challenge in itself.

**Learning objectives:**

**Thinking and analysis**

1. Apply and summarize the higher Bloom’s Taxonomy thinking levels in all communication.
2. Apply computational thinking to problem solving.
3. Synthesize your discipline in a larger context and integrate concepts from other disciplines.
   (We will approach this by reading popular press articles at the beginning of class.)
4. Assess the limitations of an experiment or study, discriminate where biases might occur, and recommend how to correct these limitations.
5. Demonstrate an ability to deal with complexity. From scientific concepts, to learning new software, there are no easy answers.
6. Be able to explain and support all of your decisions

**Professionalism and leadership.** For many students it will be one of the last courses that you take before you enter your profession.

1. Demonstrate an ability to develop a professional resume / CV ; be able to explain everything about this document.
2. Demonstrate leadership and followship when working in a team with others, both in an out of class. (You will be working with these peers for potentially the rest of your life so you should get to know them now - before they are famous!)
3. Demonstrate an ability to take criticism positively and integrate others criticism to further improve your work.

**Science**

1. Describe, explain and assess scientific findings in primary source journal articles.
2. Describe, explain and assess scientific approaches presented in class.

**Data analysis, simulations, and software**

7. Apply computer simulations to research questions of interest; summarize and assess the results.
8. Distinguish the most challenging aspects of learning new computer software.

**Evaluation philosophy**
In this class I will present knowledge and my own interpretations. For your assignments I will not present all knowledge necessary, and in some cases present no knowledge but will expect you to conduct evaluation and synthesis of a topic. I believe that you, as PhD students should be able to find all background knowledge necessary and then use it. I expect you to be able to find information on your own and hope you will already be familiar doing so. Use Google* liberally - it is your friend and knowledge (in Bloom thinking level terms) is now easily accessible. Just because other teachers have taught you knowledge and then tested you on this, does not mean that this is a good use of your time or mine. I assume the only way to learn is by trying - find what you do not know, do the best you can, and then use criticism to improve.

* Or your favorite search engine.

Grading:
50%: Exercise Problems (5 sets) – Due one week after they are given.
10%: Reading assignments.
10%: Quizzes (2) - First 20 min. of class based on problem sets.
10%: Wiki contribution - See Wiki section of syllabus.
20%: Team research project proposals.

Grading Scale: A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; F = < 60%

50% Exercise problems
Due one week after given – at the beginning of class. I expect each problem set could take more than 20 hours of your time. Genetics and statistics will be abstract unless you struggle through the problems; this course combines both. If the problem sets are taking longer than this, please see me. They are not designed to be busy work. Grades will be based on appearance, clarity, conciseness and most importantly, the amount of thought you put in. Your level of thought is graded based on Bloom’s Taxonomy thinking levels (see back of assignment #1). Late work drops grade 25% after each subsequent class. Throughout your career, if your writing is hard to follow, boring or looks messy and unattractive, people will not want to read it; therefore comments and grades are necessarily also directed at these aspects. If you do poorly you may be asked to submit a revision. If so please highlight all changes so I can find them easily.

10%: Reading assignments
Do your reading and be prepared to contribute to discussion and/ or answer questions on it. Each paper discussion will be led by one student.

10%: Quizzes
Quizzes will be unannounced and given at the beginning of class. Quiz questions will be based on assignments I have returned to you. The objective of the quizzes is to make you look over your returned work and helping you fill in your gaps in understanding.

10% Wiki contribution
Contribution to the wiki is two-fold. 1) You need to put concepts into your own words, and give your own examples – this helps reinforce what you have learned. 2) There is little available online or in print to get the “Readers Digest” version of the newest concepts, terms, systems and examples we will discuss in this class. You should describe topics however you think it will be easiest for others to learn. You can help perform Darwinian selection on scientific ideas! 3) Your examples and projects may inspire the next scientific breakthrough…but only if they are shared and published.
20% Team research proposals
You will each be a leader and a team member in groups of two to four. Your team goal is to get your
research proposal funded by a fictional private science agency. You will come up with one proposal
utilizing everyone's expertise (either three independent but synergistic projects, or one project that
everyone could participate in). The project must translate and build on something learned in this class
and be novel (i.e. fundable). 10pg. max including budget. Brevity is desirable. Assignment benchmarks
will be given to keep you on track.

Academic integrity:
Science cannot be conducted in isolation and thus I highly encourage you to collaborate with your
colleagues in the class. You will likely have interactions with them or through them for the rest of your
career. You will also learn more from them than you do from me. If you do not personally need help
then please help others who do. This being said I will not tolerate any direct copying or lack of effort
(i.e. laziness) in problem solving and neither should you.

"An Aggie does not lie, cheat or steal or tolerate those who do."
Please see the Honor Council Rules and Procedures on the web: http://www.tamu.edu/aggiehonor

Americans with Disabilities Act (ADA) policy:
The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides
comprehensive civil rights protection for persons with disabilities. Among other things, this legislation
requires that all students with disabilities be guaranteed a learning environment that provides for
reasonable accommodation of their disabilities. If you believe you have a disability requiring an
accommodation, please contact the Department of Student Life, Services for Students with Disabilities
in Room B-118 in the Cain Building, or call 845-1637.

Attendance and Homework Policy
Due to the participatory nature of this class, attendance is expected. Excused absences for class
activities are subject to TAMU rules and guidelines please see: http://student-rules.tamu.edu/rule7.htm
for details.

Expectations of students
- I expect you want to learn the material.
- I expect you to try hard.
- I expect you to take risks.
- I expect that you will not hesitate to ask a question or correct me if I am wrong.
- I expect that if you are having problems with the material you will contact me.
- I expect the problem sets could to take more than 20 hours of time.
- I expect you to do the assigned readings.
- I expect you to use higher levels of thinking and do the background research necessary to support all
  statements and conclusions.

Expectations of your teacher
- You should expect that I want to teach you the course material.
- You should expect that I will try my best to help you succeed.
- You should expect that I will be fair.
- You should expect me to be prepared and ready to defend anything I want you to know.
- You should expect for me to call on you when you are not paying attention.
17 November 2011

Dr. Craig Coates, Chair of Genetics
Department of Entomology
Texas A&M University
College Station, TX 77843

Dear Craig,

I have reviewed the changes requested for the SCSC/GENE 643 course. The Department of Biology has no objection to these changes, and in fact, we strongly support them. Good luck with the approval process.

Sincerely,

[Signature]

Thomas D. McKnight
Associate Head of Biology
**Texas A&M University**

**Departmental Request for a Change in Course**

**Undergraduate + Graduate + Professional**

*Submit original form and attachments*

**Form Instructions**

1. Request submitted by *(Department or Program Name): Department of Soil and Crop Sciences* *(Date)*

2. Course prefix, number and complete title of course: *SCSC 643, Quantitative Genetics and Plant Breeding*

   **Attach a brief supporting statement for changes made to items 3d & 8 below.**

3. Change requested:
   
   a. Prerequisite(s): From: *SCSC 641; GENE 613; STAT 619 and 652.* To: *STAT 651; SCSC 642 or GENE 613; or approval of instructor*
   
   b. Withdrawal (reason):
   
   c. Cross-list with: *GENE 643* *(Cross-listed courses require the signature of both department heads)*
   
   d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.
   
   e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

4. For informational purposes only, please indicate course number if this course will be stacked:

5. Complete current course title and current catalog course description:
   
   **Title:**
   
   Quantitative Genetics and Plant Breeding
   
   Applied aspects of quantitative genetics in plant breeding; examination of methodologies to analyze quantitative variation in crop species; genetic phenomena (inbreeding, heterosis and epistasis); quantitative trait loci (QTL) mapping and marker-assisted selection (MAS); genotype by environment interaction, heritability multiple traits and selection theory with implications in plant breeding.

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):
   
   **Title:**
   
   Molecular Quantitative Genetics and Plant Breeding
   
   Classical, applied and molecular aspects of quantitative genetics in plant breeding; genetic relationships; genetic diversity; genetic phenomena (linkage, heterosis and epistasis); genotype by environment interaction; mapping quantitative trait loci (QTL); genomic and marker-assisted selection; application of statistical software.

7. a. As currently in course inventory:

   **Prefix** | **Course #** | **Title (excluding punctuation)**
   --- | --- | ---
   SCSC | 643 | QUANT GENE PLANT BREEDING
   
   | Lec. | Lab | SCH | GIP and Fund Code | Admin. Unit | EICE Code | Level |
   --- | --- | --- | --- | --- | --- | --- |
   0 | 3 | 0 | 0 | 3 | 0 | 1 | 1 | 1 | 0 | 4 | 0 | 0 | 0 | 5 | 2 | 6 | 2 | 0 | 0 | 0 | 3 | 6 | 3 | 2 | 6 |

   b. Change to:

   **Prefix** | **Course #** | **Title (excluding punctuation)**
   --- | --- | ---
   SCSC | 643 | MOL QUANT GENE PLANT BREEDING
   
   | Lec. | Lab | SCH | GIP and Fund Code | Admin. Unit | Acad. Year | EICE Code |
   --- | --- | --- | --- | --- | --- | --- |
   0 | 3 | 0 | 0 | 3 | 0 | 1 | 1 | 1 | 0 | 4 | 0 | 0 | 0 | 5 | 2 | 6 | 2 | 0 | 1 | 2 | - | 1 | 3 | 0 | 0 | 3 | 6 | 3 | 2 |

   Approval recommended by:

   **Wayne Smith** *(Name & Sign)* *(Date)*

   **Craig Coates** *(Name & Sign)* *(Date)* *(if cross-listed course)*

   **Submitted to Coordinating Board by:**

   **Associate Director, Curricular Services** *(Date)*

   Questions regarding this form should be directed to Sandra Williams at 845-8201 or sandra.williams@tamu.edu.

   **Curricular Services – 02/11**
Texas A&M University
Departmental Request for a Change in Course
Undergraduate • Graduate • Professional
• Submit original form and attachments •

Form Instructions
1. Request submitted by (Department or Program Name): Department of Soil and Crop Sciences
2. Course prefix, number and complete title of course: SCSC 643, Quantitative Genetics and Plant Breeding

Change requested
a. Prerequisite(s): From: SCSC 641, GENE 613, STAT 619 and 652. To: STAT 651, SCSC 642 or GENE 613; or approval of instructor
b. Withdrawal (reason):
c. Cross-list with: GENE 643

d. Change in course title and description. Enter complete current course title and current course description in item 5; enter proposed course title and proposed course description in item 6. Complete item 7 for change in title.
e. Change in course number, contact hours (lab & lecture), and semester credit hours. Complete item 7. Attach a course syllabus.

5. Complete current course title and current catalog course description:
Title: Quantitative Genetics and Plant Breeding
Applied aspects of quantitative genetics in plant breeding; examination of methodologies to analyze quantitative variation in crop species; genetic phenomena (inbreeding, heterosis and epistasis); quantitative trait loci (QTL) mapping and marker-assisted selection (MAS); genotype by environment interaction, heritability, multiple traits and selection theory with implications in plant breeding.

6. Complete proposed course title and proposed catalog course description (not to exceed 50 words):
Title: Molecular Quantitative Genetics and Plant Breeding
Classical, applied and molecular aspects of quantitative genetics in plant breeding; genetic relationships; genetic diversity; genetic phenomena (linkage, heterosis and epistasis); genotype by environment interaction; mapping quantitative trait loci (QTL); genomic and marker-assisted selection; application of statistical software.

7. a. As currently in course inventory:

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<th>Prefix</th>
<th>Course #</th>
<th>Title (excluding punctuation)</th>
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<tr>
<td>SCSC</td>
<td>643</td>
<td>QUANT GENE PLANT BREEDING</td>
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Lect. Lab SCH CIP and Fund Code Admin. Unit FICE Code Level
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b. Change to:

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<th>Course #</th>
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Lect. Lab SCH CIP and Fund Code Admin. Unit Acad. Year FICE Code
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Approval recommended by:

Wayne Smith
Department Head or Program Chair
10-24-11

Chair, College Review Committee
Date

Craig Coates
10-23-11

Dean of College
Date

Mark J. Zoran
DEC 1 2011

Submitted to Coordinating Board by:

Associate Director, Curricular Services
Questions regarding this form should be directed to Sandra Williams at 45-8201 or sandra.williams@nm.edu
Curricular Services – 02/11
Rationale:
I am proposing minor changes of the course title, prerequisites and course description for class SCSC 643/GENE 643 to reflect the niche the course has evolved to fill. This course was initially developed by my predecessor over 8 years ago. After he left, much of the classical quantitative genetic material was incorporated into the SCSC 642 course (a prerequisite for SCSC 643). Since I have taught the class, student evaluations (both formal and informal) have suggested that increased emphasis is needed on applying recent molecular findings and tools to quantitative genetics, such as quantitative trait loci (QTL) mapping and studies of genetic diversity. The way in which the findings are now presented directly relates to the application of molecular quantitative genetics to plant breeding and plant improvement. These changes are a realignment of the title and description to what is actually being taught now.

The prerequisite change is necessitated in that STAT 619 is no longer offered to my knowledge, STAT 652 requires a set of tools that is unnecessary for students to succeed and STAT 651 (STAT 652’s prerequisite) provides a sufficient introduction to statistics. SCSC 641 provides a background on applied plant breeding and basic genetics theory. SCSC 641 does not provide sufficient quantitative genetics background alone so this has been replaced by SCSC 642 (which has SCSC 641 as a prerequisite) that provides advanced genetic background especially in classical quantitative genetics as applied to plant breeding. For students interested in the molecular tools without needing an advanced classical quantitative genetics background, GENE 613 provides grounding in advanced genetics.

Although not required for this proposed change the course syllabus may be found below.
Spring 2012 Quantitative Genetics in Plant Breeding
SCSC 643/GENE 643

When and where:
Tue./Thur. 9:35 am – 10:50 am
Room 224, Heep Building

Instructor:
Dr. Seth C. Murray
Agronomy Field Lab – 111
Office (979) 845-3469, Lab (979) 845-4195
sethmurray@tamu.edu

Office hours:
To be decided in class.
(Appointments are always possible)

Website:
Lectures will be available via TAMU eLearning Vista http://elearning.tamu.edu/
Static website http://maizeandgenetics.tamu.edu/SethCMurray/Teaching.html

Course description:
Graduate education in quantitative genetics is critical for success as a modern scientific plant breeder or geneticist. This course focuses on the understanding of current quantitative and population genetics for plant breeding scientists. It covers both theory and applied approaches and encourages you to reach across both commodity and discipline for interdisciplinary thinking and creative approaches. The course attempts to translate modern scientific findings and theories to application of traditional field breeding, molecular locus identification, and ultimately marker assisted breeding. A lot of material and approaches are covered briefly to reinforce different ways of viewing a few core concepts: population genetic diversity, gene effects, linkage, and epistasis always mindful of the end goal: crop improvement.

Prerequisites:
STAT 651, SCSC 642 (Plant Breeding II) or GENE 613, or approval of instructor.

Textbooks and resource material listing:
There is no textbook required. Class notes, journal articles and presentations will be posted on eLearning before we discuss them. Other pertinent material will be handed out in class. Software required for this course includes ‘R’, Mapmaker, QTL cartographer, Structure and TASSEL, all freely available.

Recommended helpful texts that were consulted in designing this class:

Hartl, D.L, and A.G. Clark. 1997. Principles of Population Genetics. Sinauer Associates, Sunderland, MA. (Pretty clear and well written book, will cover a lot of related topics that we will not have time to.)


Lynch, M., and J. B. Walsh. 1998. Genetics and Analysis of Quantitative Traits. Sinauer Associates, Sunderland, MA. (Nice reference but terminology and writing make it very difficult to read in my opinion – if you take a summer institute in statistical genetics course it may be included freely.)

Ross, S. 2002. A First Course in Probability, sixth edition. Pearson Education, India. (There is a probability basis behind all phenomenon you will observe and all decisions you will make – this helps to understand this a little better.)


Schedule: There are 15 weeks in the semester and 12 sections below, relative emphasis of each section will be dictated by student interests.

*Phenotypic Quantitative Genetics*

*(some understanding of molecular markers and techniques will be needed)*

1: Introduction
- Syllabus overview
- Review: genetics concept, statistics concepts
- Quantitative genetics: historical overview, basic concepts
- Population genetics: historical overview, basic concepts
- Probability theory and statistics
- Introduction to R (http://www.r-project.org/)
- Introduction / review of molecular markers

2: Genetic models
- Genetic models for means
- Genetic models for variances

3: Genetic and environmental variances
- Genetic and environmental variances
- Heritability
- Yield stability
- Genetic gain from selection

4: Relationships and genetic diversity
- Covariances among relatives
- Heterosis
- Combining ability
- Inbreeding coefficients
- Genetic distance

5: Recurrent selection & linkage
- Synthetic populations
- Genetic drift
- Introgression
- Linkage and linkage disequilibrium (LD)

6: **Epistasis**
- Advanced epistasis
- Testers
- Hemizygosity
- Multiple trait selection

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**Molecular Quantitative Genetics**

7: **Bi-parental QTL mapping I.**
- What is a QTL, why do they matter, and how do they connect to what we have covered?
- Genetic map construction
- Single marker analysis

8: **Bi-parental QTL mapping II.**
- Interval mapping, composite interval mapping
- Bayesian mapping
- Reality situations (tetraploid, half sib, unknown parents, etc.)

9: **Association mapping**
- Linkage disequilibrium (pt. II)
- Population structure, sub-structure, kinship, genetic distance
- TASSEL

10: **Selection mapping (identifying temporal selection)**
- Recurrent selection revisited

11: **QTL MAS & genomic Selection**
- Marker assisted selection in the phenotypic quantitative genetics model
- Genomic selection (the next big thing)

12: **Putting it all together**
- Team research project proposal presentations

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**Course rationale**

I assume that in your previous courses you have learned how to be a good scientific plant breeder: how to identify and use genetic diversity, how to select, how to minimize GxE, how to evaluate field data, etc. The scientific goals of this class include reinforcing these previously learned concepts, adding relevant statistical and molecular technologies, relating recent scientific discoveries to plant breeding and finally helping you synthesize new concepts. A major focus is to help you understand the complexity of what is going on in the genome and how four main concepts: *population genetic diversity, gene effects, linkage, and epistasis* should affect how you breed and research plants (i.e. *crop improvement*). Internalizing these four concepts are the learning goals of the class, not how to use specific software or perform specific calculations (but this is good too).

In this course we will first review topics with traditional (phenotypic) quantitative genetics, both the basic theory of genetic models and application for estimating the effects within these genetic models, calculating heritability, and combining ability.
We will then cover molecular quantitative genetics as it applies to scientific breeding. Although some people stress a difference between ‘field’ and ‘molecular’ breeding, these are already integrated in many breeding programs. You can think of markers as one more way we are able to partition variance. Molecular breeding is not about spending all day in a lab genotyping, it is a tool providing biologically relevant information for selection and understanding of your organism of interest. If you went to a large corporate corn or soybean program today you would see marker assisted selection for known QTL on a massive scale being done by people who are field breeders. If you went to another large company you would see complex molecular genetics models predicting which crosses will be the most successful; this has let the breeders spend more time evaluating the best plants rather than simply making crosses to determine which plants are best. In public sector breeding you will also be much more successful understanding and even applying some of these same molecular techniques. The $100 genome sequence is coming quickly. In both the public and private sector molecular breeding is becoming increasingly automated. To be most successful as a PhD breeder and/or geneticist you must understand these tools and how to design a good experiment to take advantage of them (or at the very least understand the implications of others work). We no longer will be working with tens of markers on a few genes of interest; we will be working with thousands or millions that move towards predicting and designing the biology we want to see. Organizing, protecting, interpreting and using this data is a challenge in itself!

**Learning objectives:**

**Thinking and analysis**

1. Apply and summarize the higher Bloom’s Taxonomy thinking levels in all communication.
2. Apply computational thinking to problem solving.
3. Synthesize your discipline in a larger context and integrate concepts from other disciplines.
   (We will approach this by reading popular press articles at the beginning of class.)
4. Assess the limitations of an experiment or study, discriminate where biases might occur, and recommend how to correct these limitations.
5. Demonstrate an ability to deal with complexity. From scientific concepts, to learning new software, there are no easy answers.
6. Be able to explain and support all of your decisions

**Professionalism and leadership.** For many students it will be one of the last courses that you take before you enter your profession.

1. Demonstrate an ability to develop a professional resume / CV; be able to explain everything about this document.
2. Demonstrate leadership and followship when working in a team with others, both in and out of class. (You will be working with these peers for potentially the rest of your life so you should get to know them now - before they are famous!)
3. Demonstrate an ability to take criticism positively and integrate others criticism to further improve your work.

**Science**

1. Describe, explain and assess scientific findings in primary source journal articles.
2. Describe, explain and assess scientific approaches presented in class.

**Data analysis, simulations, and software**

7. Apply computer simulations to research questions of interest; summarize and assess the results.
8. Distinguish the most challenging aspects of learning new computer software.
Evaluation philosophy
In this class I will present knowledge and my own interpretations. For your assignments I will not present all knowledge necessary, and in some cases present no knowledge but will expect you to conduct evaluation and synthesis of a topic. I believe that you, as PhD students should be able to find all background knowledge necessary and then use it. I expect you to be able to find information on your own and hope you will already be familiar doing so. Use Google* liberally - it is your friend and knowledge (in Bloom thinking level terms) is now easily accessible. Just because other teachers have taught you knowledge and then tested you on this, does not mean that this is a good use of your time or mine. I assume the only way to learn is by trying - find what you do not know, do the best you can, and then use criticism to improve.
* Or your favorite search engine.

Grading:
50%: Exercise Problems (5 sets) – Due one week after they are given.
10%: Reading assignments.
10%: Quizzes (2) - First 20 min. of class based on problem sets.
10%: Wiki contribution - See Wiki section of syllabus.
20%: Team research project proposals.

Grading Scale: A = 90-100%; B = 80-89%; C = 70-79%; D = 60-69%; F = < 60%

50% Exercise problems
Due one week after given – at the beginning of class. I expect each problem set could take more than 20 hours of your time. Genetics and statistics will be abstract unless you struggle through the problems; this course combines both. If the problem sets are taking longer than this, please see me. They are not designed to be busy work. Grades will be based on appearance, clarity, conciseness and most importantly, the amount of thought you put in. Your level of thought is graded based on Bloom’s Taxonomy thinking levels (see back of assignment #1). Late work drops grade 25% after each subsequent class. Throughout your career, if your writing is hard to follow, boring or looks messy and unattractive, people will not want to read it; therefore comments and grades are necessarily also directed at these aspects. If you do poorly you may be asked to submit a revision. If so please highlight all changes so I can find them easily.

10%: Reading assignments
Do your reading and be prepared to contribute to discussion and/ or answer questions on it. Each paper discussion will be led by one student.

10%: Quizzes
Quizzes will be unannounced and given at the beginning of class. Quiz questions will be based on assignments I have returned to you. The objective of the quizzes is to make you look over your returned work and helping you fill in your gaps in understanding.

10% Wiki contribution
Contribution to the wiki is two-fold. 1) You need to put concepts into your own words, and give your own examples – this helps reinforce what you have learned. 2) There is little available online or in print to get the “Readers Digest” version of the newest concepts, terms, systems and examples we will discuss in this class. You should describe topics however you think it will be easiest for others to learn.

You can help perform Darwinian selection on scientific ideas! 3) Your examples and projects may inspire the next scientific breakthrough...but only if they are shared and published.

20% Team research proposals
You will each be a leader and a team member in groups of two to four. Your team goal is to get your research proposal funded by a fictional private science agency. You will come up with one proposal utilizing everyone’s expertise (either three independent but synergistic projects, or one project that everyone could participate in). The project must translate and build on something learned in this class and be novel (i.e. fundable). 10pg. max including budget. Brevity is desirable. Assignment benchmarks will be given to keep you on track.

Academic integrity:
Science cannot be conducted in isolation and thus I highly encourage you to collaborate with your colleagues in the class. You will likely have interactions with them or through them for the rest of your career. You will also learn more from them than you do from me. If you do not personally need help then please help others who do. This being said I will not tolerate any direct copying or lack of effort (i.e. laziness) in problem solving and neither should you.

"An Aggie does not lie, cheat or steal or tolerate those who do."
Please see the Honor Council Rules and Procedures on the web: http://www.tamu.edu/aggiehonor

Americans with Disabilities Act (ADA) policy:
The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room B-118 in the Cain Building, or call 845-1637.

Expectations of students
- I expect you want to learn the material.
- I expect you to try hard.
- I expect you to take risks.
- I expect that you will not hesitate to ask a question or correct me if I am wrong.
- I expect that if you are having problems with the material you will contact me.
- I expect the problem sets could take more than 20 hours of time.
- I expect you to do the assigned readings.
- I expect you to show up to class or else to notify me of your absence.
- I expect you to use higher levels of thinking and do the background research necessary to support all statements and conclusions.

Expectations of your teacher
- You should expect that I want to teach you the course material.
- You should expect that I will try my best to help you succeed.
- You should expect that I will be fair.
- You should expect me to be prepared and ready to defend anything I want you to know.
- You should expect for me to call on you when you are not paying attention.