Continuing Education Available Courses

To fully participate in our continuing education courses, students should have:

- High speed internet connection and updated browsers, including Internet Explorer and either Chrome or Firefox
- Common plug-ins (e.g. Adobe Reader, Flash Player, Virus Protection, Java, etc.)
- Speakers and Webcam with microphone
- Skype
- Ability to either scan or fax course documents to the instructor

Plant Breeding Fundamentals – Full Course (3 Units) – Cost $679.65
Introduction to the field of plant breeding for students without a plant breeding background. Includes common plant breeding terminology and introduction of concepts. Genetic improvement of crops by hybridization and selection; special breeding methods and techniques applicable to naturally self-pollinated, cross-pollinated and asexually reproduced plants.

Basic Plant Breeding - Full Course (3 Units) - Cost - $679.65
Basic Plant Breeding can be taken as an entire course (all three units) or each unit can be taken individually. For participants in our Professional Certificate in Plant Breeding and Genetics, completion of all three units is required.

Unit 1 - Introduction to Basic Plant Breeding Cost - $226.55
Introduction to Basic Plant Breeding provides a review of plant reproduction, genetic variation, gene banks, germplasm preservation, gene segregation, the power of selection and its role in plant breeding, and an introduction to intellectual property and its role in the life of a plant breeder. This unit is designed to prepare the participant to explore the genetics and methodologies employed by plant breeders of self and cross pollinated crop species in units two and three of Basic Plant Breeding.

Unit 2 - Breeding Self Pollinated Crops Cost - $226.55
The frequency of any specific heterozygous locus will be reduced by 50% for every generation of selfing, resulting in a mixture of homozygous lines within any natural population. Phenotypic selection within heterozygous generations will lead to homozygous or near homozygous germplasm lines or cultivars under self-pollination. This unit is designed to communicate plant breeding methodologies that take advantage of the genetic consequences of natural or forced self-pollination in agronomic crops. Topics will include: [1] the basics of segregation, [2] breeding methodologies, [3] the grain sorghum conversion program-an example of backcrossing in a different direction, [4] review of a commercial soybean cultivar development program, and [5] a review of the types of genetic releases from Texas A&M AgriLife Research.

Unit 3 - Breeding Cross Pollinated Crops Cost - $226.55
Topics covered include: quantitative genetics and plant breeding, effects of selection on Hardy Weinberg Equilibrium, mating designs with cross pollinated crops, breeding methods for cross pollinated crops, deviations from Mendelian ratios, genetic male sterility and hybrid seed production, seed certification and types of release.

Recommended textbooks are “Breeding Field Crops” by J.M. Poehlman and D.A. Sleper, and “Principles of Cultivar Development” by W.F. Fehr. A final exam will allow the participant to assess their grasp of topics covered. Participants in the Plant Breeding and Genetic Certificate Program must score 70% on the final exam for each unit.

This is a "self-paced" course and is available for viewing for a limited time. Time commitment is individual student driven. Few outside assignments are made. Students should view each lecture, review all previous lectures and be prepared to discuss any issues that are unclear. Each unit has a printable note set and most units have a set of review questions that can be used as a tool to check your comprehension and grasp of unit concepts. Feel free to contact the instructor, Dr. Wayne Smith, by e-mail (cwsmith@tamu.edu) or phone (979-845-3450) with any questions you have or if you need additional information.

Advanced Plant Breeding - Full Course (3 Units) - Cost - $679.65
Expectations of genetic improvement for different plant breeding methods; relative efficiency for crops of different reproductive mechanisms; genetic variances, covariances and genotype-environment interaction components of variance used in planning selection procedures. Advanced Plant Breeding can be taken as an entire course (all three units) or each unit can be taken individually. For participants in our Professional Certificate in Plant Breeding and Genetics, completion of all three units is required.

Unit 1 - Advanced Genetic Principles in Plant Breeding
Topics covered include: Hardy Weinberg, means and variances, covariances and heritability, mating designs, genetic diversity.
Cost - $226.55

Unit 2 - Selection: Theory and Practice in Advanced Plant Breeding
Topics covered include: recurrent selection, inbred line selection and testcrossing, selection environments, indirect selection, multiple trait selection, QTL MAS, heterosis and hybrid prediction.
Cost - $226.55

Unit 3 - Statistical Tools in Advanced Plant Breeding
Topics covered include: statistical concepts review, expected mean squares and combined analysis, GxE interactions and stability analysis, polyploidy.
Cost - $226.55

Experimental Designs in Agronomic Research - Full Course (3 Units) - Cost - $679.65
Teaches fundamental principles and procedures of experimental designs in agricultural sciences. Emphasis includes factorial designs, predicting outputs, use of covariance, and balanced and unbalanced experimental designs as related to common agricultural research projects under field, greenhouse or growth chamber culture. Students will become familiarized with computer programming of common statistical software. Experimental Designs in Agronomic Research can be taken as an entire course (all three units) or each unit can be taken individually. For participants in our Professional Certificate in Plant Breeding and Genetics, completion of all three units is required.

Unit 1 - Factorial Experimental Designs in Agronomic Research
Topics covered include: Fundamentals of agricultural research methodology and methodology, basic statistical concepts for testing of hypothesis, introduction to simple computer statistical software programs and applications, complete randomized design, randomized complete block design, and Latin square design.
Cost - $226.55

Unit 2 - Factorial and Unbalanced Designs in Agronomic Research
Topics covered include: Split-plot and split-split plot designs, nested designs, variance analyses, interactions with years and locations, comparisons of paired and grouped mean, estimation of missing values, the general linear model, and planned incomplete block design.
Cost - $226.55

Unit 3 - Correlation, Regression, Covariance, and Biplot Analysis in Agronomic Research
Topics covered include: Correlation, regression, path coefficient analysis, covariance analysis, nearest neighbor analysis, augmented designs and moving means and analysis, database management, biplot analyses.
Cost - $226.55

This is a "self-paced" course and is available for viewing for a limited time. Time commitment is individual student driven. Students should view each lecture, review all previous lectures and be prepared to discuss any issues that are unclear. Each unit has a printable note set and voiced over PowerPoint video lectures.

Analysis of Complex Genomes – Full Course (3 Units) – Cost - $679.65
Genome structure, organization and function of model organisms and higher eukaryotes; theory and methodology of genetic and physical mapping, comparative genomics, sequencing, sequence analysis and annotation; emphasis on understanding the function of complex genomes, genome-wide expression analysis, genetic and epigenetic mechanisms; X-inactivation, imprinting, gene silencing, transposons, genome duplication and evaluation.

Quantitative Genetics and Plant Breeding - Full Course (3 Units) - Cost - $679.65
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.

Intellectual Properties in the Plant Sciences - Full Course (3 Units) - Cost - $679.65
This course introduces the major foci of intellectual property (IP) impacting plant sciences, including: 1) traditional vs. emerging knowledge economies, 2) governing U.S. statutes and international treaties, 3) forms of IP protection, and 4) IP asset identification,
valuation, capture, and deployment towards an understanding of best practices for the development of effective IP strategies and management of IP portfolios.

**Unit I - Introduction to Intellectual Property, International Treaties and Patents**

**Unit II - Intellectual Property Documentation**
Unit II of the Intellectual Properties in the Plant Sciences Course. Topics covered include: Trademarks, Copyrights, & Trade Secrets; USPTO; Inventorship, Ownership, Compensation, IP Training; Confidential Information; IP Audit; IP Value; Competitive Intelligence; Cyberspace – IP and IT Cooperation.

**Unit III - Intellectual Property Transfer and Enforcement**

**Soil Fertility - Full Course (3 Units) - Cost - $679.65**
Chemical and biological reactions in soils that influence nutrient availability to plants; environmental aspects associated with nutrient availability and fertilization, especially for nitrogen (N) and phosphorus (P). Topic covered include: introduction and historical background; plant essential nutrients, soil plant relations, calculations in soil fertility, soil acidity, soil nitrogen, soil phosphorus, potassium, calcium, magnesium, sulfur and the micronutrient elements.

**Topic 1 – Introduction and Historical Background**
Major contributions to soil chemistry and fertility. Introduction to soils and climate of Texas.

**Topic 2 – Plant Essential Nutrients, Soil-Plant Relations**
Plant available forms of nutrients, functions of nutrients in plants, types of soils where deficiencies might be anticipated, relative quantities required by plants.

**Topic 3 – Calculations in Soil Fertility**
Chemical notations, mole on a weight basis, mole on a charge basis, equivalents, ppm, concentrations of solutions, lbs/acre, kg/ha, lbs/1000 ft2, etc.

**Topic 4 – Soil Acidity**
Measurement and causes, active and reserve acidity, effects on nutrient availability and chemical properties, influence on plant grown, correction of, exchangeable Al, Al hydroxyl polymers, effective CEC.

**Topic 5 – Soil Nitrogen**
Reactions of N in soils, N cycle, N gains and losses, biological N2 fixations, factors influencing availability, mineralization-immobilization, nitrification, NO-3 movement and groundwater contamination, eutrophication, NH4+ fixation, NH3 volatilization, denitrification, nitrification inhibitors, production of N fertilizers, acidification from NH4+ fertilizers, selection of N source potential environmental effects.

**Topic 6 – Soil Phosphorus**
Phosphorus cycle, low uptake efficiencies – reversion in acid and alkaline soils, solubility product constants of reversion precipitates, solubility diagrams, influence of soil pH on P availability, method of application, production of P fertilizers, potential environmental consequences, eutrophication.

**Topic 7 – Potassium, Calcium, Magnesium**
Potassium cycle, available forms, soil reactions, K+ fixation, mineral sources, factors influencing plant availability, fertilizer sources.

**Topic 8 – Sulfur and the Micronutrient Elements**
Reactions of S in soils, S cycle, sources of S fertilizers, anticipated crop responses, reactions influencing availability of micronutrients in soils, pH effect chelates, extent of micronutrient deficiencies, correction of deficiencies.

**Genetics - Full Course (3 Units) - Cost - $679.65**
Development of fundamental concepts related to the structure, function, organization, transmission and distribution of genetic material.

**Plant Disease Management (1 Units) - Cost - $226.55**
On-line course designed to provide a strong foundation in the principles and practices of management of plant diseases; analysis of disease cycles and epidemiological parameters to develop and evaluate efficient control strategies and forecasting models.

**Physiology of Plants - Full Course (3 Units) - Cost - $679.65**
Advanced physiology of higher plants, includes water relations, mineral metabolism, biochemistry, growth, development, hormones, environmental signals and stress physiology. Emphasis on current literature and research trends; cellular and sub-cellular mechanisms related to whole plant behavior.

**Introduction to Host Plant Resistance (1 Units) - Cost - $226.55**
Host plant resistance programs from the standpoint of the plant breeder.