New Course Request

Indiana University

South Bend Campus

Check Appropriate Boxes:  Undergraduate credit □  Graduate credit ☑  Professional credit □

1. School/Division  Liberal Arts and Sciences  2. Academic Subject Code  MATH

3. Course Number  M562  (must be cleared with University Enrollment Services)  4. Instructor  Yi Cheng

5. Course Title  Statistical Design of Experiments

Recommended Abbreviation (Optional)  (Limited to 32 Characters including spaces)

6. First time this course is to be offered (Semester/Year):  Fall 2005

7. Credit Hours: Fixed at 3 or Variable from ______ to _______

8. Is this course to be graded S-F (only)? Yes ____ No ☑

9. Is variable title approval being requested? Yes ____ No ☑

10. Course description (not to exceed 50 words) for Bulletin publication: P: M565 or consent of instructor. Latin square, incomplete blocks, and nested designs. Design and analysis of factorial experiments with crossing and nesting of factors, under fixed, random, and mixed effects models, in the balanced case. Blocking and fractionation of experiments with many factors at two levels. Exploration of response surfaces.

11. Lecture Contact Hours: Fixed at 3 or Variable from ______ to _______

12. Non-Lecture Contact Hours: Fixed at _______ or Variable from _______ to _______

13. Estimated enrollment: 15 of which 50 percent are expected to be graduate students.

14. Frequency of scheduling: Every 2 yrs  Will this course be required for majors? Yes

15. Justification for new course:  Required for Master's degree in Applied Mathematics and Computer Science; satisfies need for advanced, upper-level statistical techniques course

16. Are the necessary reading materials currently available in the appropriate library?  Yes

17. Please append a complete outline of the proposed course, and indicate instructor (if known), textbooks, and other materials.

18. If this course overlaps with existing courses, please explain with which courses it overlaps and whether this overlap is necessary, desirable, or unimportant.

19. A copy of every new course proposal must be submitted to departments, schools, or divisions in which there may be overlap of the new course with existing courses or areas of strong concern, with instructions that they send comments directly to the originating Curriculum Committee. Please append a list of departments, schools, or divisions thus consulted.

Submitted by:  

Date 2/10/05

Department Chairman/Director

Dean of Graduate School (when required)  

Date  

Chancellor/Vice-President  

Date  

University Enrollment Services  

Approved by:  

Date 2/10/05

Dean  

Date  

University Enrollment Services

After School/Division approval, forward the last copy (without attachments) to University Enrollment Services for initial processing, and the remaining four copies and attachments to the Campus Chancellor or Vice-President.
or consent of instructor. Existence, uniqueness, continuous dependence; linear systems, stability theory, Floquet theory; periodic solutions of nonlinear equations; Poincaré-Bendixson theory, direct stability methods; almost periodic motions; spectral theory of nonsingular and singular self-adjoint boundary-value problems; two-dimensional autonomous systems; the saddle-point property; linear systems with isolated singularities.

M546 Control Theory (3 cr.) Examples of control problems: optimal control of deterministic systems: linear and nonlinear. The maximal principle: stochastic control problems.


M551 Markets and Multi-Period Asset Pricing (3 cr.) P: M463, M345, or equivalent. The concepts of arbitrage and risk-neutral pricing are introduced within the context of dynamic models of stock prices, bond prices, and currency exchange rates. Specific models include multi-period binomial models, Markov processes, Brownian motion, and martingales.

M553 Cryptography (3 cr.)*** P: M301 or M303. Covers encryption and decryption in secure codes. Topics include: cryptosystems and their cryptanalysis, Data Encryption Standard, differential cryptanalysis, Euclidean algorithm, Chinese remainder theorem, RSA cryptosystem, primality testing, factoring algorithms, ElGamal cryptosystem, discrete log problem, other public key cryptosystems, signature schemes, hash functions, key distribution, and key agreement. Credit not given for both M553 and M453.

M555-M556 Quantum Computing I-II (3-3 cr.)*** Covers the interdisciplinary field of quantum information science for graduate students in computer science, physics, mathematics, philosophy, and chemistry. Quantum information science is the study of storing, processing, and communicating information using quantum systems.


M561 Nonparametric Statistics I (3 cr.) P: M466. Problems of estimating and testing hypotheses when the functional form of the underlying distribution is unknown. Robust methods. Sign test, rank tests, and confidence procedures based on these tests. Tests based on the permutations of observations. Nonparametric tolerance limits. Large sample properties of the tests.

M562 Statistical Design of Experiments (3 cr.) P: M565 or consent of instructor. Latin square, incomplete blocks, and nested designs. Design
and analysis of factorial experiments with crossing and nesting of factors, under fixed, random, and mixed effects models, in the balanced case. Blocking and fractionation of experiments with many factors at two levels. Exploration of response surfaces.

**M563-M564 Theory of Probability I-II (3-3 cr.)** P: M463, M512; or consent of instructor. Basic concepts of measure theory and integration, axiomatic foundations of probability theory, distribution functions and characteristic functions, infinitely divisible laws and the central limit problem, modes of convergence of sequences of random variables, ergodic theorems, Markov chains, and stochastic processes.


**M566-M567 Mathematical Statistics I-II (3-3 cr.)** P: M466, M512; or consent of instructor. Modern statistical inference, including such topics as sufficient statistics with applications to similar tests and point estimates, unbiased and invariant tests, lower bounds for mean square errors of point estimates, interval estimation, linear hypothesis, analysis of variance, sequential analysis, decision functions, and nonparametric inference.

**M568 Time Series Analysis (3 cr.)** P: M466 or consent of instructor. Autocovariance, power spectra, windows, prewhitening, aliasing, variability and covariability, rejection filtering and separation, pilot estimation, cross-spectra, R-th order spectra, prediction, numerical spectrum analysis.

**M569 Statistical Decision Theory (3 cr.)** P: M466 or consent of instructor. Decision-theoretic approach to statistical problems, randomized and nonrandomized decision rules, comparison of decision rules, Bayes decision rules, construction of Bayes decision rules when the number of possible decisions is finite and infinite, and linear programming as a computational rule.


**M583 Set Theory (3 cr.)** P: M482 or M511 or M521. Zermelo-Fraenkel axioms for set theory, well-foundedness and well-orderings, induction and recursion, ordinals and cardinals, axiom of choice, cardinal exponentiation, generalized continuum hypothesis, infinite combinatorics and large cardinals. Martin’s axiom, applications to analysis and topology.

**M584 Recursion Theory (3 cr.)** P: one of M482, M511, M521 or CSCI C452; or consent of instructor. Classes of recursive functions, models of computation, Church’s thesis, normal forms, recursion theorem, recursively enumerable sets, reducibilities, lattice of r.e. sets, jump operator, priority arguments, degrees of unsolvability, and hierarchies.