New Course Request

Check Appropriate Boxes:

- Undergraduate credit
- Graduate credit [X]
- Professional credit

1. School/Division: Liberal Arts and Sciences
2. Academic Subject Code: MATH
3. Course Number: M565 (must be cleared with University Enrollment Services)
4. Instructor: Yi Cheng
5. Course Title: Analysis of Variance

Recommended Abbreviation (Optional)

(Limited to 32 Characters including spaces)

6. First time this course is to be offered (Semester/Year): Fall 2004
7. Credit Hours: Fixed at [ ] 3 [ ] or Variable from ______ to ______
8. Is this course to be graded S-F (only)? Yes [ ] No [X]
9. Is variable title approval being requested? Yes [ ] No [X]
10. Course description (not to exceed 50 words) for Bulletin publication:


11. Lecture Contact Hours: Fixed at ______ or Variable from ______ to ______
12. Non-Lecture Contact Hours: Fixed at ______ or Variable from ______ to ______
13. Estimated enrollment: ______ of which ______ percent are expected to be graduate students.
14. Frequency of scheduling: Every other [ ] Will this course be required for majors? [ ] No
16. Are the necessary reading materials currently available in the appropriate library? Yes [ ] No
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: [Signature]
Date: 1/21/04

Department Chairman/Division Director

Approved by: [Signature]
Date: 2/3/04

Dean

Chancellor/Vice-President

University Enrollment Services

Date

Dean of Graduate School (when required)

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.

UPS 724

University Enrollment Services Final—White; Chancellor/Vice-President—Blue; School/Division—Yellow;
Department/Division—Pink; University Enrollment Services Advance—White
When you become a student at Indiana University, you join an academic community internationally known for the excellence and diversity of its programs. Indiana University is one of the nation's oldest and largest state universities, with eight campuses serving 96,000 students. IU also offers courses through facilities at Columbus, Elkhart, and many other sites.

*Indiana University Campuses*
- Indiana University Bloomington
- Indiana University-Purdue University Indianapolis
- Indiana University East (Richmond)
- Indiana University-Purdue University Fort Wayne
- Indiana University Kokomo
- Indiana University Northwest (Gary)
- Indiana University South Bend
- Indiana University Southeast (New Albany)
does not count toward meeting any of the 500-level requirements toward an M.A. or Ph.D.
M599 Colloquium (1 cr.) Attendance at Department of Mathematics colloquia required. May be repeated. May not be used in fulfillment of the 36 credit hours of 500-, 600-, or 700-level course work required for the Ph.D. Also not applicable to 30 credit hours for master's degree.
M601-M602 Algebraic Number Theory I-II (3-3 cr.) P: M501-M502. Variations of fields of algebraic functions, cohomology of groups, local and global class field theory.
M607-M608 Group Representations I-II (3-3 cr.) P: consent of instructor. Study of representation theory of finite groups, covering groups, Lie algebras, invariant measure, and induced representations. May be taught in alternate years by members of the Mathematics Department and Physics.
M621-M622 Algebraic Topology I-II (3-3 cr.) P: M522. Basic concepts of homological algebra, universal coefficient theorems for homology and cohomology, Kunneth formula, duality in manifolds. Homotopy theory including Hurewicz and Whitehead theorems; classifying spaces, Postnikov systems, spectral sequences of homotopy spheres. Offered every other year, alternating with M623-M624.
M623-M624 Geometric Topology I-II (3-3 cr.) P: M522. Topics in geometric topology chosen from K-theory, simple homotopy theory, topology of manifolds, fiber bundles, knot theory, and related areas. May be taken more than once. Offered every other year, alternating with M621-M622.
M630 Algebraic Geometry (3 cr.) A study in the plane, based on homogenous points and line coordinates; a study of algebraic curves and envelopes, including such topics as invariants, singularities, reducibility, genus, polar properties, Pascal and Brianchon theorems, and Jacobian, Hessian, and Plücker formulas.
M633-M634 Algebraic Varieties I-II (3-3 cr.) Topological and algebraic properties of algebraic varieties. 
M637 Theory of Approximation I (3 cr.) Introduction to the general theory of approximation, stress-energy tensor, parallel transport, geodesics, Einstein's equation, differential geometry, manifolds, general covariance, bending of light, perihelionadvance. Modern cosmology, Robertson-Walker metric, equations of state. Friedmann equations, Hubble's law, redshift, cosmological constant, inflation, quintessence, cosmic microwave background, Big Bang nucleosynthesis, structure formation. May be taught in alternate years by members of the Department of Physics; see PHYS P637.
M638 Theory of Gravitation II (3 cr.) Gravitation waves, Schwarzschild geometry and black holes, Kerr metric, Reissner-Nordstrom metric, extremal black holes, Penrose diagrams, Hawking radiation; Lie derivatives, isometries and Killing vectors, variational principle and the Palatini formalism, spinors in general relativity, vierbeins, gravitation as a gauge theory, quantum gravity. May be taught in alternate years by members of the Department of Physics; see PHYS P639.
A641 Elliptic Differential Equations (3 cr.) P: M511, M513, M540, or consent of instructor. Green's identity, fundamental solutions, function theoretic methods, partition of unity, weak and strong derivatives, Sobolev inequalities, embedding theorems, Garding's inequality, Dirichlet problem, existence theory, regularity in the interior, regularity on the boundary, and selected topics.
A642 Evolution Equations (3 cr.) P: M511, M513, M540, or consent of instructor. Hyperbolic equations and systems, parabolic equations, Cauchy problems in higher dimension, method of descent, fundamental solutions and their construction, strongly continuous semigroups, analytic semigroups, uniqueness theorems in Hilbert space, fractional powers of operators, analyticity of semigroups, and related topics.
A643 Integral Equations (3 cr.) Covers the Volterra-Fredholm theory of integral equations and the abstract Riesz theory of compact operators. Other topics include ideals of compact operators, Fredholm operators, convolution equations and their relationship to Toeplitz operators, Wiener-Hopf factorization.
M647 Mathematical Physics (3 cr.) P: M541 or consent of instructor. Applications of the theory of normed linear spaces, distributions, unbounded operators, Hilbert space, and related topics to problems in mathematical physics. May be taught in alternate years by members of the Department of Physics; see PHYS P647.
M655 Mathematical Foundations of Quantum Mechanics (3 cr.) P: consent of instructor. Philosophical and mathematical theories of the concepts: quantum observable, compatibility, quantum state, superposition principle, symmetry. Axiomatic construction of conventional quantum mechanics. May be taught in alternate years by members of the Department of Physics; see PHYS P655.
M656-M657 Kinetic Theory and Statistical Mechanics I-II (3-3 cr.) Introduction to the classical theory and modern developments. Historical development of kinetic-statistical theories; rigorous equilibrium statistics; kinetic gas dynamics; Boltzmann equation; kinetic theories of transport processes in liquids. May be taught in alternate years by members of the Departments of Mathematics and Physics; see PHYS P656, P657.
M658-M659 Continuum Mechanics I-II (3-3 cr.) P: consent of instructor. Two-semester course dealing with mathematical foundations of continuum mechanics; content varies yearly; topics selected from elasticity, plasticity, or fluid mechanics and related areas.
M662 Nonparametric Statistics II (3 cr.) P: M565, M566, M561, or consent of instructor. Multisample procedures, ranking methods in analysis of variance; Bivariate and multivariate procedures. Efficiency comparisons. Recent developments.
M664 Large Sample Theory of Statistics (3 cr.) P: M563, M566. Asymptotic distributions of sample moments, sample quantiles, and U-statistics; methods of estimation: maximum likelihood estimates, method of moment estimators, Bayes estimators; asymptotic efficiency; likelihood ratio tests; chi-square tests; asymptotic relative efficiencies of tests; weak convergence of the empirical distribution