COURSE APPROVAL ROUTING CHECK LIST

091031

1. **Course Number:** ~~PSM~~ ACM 652 — 1st Bulletin 11/5/09, 2nd Bulletin 11/19/09

2. **Course Title:** Continuous-time Stochastic Processes
(*no more than 70 characters*)

Title Abbreviation: Cont Stoch Proc
For use in Master Schedule (*no more than 19 characters*)

3. **Action:** ☒ New Course ☐ Revision ☐ IF Designation ☐ WAC

Requested Designation(s): _____

Course Proposal/Revision Check List

This checklist will help departments avoid some of the most common mistakes made on course proposals. Your use of the checklist will allow the College Senate Curriculum Committee to focus its review on more substantive issues and expedite the approval process.

☒ Proposal format conforms to the Directory of Policy Statements, Section IV:02.00 (2002).

☒ Proposal has been proofread for spelling, punctuation, grammar, style and gender-neutral language.

☒ If the course is a new course, reasons for the additions are included; if the course is a revision of an existing course, reasons for revision and a copy of the old course are included as well as the IF Narrative when appropriate.

☒ Catalog description follows the guidelines in the Curriculum Handbook, Appendix C.

☒ Student learning outcomes are coherent with course content and assessment.

☒ Outcomes are referenced with course content.

☒ All resource entries are alphabetized and conform to a specific style manual.

☐ Cross listed courses have been checked with all chairs and deans included in development of the course.

DEPARTMENT ACTION

[signature] — 10/16/09
Chair, Department Curriculum Committee — Date

4. **Approved** with confirmation that all necessary laboratories, studios, resources, facilities and personnel for support of this course are available.

[signature] — MATH — 10/16/09
Signature of Department Chairperson — Department — Date

(OVER)

Faculty (Check one)
- ☒ **SNSS** *School of Natural and Social Sciences*
- ☐ **SOE** *School of Education*
- ☐ **SAH** *School of Arts and Humanities*
- ☐ **SOP** *School of Professions*

DEAN'S ACTION

Approved with confirmation that all necessary laboratories, studios, resources, facilities and qualified faculty for support of this course are available.

10/26/09 _____
Date Signature of Dean (both Dean's if cross-listing)

COURSE PACKET INCLUDES:

- ☐ Electronic proposal form
- ☐ Attached electronic document with explanations of contingencies as stipulated at Dean's level
- ☐ One hard copy of proposal with attached contingencies and routing sheet with all appropriate signatures (copy of routing sheet in packet sent to Academic Affairs)
- ☐ For all revisions, one hard copy of current course should be submitted (e-copy is preferable when available)

COLLEGE SENATE ACTION

1. **Received**, logged and electronic packet and hard copies forwarded to the College Senate Office. Program title to be published in the *College Bulletin*.

10/27/09 _____ 091031
Date Signature of College Senate Office Log Number

2. Action for Intellectual Foundations' Designation

_____ Recommend approval _____
Signature of Assistant Dean, Intellectual Foundations

_____ Recommend disapproval _____
Signature of Assistant Dean, Intellectual Foundations

3. **Action** of the College Senate Curriculum Committee

X Recommend approval and forward to College Senate

11/17/2009 _____
Date Signature of Chair, College Senate Curriculum Committee

_____ Recommend disapproval and return to Department

_____ _____
Date Signature of Chair, College Senate Curriculum Committee

ACTION OF THE OFFICE OF ACADEMIC AFFAIRS

✓ Approved and forwarded to President _____ 11/19/09
Signature Date

_____ Disapproved and returned to Department _____ _____
Signature Date

Prefix, Number and Name of Course: PSM 652 Continuous-time Stochastic Processes

Credit Hours: 1
In Class Instructional Hours: 1 **Labs:** 0 **Studio:** 0 **Field Work:** 0

Catalog Description:
Prerequisite: Admission to program or instructor permission
Exponential distribution, Poisson, Yule, pure birth, birth and death processes, applications.

Reasons for revision:
To create a one-semester-hour module for the graduate Professional Applied and Computational Mathematics program in intermediate probability focusing on continuous-time Stochastic Processes.

Student Learning Outcomes: Students will	**Course Content Reference:**	**Assessment:**
1. develop and analyze theoretical models of real-world random phenomena.	I, II, III, IV	Group work in class, individual homework assignments, examinations, and computer projects.
2. analyze theoretical models as applied to real-world phenomena and determine the appropriateness of the theoretical models.	II, III, IV	Group work in class, individual homework assignments, examinations, and computer projects.
3. design and implement computer simulations to calculate important features of continuous-time stochastic processes.	I, II, III, V	Group work in class, individual homework assignments, and computer projects.

Course Content:

I. Exponential distribution
- A. Memoryless property
- B. Sums of independent exponential variables

II. Poisson processes
- A. Independent increments
- B. Stationary increments
- C. Definitions of the Poisson process
- D. Interarrival distributions
- E. Properties of the Poisson process
- F. Conditional distribution of arrival times

G. Queuing examples

III. Definitions of other processes
- A. Continuous-time Markov chains
- B. Linear birth (Yule) processes
- C. Pure birth processes
- D. Two-state processes
- E. Birth and death processes

IV. Theoretical results
- A. Chapman-Kolmogorov equations
- B. Backward differential equations
- C. Forward differential equations
- D. Transition probabilities
- E. Mean value of a process

V. Calculating with technology
- A. Simulation of a process (generating exponential random variables)
- B. Computation of transition probabilities (multiplying matrices)
- C. Evaluation of theoretical results (calculating formula values)

Resources

Scholarship:

Andersen, P., Borgan, O., Gill, R., and Keiding, N., *Statistical Models Based on Counting Processes*, Springer, 1996.

Bhat, U. and Miller, G., *Elements of Applied Stochastic Processes*, 3rd ed., Wiley-Interscience, 2002.

Brzezniak, Z. and Zastawniak, T., *Basic Stochastic Processes,* corrected edition, Springer, 2000.

Cox, D. and Miller, H., *The Theory of Stochastic Processes*, Chapman & Hall / CRC, 1977.

Doob, J., *Stochastic Processes*, Wiley-Interscience, 1990.

Durrett, R., *Essentials of Stochastic Processes*, Springer, 2001.

Hoel, P., Port, S. and Stone, C., *Introduction to Stochastic Processes*, Waveland Press, 1986.

Hsu, H., *Schaum's Outline of Probability, Random Variables, and Random Processes*, McGraw-Hill, 1996.

Karlin, S. and Taylor, H., *A First Course in Stochastic Processes*, 2nd ed., Academic Press, 1975.

Karlin, S. and Taylor, H., *A Second Course in Stochastic Processes*, Academic Press, 1981.

Kingman, J., *Poisson Processes*, Oxford University Press, 1993.

Kempen, N., *Stochastic Processes in Physics and Chemistry*, 3rd ed., North Holland, 2007.

Lawler, G., *Introduction to Stochastic Processes*, 2nd ed., Chapman & Hall / CRC, 2006.

Lefebvre, M., *Applied Stochastic Processes*, Springer, 2006.

Mikosch, T., *Non-life Insurance Mathematics: An Introduction with the Poisson Process*, 2nd ed., Springer, 2009.

Prabhu, N., *Stochastic Processes: Basic Theory and its Applications*, World Scientific Publishing Company, 2007.

Resnick, S., *Adventures in Stochastic Processes*, Birkhäuser-Boston, 1992.

Ross, S., *Stochastic Processes*, 2nd ed., Wiley, 1995.

Serfozo, R., *Basics of Applied Stochastic Processes*, Springer, 2009.

Varadhan, S., *Stochastic Processes (Courant Lecture Notes)*, American Mathematical Society, 2007.

Yates, R. and Goodman, D., *Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers*, 2nd ed., Wiley, 2004.

Periodicals:

Advances in Applied Probability

Annals of Applied Probability, The

Annals of Probability, The

Applied Stochastic Models and Data Analysis

Bernoulli

Chance

Electronic Journal of Probability

Journal of Applied Probability

Methodology and Computing in Applied Probability

Probability in the Engineering and Informational Sciences

Probability Theory and Related Fields

Scandinavian Actuarial Journal

Stochastic Analysis and Applications

Stochastic Processes and Their Applications

Theory of Probability and Its Applications

Theory of Stochastic Processes

Electronic and/or Audiovisual Resources:

Moon, T., "ECE6010 - Stochastic Processes, Spring 2006," http://ocw.usu.edu/Electrical_and_Computer_Engineering/Stochastic_Processes/.

Standford University, "Seminar on Stochastic Processess 2009," http://www-stat.stanford.edu/~cgates/SSP2009/.

Shalizi, C., "ECE6010 - Stochastic Processes, Spring 2006," http://www.stat.cmu.edu/~cshalizi/754/.

Wolfram Research Inc., "Wolfram MathWorld: Stocastic Process," http://mathworld.wolfram.com/StochasticProcess.html.