COMPUTER PERFORMANCE EVALUATION (CSC 841 and CSC 641)

Instructor: Dr. Jozo Dujmović (English spelling/pronunciation Yozo Dooy-mo-vich)
Web site: http://cs.sfsu.edu/People/jozo/jozo.html
Office: Thornton 946, Phone: (415) 338-2207
Office hours: Posted on iLearn
E-mail: jozo@sfsu.edu

Objectives: A systematic presentation of specific analytic, measurement, and simulation methods for performance analysis of computer systems (from personal computers to mainframes, networks, and Web systems). The course prepares students to effectively solve computer performance analysis problems related to the capacity planning, management, design, tuning, and comparison of computer systems.

Level: Formal prerequisites for this course are **CSc 415** or **ENGR 456** or consent of instructor. Essential prerequisites include (1) understanding of computer architecture and organization, (2) understanding of operating system functions and organization, (3) knowledge of basic probability theory and statistics, and (4) ability to write programs in one of general purpose programming languages. This is essentially a *graduate course* but qualified and motivated undergraduate students are usually also successful.

Content: Computer performance analysis is required at any stage in the life cycle of a computer system, including *system design*, *system selection/procurement*, and *system use/tuning*. The first problem is to predict the values of performance indicators of a computer system during its design and development. Then, in the area of system comparison and selection the problem is to evaluate and compare the performance of existing competitive systems, which are assumed to be available for performance measurements. In the area of system management the problem is to improve the performance level of existing operational computer systems. The main techniques for computer performance analysis include (1) *analytic modeling* (queuing theory, and operational analysis), (2) *simulation* (the use of specialized simulators, and general purpose simulation systems and languages), and (3) *measurement* (benchmarking based on natural and synthetic workloads). This course includes the presentation of all main techniques for computer performance analysis.

Textbooks: R. Jain, *The Art of Computer Systems Performance Analysis*. J. Wiley, 1991. [Recommended]
M. Harchol-Balter, *Performance modeling and design of computer systems.* Cambridge, 2013
Menasce-Almeida-Dowdy, *Capacity Planning and Performance Modeling.* Prentice Hall, 1994.
Menacsce, D., and V. Almeida, *Capacity Planning for Web Performance.* Prentice Hall, 1998.
Menasce, D. and V. Almeida, *Scaling for E-Business.* Prentice Hall, 2000.
A.O. Allen, *Probability, Statistics, and Queuing Theory with Computer Science Applications.* Academic Press, 1990.

Reader: J.J. Dujmović, *CSc841 Reader: Computer Performance Evaluation*. SFSU, 2003. Available on iLearn.

Journals: ACM SIGMETRICS Performance Evaluation Review, CMG Journal, Performance Evaluation, IEEE Transactions on Software Engineering.

Conferences: ACM SIGMETRICS, IEEE MASCOTS, CMG, WOSP, SIPEW (see Proceedings of these conferences)

Methods: Instructional methods include lectures, practical laboratory work (performance measurement and modeling), homework assignments (projects), and reading and presentation of recent research papers.

Points: Homework (P_H=20), Midterm exam (P_M=30), Final exam (P_F=50), individual extra work (P_E=5). All exams are open notes. Attendance of classes is mandatory and periodically checked.

Grading: The total number of points (the total score $P=P_H+P_M+P_F+P_E$) is used for relative ranking of students. Letter grades are assigned taking into account both the ranking and the total score. Generally, the passing level is $P \geq 60\%$.