

B60.4315: Queueing Networks - Theory and Application

Spring 2004

Instructor:

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Description:

This course is designed for Ph.D. students in the areas of operations management, information systems, and statistics. From a theoretical perspective, the course covers the fundamental theory of queueing networks for deterministic and stochastic systems. From a practical standpoint, the course discusses the growing literature on queueing networks and their applications to manufacturing processes, supply chain management, call centers, telecommunication networks, among others. The course content shall include book chapters and published research articles.

Lectures: Two 90-minute sessions per week.

Time: Tuesdays 9:30-12:30 (15 minutes break)

Room: KMC 2-90

Grading:

Homeworks 20%

Midterm 40%

Final 40%

Content:[†]

Session	Date	Description	Readings
1	T.B.A.	Introduction to Queueing Networks	
2	T.B.A.	Markov Processes and Reversibility	[10]-2, [8]-1
3	T.B.A.	Jackson & Whittle Networks	[10]-1, [2]-4-5, [3]-2
4	T.B.A.	Kelly Networks	[8]-2-3-4, [3]-3
5	T.B.A.	Network with Signals & String Transitions	[2]-6-7, [10]-7
6	T.B.A.	Quasi-Reversible Networks & Product Form	[10]-8, [2]-11
7	T.B.A.	Midterm	
8	T.B.A.	Discrete Time Networks	[2]-12
9	T.B.A.	Fluid Approximations	[3]-7-8
10	T.B.A.	Brownian Networks I	[3]-10
11	T.B.A.	Brownian Networks II	[5], [7]
12	T.B.A.	Stability	[1], [11]
13	T.B.A.	Scheduling and Control	[6]

[†]Students are supposed to prepare the readings before the corresponding session. The notation [X]-Y stands for chapter (or section) Y on reference X.

References

- [1] Bacelli, F., S. Foss (1994). Stability of Jackson-type Queueing Networks, I. *Queueing Systems* **17**, 5-72.
- [2] Chao, X., M. Miyazawa, M. Pinedo (1999). *Queueing Networks: Customers, Signals, and Product Form Solutions*. John Wiley & Sons, New York.
- [3] Chen, H., D. Yao. *Fundamentals of Queueing Networks*. Springer-Verlag, New York.
- [4] Jackson, J.R. (1963). Jobshop-Like Queueing Systems. *Management Science* **10**, 131-142.
- [5] Harrison, M., R. Williams (1987). Brownian Models of Open Queueing Networks with Homogeneous Customer Populations. *Stochastics* **22**, 77-115.
- [6] Harrison, M., J. van Mieghem (1997). Control of Brownian Networks: State Space Collapse and Equivalent Workload Formulations. *Annals of Applied Probability* **7**, 747-771.
- [7] Harrison, M. (2003) A Broader View of Brownian Networks. *Annals of Applied Probability* **13**, 1119-1150.
- [8] Kelly, F.P. (1979). *Reversibility and Stochastic Networks*. John Wiley & Sons, New York.
- [9] Kelly, F.P. (1991). Loss Networks. *Ann. Appl. Prob.* **1**, 319-378.
- [10] Serfozo, R. (1999). *Introduction to Stochastic Networks*. Springer-Verlag, New York.
- [11] Sigman, K. (1990). The Stability of Open Queueing Networks. *Stochastic Processes and Their Applications* **35** 11-25.