COLUMBIA
BUSINESS
SCHOOL

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B9801-01: Seminar in Operations Management

In this class we will review some papers from the operations management literature with specific emphasis on revenue management, dynamic pricing and auctions, with the dual aims of gaining a perspective of the literature and identifying promising research areas. Most of the papers are very recent, but I have also included several foundational papers. The focus of the class will be on the modeling aspects of these papers, as opposed to the mathematical details.

In each class, we will discuss one (or two clsely related) papers: 75 min. (or 45 min. per paper) will be devoted to a student presentation of one paper, and an additional hour (or 30 min. per paper) will be available for discussion. To encourage student participation, one student will be designated discussant per paper.

The class was scheduled to meet on *Thursdays, 10:00am-1:00pm in Uris 306* but will change to
Wednesdays 11:45am-2:15pm (Uris 329).

(First class, which is a short organizational meeting, willbe held both Wedn. 1/17 and Thurs. 1/18. Starting next week we will meet on wednesdays.)

There are no formal prerequisites for the class, although basic courses in stochastic processes and mathematical programming will be helpful.

If there are any questions, please call or send email.

(TENTATIVE) COURSE OUTLINE
B9801-01 Seminar in Operations Management
Spring 2001

Pricing

(1/24) Class 1: Single server, single class models

1. Mendelson, H. (1985), "Pricing computer services: queueing effects," Comm. of the ACM, 28(3), 312-321.
2. Stidham, Jr., S. (1985), "Optimal control of admission to a queueing system," IEEE Trans. on Aut. Control, 30(8), 705-713.

(1/31) Class 2: Single server, multi-class models

3. Mendelson, H. and Whang, S. (1990), "Optimal incentive-compatible priority pricing for the M/M/1 queue," Operations Research, 48(5), 870-883.
4. Van Mieghem, J. (2000), "Price and service discrimination in queueing systems: incentive compatibility of Gcμ policy," Management Science, 46(9), 1249-1267.

(2/7) Class 3: Multi-class network

5. Kelly, F.P., Maullo, A.K., Tan, D.K.H. (1998), "Rate control for communication networks: shadow prices, proportional fairness and stability," J. of Oper. Res. Soc., 49, 237-252.
6. Kelly, F.P. (1997), "Charging and rate control for elastic traffic," European Trans. On Telecommunications, 8, 33-37. (This paper contains an essential result used in [5].)

Revenue management

(2/14) Class 4: Single leg models

7. Lee, T.C. and Herch, M. (1993), "A model for dynamic airline seat inventory control with multiple seat bookings," Transportation Science, 27(3), 252-265.
8. Brumelle, S.L. and McGill, J.I. (1993), "Airline seat allocation with multiple nested fare classes," Operations Research, 41(1), 127-137.
9. Gallego, G. and van Ryzin, G.J. (1993), "Optimal Dynamic Pricing of Inventories with Stochastic Demand Over Finite Horizons". Management Science, 40, 999-1020.

   We will discuss [7,8] –these are typical revenue management papers for the single class model. [9] formulates the problem in the spirit of [10,11,12] that we cover next week.

(2/21) Class 5: No class – should attend Professor Avi Mandelabum's short course.

The week 2/19-2/23 Prof. Avi Mandelbaum (Technion) will give a short course on service engineering. Professor Mandelbaum is a world expert in these areas and an excellent teacher. You should all attend these lectures!! As of now the schedule for his visit is:

- ▷ Fri 2/16 10:30am-noon (Uris 329): a self contained seminar
- ▷ Tue 2/20 1:30pm-4:30pm (Uris 306): Lectures 1 and 2 of his course.
- ▷ Fri 2/23 10am-1pm (Uris 329): Lectures 3 and 4 of his course.

(2/28) Class 6: Network models

10. Gallego, G. and van Ryzin, G.J. (1997), "A Multiple Product Dynamic Pricing Problem with Applications to Network Yield Management," Operations Research, 45, 24-41.
11. Talluri, K. and van Ryzin, G.J. (1998), "An Analysis of Bid-Price Controls for Network Revenue Management," Management Science, 44, 1577-1593.
12. Cooper, W. (2001), "Asymptotic behavior of allocation policies for revenue management," preprint.

    We will review the results in [10,11]; [12] is closely related to [10,11]. Finally, some RM applications. [13] studies congestion pricing for network resources, and [14] gives an MDP formulation for a related problem where the service provider for an M/M/1 queue dyamically adjusts the service rate of the system.
13. Paschalidis, I. and Tsitsiklis, J. (2000), "Congestion-dependent procing of network services," IEEE/ACM Trans. on Networking, 8, 171-184.
14. George, J. and Harrison, J.M. (2001), "Dynamic control of a queue with adjustable service rate," To appear in Operations Research.

(3/7) Class 7: Choice demand models

15. Talluri, K. and van Ryzin, G.J. (2001), "A discrete choice model os yield management," preprint.
16. Anderson, S.P., de Palma, A. and Thisee, J-F. (1996), "Discrete choice theory of product differentiation" chapter 2, MIT Press, Cambridge MA.

(3/21) Class 8: Competition

18. Netessine, S. and Shumsky, R. (2001), "Revenue management games,", preprint.

19. Cachon, G. and Harker, P. (2001), "Service competition, outsourcing, and co-production in a queueing game," preprint.

    We will discuss [18].

Auctions

(3/28) Class 9: Introduction to auctions

20. Riley, J.G. and Samuelson, W.F. (1981), "Optimal auctions," The American Economic Review, 71(3), 381-392.

21. Wolfstetter, E. (1996), "Auctions: an introduction," Journal of economic surveys,10(4), 367-420.

(4/4) Class 10: Procurement auctions

22. Gallien J. and Wein L. (2001), "Design and analysis of a smart market for industrial procurement," preprint.

(4/11) Class 11: Smart markets for network pricing and control

23. MacKie-Mason, J.K. and Varian, H. (1995), "Pricing congestible network resources," IEEE J. Sel. Areas Communication, 13, 1141-1149.

24. Wellman, M.P., Walsh, W.E., Wuman, P.R. and MacKie-Mason, J.K. (2000), "Auction protocols for decentralized scheduling," To appear in Games and Economic Behavior.

(4/18-4/25) Classes 12-13: Project presentations.