

B60.4308: Applications of Stochastic Control to Revenue Management

Stern School of Business, Spring 2003

Instructor:

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Description:

This course is designed for Ph.D. students in the areas of operations management, economics, and marketing. From a theoretical perspective, the course covers the fundamental theory of optimal control for deterministic and stochastic system. From a practical standpoint, the course discusses the growing literature on Revenue Management and their applications to dynamic pricing and capacity control. The course content shall include book chapters and published research articles.

Lectures:

Thursday 9:00AM - 12:00AM (15-minute break)
Room: T.B.A.

Grading:

Homeworks 20%
Midterm 40%
Final 40%

Content:[†]

Session	Date	Description	Readings
1	01-30	Intro. to Rev. Mgmt & Calculus of Variation	[5], [1]
2	02-06	Deterministic Optimal Control	[8]-Chp:II,III,[13]
3	02-13	Dynamic Programming	[8]-Chp:IV, [2]-Chp:4-5
4	02-20	Dynamic Programming	[14],[4]
5	02-27	Point Processes	[6]-Chp:I,II,III
6	03-06	Opt. Control of Point Processes	[6]-Chp:VII,[10],[9]
7	03-13	Midterm	
8	03-27	Markov Diffusion Processes	[8]-Chp:V
9	02-13	Opt. Control of Markov Diffusion Processes	[8]-Chp:VI,[12]
10	04-03	Singular & Impulse Control	T.B.A.
11	04-10	Numerical Methods	[2]-Chp:6
12	04-24	Numerical Methods	[11]-T.B.A., [7]
13	05-01	Intro. to Stochastic Programming	[3]-T.B.A.

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

References

- [1] Belobaba, P. 1989. Application of a Probabilistic Decision Model to Airline Seat Inventory Control. *Ops. Res.* **37**, 183-197.
- [2] D. Bertsekas (1995). *Dynamic Programming and Optimal Control*. Athena Scientific.
- [3] Birge, J. (1997). *Introduction to Stochastic Programming*. Springer-Verlag.
- [4] Bitran G., S. Monschein. 1997. Periodic Pricing of Seasonal Product in Retailing. *Mgmt. Sci.* **43**, 427-443.
- [5] —, R. Caldentey. 2002. An Overview of Pricing Models for Revenue Management. Submitted to MSOM.
- [6] Bremaud, P. (1981). *Point Processes and Queues*. Springer-Verlag
- [7] Caldentey, R., L. Wein. 2002. Revenue Management of a Make-to-Stock Queue. Working Paper.
- [8] Fleming, W., R. Rishel (1975). *Deterministic and Stochastic Optimal Control*. Springer-Verlag.
- [9] Gallego, G., G. van Ryzin G. 1994. Optimal Dynamic Pricing of inventories with Stochastic Demand over Finite Horizons. *Mgmt. Sci.* **40**, 999-1020.
- [10] Kincaid, W.M., D.A. Darling. 1963. An inventory Pricing Problem. *J. Math. Analysis App.* **7**, 183-208.
- [11] Kushner, H., P. Dupuis (2001). *Numerical Methods for Stochastic Control Problems in Continuous Time*. Springer-Verlag.
- [12] Raman, K., R. Chatterjee. 1995. Optimal Monopolist Pricing Under Demand Uncertainty in Dynamic Markets. *Mgmt. Sci.* **41**, 144-162.
- [13] Smith S.A., D. Achabal. 1998. Clearance Pricing and Inventory Policies for Retail Chains. *Mgmt. Sci.* **44**, 285-300.
- [14] Talluri, K., G. van Ryzin. 1998. An Analysis of Bid-Price Controls for Network Revenue Management. *Mgmt. Sci.* **44**, 1577-1593.