

IOE 419 - Service Operations Management Course Outline Winter, 2014

TENTATIVE COURSE OUTLINE

Date	Topic	Readings
8-Jan	Introduction, course overview, importance of services in economy	Chapter 1 Review Ch 2, especially section 2.9
13-Jan	Taxonomy of location models and continuous location model	Ch. 4, sections 4.1, 4.2 Appendix B pages 29-32
15-Jan	Set covering model	Ch. 4, section 4.3
20-Jan	NO CLASS -- MARTIN LUTHER KING DAY	
22-Jan	Maximum covering model	Ch. 4, section 4.3, 4.4
27-Jan	Median and fixed charge location models	Ch. 4, section 4.4, 4.5
29-Jan	Multiobjective optimization	Ch. 2, section 2.8 Ch. 4, section 4.5
3-Feb	Multiobjective location models	Ch. 4, section 4.5
5-Feb	Deterministic inventory issues in services	Ch. 5, sections 5.1-5.4
10-Feb	Stochastic inventory issues in services	Ch 5, sections 5.5,5.6
12-Feb	Resource Allocation issues in services	Ch 6, sections 6.1-6.5
17-Feb	Short term workforce scheduling	Ch 7, sections 7.1-7.3
19-Feb	Short term workforce scheduling	Ch 7, section 7.4
24-Feb	Review for quiz	
26-Feb	QUIZ -- IN CLASS	
3-Mar	SPRING BREAK	
5-Mar	SPRING BREAK	
10-Mar	Queueing theory -- Basic principles. Kendall's notation, Memoryless Property of Exponential, CK Equations	Ch. 3, up to 3.4.2.2
12-Mar	Fundamental Markovian Steady State Equation (M/M/1, M/M/s)	Ch. 3, from 3.4.2.2 through 3.6
17-Mar	Finite population, finite queue, M/G/1 and Time dependent queueing	Ch. 3, section 3.7
19-Mar	Linking performance to scheduling	Ch. 7, sections 7.5-7.7
24-Mar	Priority queueing	Ch. 9, sections 8.1-9.2
26-Mar	Call center design and heavy traffic approximations	Ch. 9, section 9.3
31-Mar	Customer scheduling	Ch. 9, section 9.4
2-Apr	Long term workforce scheduling	Ch. 8, sections 8.1-8.4
7-Apr	Long term workforce scheduling and the newsvendor problem	Ch. 8, sections 8.5-8.7
9-Apr	Vehicle Routing - arc routing	Ch. 10, 10.1-10.3
14-Apr	Vehicle Routing - node routing	Ch. 10, 10.4-10.5
16-Apr	NO CLASS	
21-Apr	Vehicle Routing and Review for Final	
23-Apr		
29-Apr	FINAL EXAM Tuesday 4/29 1:30-3:30 pm	

BRIEF COURSE DESCRIPTION:

The service industry accounts for about 75% of the US employment and almost 60% of all personal consumption. This course will explore the service industries in the US (e.g., transportation, health care, retailing, restaurants, education, emergency services) with a view toward developing models that allow planners to reduce costs and enhance customer service. Topics to be covered include facility location planning for services (e.g., ambulances, fire stations, repair facilities, cell phone facilities), resource allocation problems, inventory management issues in the service sector, workforce planning and scheduling, yield and demand management, queueing analysis and design of service systems, call center management, and vehicle routing in the service industries.

In addition to learning about the service industry, the course has a secondary objective of introducing students to the non-textbook literature. Some of the course will be based on case studies that were documented in *Interfaces*, a journal published by INFORMS, the Institute for Operations Research and the Management Sciences. This journal is designed to be accessible to a broad range of readers including undergraduate and graduate students, working engineers and managers. Students will be exposed to a number of papers in the literature spanning a variety of problems in the service sector and a number of different industries. Students will learn to read such papers critically.

COURSE REQUIREMENTS:

Students will be graded on the following:

Homework assignments (approximately one per week)	35% total
One midterm exam	25% total
Written summary of one paper in the literature	10% total
Final exam	30% total

The midterm exam will be on February 26. The FINAL exam will be during the regularly scheduled time, as per the university guidelines for final exams. This time is Tuesday, April 29, 2013, from 1:30-3:30 pm.

Students are expected to come to all classes (unless they notify me in advance that they will not be able to attend a particular class). Students are expected to have read the assigned readings from the text (and any other material) and to **be prepared to discuss the readings in class**. Some readings will also form the basis for homework assignments.

Students may work together on homeworks, but each student is to hand in his/her own work.

<p>Students should have access to a portable computer with Excel and the Excel Solver installed. The computer should be brought to class every day as there will be in-class assignments almost every day</p>
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INSTRUCTOR and IA:

INSTRUCTOR: Mark S. Daskin
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IOE 1877A
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Because of the large volume of emails that I receive, please send all emails with the following text at the beginning of the subject line: **IOE 419**. This will help me respond in a timely manner. **Also, be sure to send emails from your UMICH account; emails from other accounts may go to SPAM.**

OFFICE HOURS:

Daskin: **Monday and Friday 1-4 in IOE 2717.** Due to travel, I may have to miss some office hours. In that case, alternate office hours will be identified, if possible. Also, you can make an appointment with me for times other than my office hours by emailing me.

Rose: **Tuesday 12-2.** Location to be announced.

REQUIRED TEXT:

Almost all readings and most problem assignments will be taken from the following text:

Daskin, M. S., 2010, *Service Science*, John Wiley, New York, NY.

Note that the entire text is available FREE to UMICH students in PDF format at

<http://mirlyn.lib.umich.edu/Record/011201266>

or go to <http://onlinelibrary.wiley.com.proxy.lib.umich.edu/advanced/search> and type in Daskin as the Author and Service Science as the Publication Title and hit Search.

The website for the book is:

<http://www-personal.umich.edu/~msdaskin/servicescience/>

This site includes many examples relevant to the book and the course as well as some stand-alone software that may be useful to you.

In addition students will be given papers from journals such as *Interfaces* which will be required reading.

OTHER TEXTS: (not required!!)

Chang, C. M., 2010, Service Systems Management and Engineering: Creating Strategic Differentiation and Operational Excellence, John Wiley, New York, NY.

Davis, M. M. and J. Heineke, 2003, Managing Services: Using Technology to Create Value, McGraw Hill Irwin, Boston, MA.

Fitzsimmons, J. A. and M. J. Fitzsimmons, 2004, Service Management: Operations, Strategy and Information Technology, Irwin/McGraw Hill, Boston.

Johnson, R. and G. Clark, 2008, Service Operations Management: Improving Service Delivery, Prentice Hall Financial Times, Harlow, England.

Katzan, J., 2008, Service Science: Concepts, Technology and Management, iUniverse, Inc., New York.

Metters, R., K. King-Metters, M. Pullman, 2003, Successful Service Operations Management, 2003, Thomson South-Western, Australia.

UNIVERSITY OF MICHIGAN DISABILITY STATEMENT:

The University of Michigan is committed to providing equal opportunity for participation in all programs, services and activities. Request for accommodations by persons with disabilities may be made by contacting the Services for Students with Disabilities (SSD) Office located at G 664 Haven Hall. The SSD phone number is 734-763-3000. Once your eligibility for an accommodation has been determined you will be issued a verified individual services accommodation (VISA) form. Please present this form to me at the start of the term or at least two weeks prior to the accommodation date (test, project, etc...)

ADDITIONAL POTENTIAL READINGS:

The course will also be based on readings from the literature (mostly from the journal *Interfaces*). Links to these papers will be posted on C-Tools as we encounter them in the course. These readings are listed below. **Not all of them will be used in this course and there may be others that are added as the course progresses.**

Sports:

1. Streib, N. S. J. Young and J. Sokol, 2012, "Major League Baseball Team Uses Operations Research to Improve Draft Preparation," *Interfaces*, **42**:2, 119-130.
2. Ribeiro, C. C. and S. Urrutia, 2012, "Scheduling the Brazilian Soccer Tournament: Solution Approach and Practice," *Interfaces*, **42**:3, 260-272.

3. Trick, M. A., H. Yildiz and T. Yunes, 2012, "Scheduling Major League Baseball Umpires and the Traveling Umpire Problem," *Interfaces*, **42**:3, 232-244.

Location Modeling:

4. McLay, L. A. and H. Moore, 2012, "Hanover County Improves Its Response to Emergency 911 Patients," *Interfaces*, **42**:4, 380-394.
5. Gavirneni, S., L. Clark, and G. Pataki, 2004, "Schlumberger optimizes receiver location for automated meter reading," *Interfaces*, **34**:3, 208-214.
6. Wang, X., X. Zhang, X Liu, L. Guo, T. Li, J. Dong, W. Yin, M. Xie and B. Zhang, 2012, "Branch Reconfiguration Practice Through Operations Research in Industrial and Commercial Ban of China," *Interfaces*, **42**:1, 33-44.
7. Dekle, J., M. S. Lavieri, E. Martin, H. Emir-Farinas, and R. L. Francis, 2005, "A Florida County Locates Disaster Recovery Centers," *Interfaces*, **35**:2, 133-139.
8. Sen, A., Bhatia, D. and K. Dogan, 2010, "Applied Materials Uses Operations Research to Design Its Service and Parts Network," *Interfaces*, **40**:4, 253-266.
9. Duran, S., M. A. Gutierrez and P. Keskinocak, 2011, "Pre-Positioning of Emergency Items for CARE International," *Interfaces*, **41**:3, pp. 223-237.
10. Aktas, E., O. Ozaydin, B. Bozkaya, F. Ulengin and S., Onsel, 2013, "Optimizing Fire Station Locations for the Istanbul Metropolitan Municipality," *Interfaces*, **43**:3, 240-255.

Resource Allocation:

11. Miranda, J., 2010, "eClasSkeduler: A Course Scheduling System for the Executive Education Unit at the Universidad de Chile," *Interfaces*, **40**:3, 196-207.
12. Lee, E., C.-H. Chen, N. Brown, J. Handy, A. Desiderio, R. Lopez, and B. Davis, 2012, "Designing Guest Flow and Operations Logistics for the Dolphin Tales," *Interface*, **42**:5, 492-506.
13. Thomas, B. G., S. Bollapragada, K. Akbay, D. Toledano, P. Katlic, O. Dulgeroglu and D. Yang, 2013, "Automated Bed Assignments in a Complex and Dynamic Hospital Environment," *Interfaces*, **43**: 5, 435-448.

Yield Management and Demand Management:

14. Ernst, A. T., M. Horn, M. Krishnamoorthy, P. Kilby, P. Degenhardt and M. Moran, 2007, "Static and dynamic order scheduling for recreational rental vehicles at tourism holdings limited," *Interfaces*, **37**:4, 334-341.
15. Brooks, J. P., 2012, "The Court of Appeals of Virginia Uses Integer Programming and Cloud Computing to Schedule Sessions," *Interfaces*, **42**:6, 544-553.
16. Koushik, D., J. A. Higbie and C. Eister, 2012, "Retail Price Optimization at InterContinental Hotels Group," *Interfaces*, **42**:1, 46-57.

Vehicle Routing

17. Mahadevan, B., S. Sivakumar, D. Dinesh Kumar, and K. Ganeshram, 2013, "Redesigning Midday Meal Logistics for the Akshaya Patra Foundation: OR at Work in Feeding Hungry School Children," *Interfaces*, **43**:6, 530-546.
18. Carnes, T. A., S. G. Henderson, D. B. Shmoys, M. Aghari, and R. D. MacDonald, 2013, "Mathematical Programming Guides Air-Ambulance Routing in Ornge," *Interfaces*, **43**:3, 232-239.
19. Yu, J. and R. Hoff, 2013, "Optimal Routing and Assignment of Consultants for Energy Education, Inc.," *Interfaces*, **43**:2, 142-151.

Workforce Management:

20. Belien, J., B. Cardoen, and E. Demeulemeester, 2012, "Improving Workforce Scheduling of Aircraft Line Maintenance at Sabena Technics," *Interfaces*, **42**:4, 352-364.
21. Miller, G., M. Weatherwas, T. Gardinier, N. Abe, P. Melville, C. Pendus, D. Jensen, C. K. Reddy, V. Thomas, J. Bennett, G. Anderson and B. Cooley, 2012, "Tax Collections Optimization for New York State," *Interfaces*, **42**:1, 24-84.
22. Bodin, L. and A. Panken, 2003, "High tech for a higher authority: The placement of graduating rabbis from Hebrew Union College - Jewish Institute of Religion," *Interfaces*, **33**:3, pp. 1-11.
23. Shrimpton, D. and A. M. Newman, 2005, "The US Army Uses a Network Optimization Model to Designate Career Fields for Officers," *Interfaces*, **35**:3, 230-237.
24. Martin, C. H., 2004, "Ohio University's College of Business Uses Integer Programming to Schedule Classes," *Interfaces*, **34**:6, 460-465.
25. Gordon, L. and E. Erkut, 2004, "Improving Volunteer Scheduling for the Edmonton Folk Festival," *Interfaces*, **34**:5, 367-376.

26. Cutshall, R., S. Gavirneni, and K. Schultz, 2007, "Indiana University's Kelly School of Business Uses Integer Programming to Form Equitable Cohesive Student Teams," *Interfaces*, **37**:3, 265-276.
27. Jessop, B., 2008, "Applying Optimization Techniques to Long-Term Workforce Planning," senior honors thesis, Department of Industrial Engineering and Management Sciences, Northwestern University, Evanston, IL, 60208.
28. Falasca, M., C. Zobel and C. Ragsdale, 2011, "Helping a Small Development Organization Manage Volunteers More Efficiently," *Interfaces*, **41**:3, pp. 254-262.
29. Ferrand, Y. M. Magazine, U. S. Rao, and T. F. Glass, 2011, "Building Cyclic Schedules for Emergency Department Physicians," *Interfaces*, **41**:6, pp. 521-533.
30. Cao, H., J. Hu, C. Jiang, T. Kumar, T.-H. Li, Y. Liu, Y. Lu, S. Mahatma, A. Mojsilovic, M. Sharma, M. S. Squillante and Y. Yu, 2011, "OnTheMark: Integrated Stochastic Resource Planning of Human Capital Supply Chains," *Interfaces*, **41**:5, pp. 414-435.
31. Woodall, J. C., T. Gosselin, A. Boswell, M. Murr, and B. T. Denton, 2013, "Improving Patient Access to Chemotherapy Treatment at Duke Cancer Institute," *Interfaces*, **43**:5, 449-461.
32. Santos, C., T. Gonzalez, H. Li, K.-Y. Chen, D. Beyer, S. Biligi, Q. Feng, R. Kumar, S. Jain, R. Ramanujam, and A. Zhang, 2013, "HP Enterprise Services Uses Optimization for Resource Planning," *Interfaces*, **43**:2, 152-169.
33. Lee, E. K., F. Pietz, B. Benecke, J. Mason and G. Burel, 2013, "Advancing Public Health and Medical Preparedness with Operations Research," *Interfaces*, **43**:1, 79-98.

Call Centers:

34. Whitt, W., 2007, "What you should know about queueing systems to set staffing requirements in service systems," *Naval Research Logistics*, **54**:5, 476-484.
35. Kelbis, M. F. and M. Chen, 2006, "Improving Customer Service Operations at Amazon.com," *Interfaces*, **36**:5, 433-445.

Airline Scheduling:

36. Desrosiers, J., A. Lasry, D. McInnis, M. M. Solomon, and F. Soumis, 2000, "Air Transat Uses ALTITUDE to Manage Its Aircraft Routing, Crew Pairing, and Work Assignment," *Interfaces*, **30**:2, pp. 41-53.

Auctions:

37. Rothkopf, M. H., and S. Park, 2001, "An Elementary Introduction to Auctions," *Interfaces*, **31**:6, pp. 83-97.

38. Ledyard, J. O., M. Olson, D. Porter, J. A. Swanson, and D. P. Torma, 2002, "The first use of a combined-value auction for transportation services," *Interfaces*, **32**:5, pp. 4-12.

Districting:

39. Duran, G., R. Epstein, C. Martinez, G. A. Zamorano, 2011, "Quantitative Methods for a New Configuration of Territorial Units in a Chilean Government Agency Tender Process," *Interfaces*, **41**:3, pp. 263-277.

40. Buzkaya, B., E. Erkut, D. Haight, G. Laporte, 2011, "Designing New Electoral Districts for the City of Edmonton," *Interfaces*, **41**:6, pp. 534-547.

41. Gopalan, R., S. O. Kimbrough, F. H. Murphy, and N. Quintus, 2013, "The Philadelphia Districting Contest: Designing Territories for City Council Based Upon the 2010 Census," *Interfaces*, **43**:5, 477-489.

Other Topics:

42. Duran, G. and R. Wolf-Yadlin, 2011, "A Mathematical Programming Approach to Applicant Selection for a Degree Program Based on Affirmative Action," *Interfaces*, **41**:3, pp. 278-288.

43. Smalley, H. K., P. Keskinocak, F. G. Engineer, and L. K. Pickering, 2011, "Universal Tool for Vaccine Scheduling: Applications for Children and Adults," *Interfaces*, **41**:5, pp. 436-454.

44. Turner, J. P., H. E. Rodriguez, D. A. DaRosa, M. S. Daskin, A. Hayman, and S. Mehrotra, 2013, "Northwestern University Feinberg School of Medicine Uses Operations Research Tools to Improve Surgeon Training," *Interfaces*, **43**:4, 341-351.

45. Andrade-Pineda, J. L., P. L. Gonzalez-R, and J. M. Framinan, 2013, "A Decision-Making Tool for a Regional Network of Clinical Laboratories," *Interfaces*, **43**:4, 360-372.