IE 365 Manufacturing and Service Systems Planning I

Year and Semester: **2016-2017 Spring**
Credit Hour: **(3 2 4)**
ECTS: **6**
Prerequisite(s): **IE 232 (Operations Research I – Modeling)**

Catalog Description

This is the first of two sequel courses, which are designed to introduce the planning issues for manufacturing and service systems. The topics covered in the first course are manufacturing and service systems, long-range planning, forecasting, aggregate planning, deterministic and independent demand inventory management, dynamic lot sizing.

Textbook

- S. Nahmias, *Production and Operations Analysis* (6th ed.), McGraw-Hill, 2010.

Reference Books

- D. Sipper, and R.D. Bulfin, *Production Planning, Control, and Integration*, McGraw-Hill, 1997.
- E.A. Silver, D. Pyke, and R. Peterson, *Inventory Management and Production Planning and Control* (3rd ed.), Wiley, 1998.
- T.E. Vollmann, W.L. Berry, and D.C. Whybark, *Manufacturing Planning and Control Systems* (3rd ed.), Irwin, 1992.
- S. Chopra, and P. Meindl, *Supply Chain Management: Strategy, Planning, and Operation* (4th ed.), Prentice-Hall, 2009.

Course Objective

This course aims to introduce basic and advanced models and solution techniques for forecasting, aggregate planning and inventory planning problems for manufacturing and service systems.

Learning Outcomes

On successful completion of the course, all students will have developed:

- Ability to identify basic managerial concepts and issues in manufacturing and service systems
- Capability to use quantitative methods to model, analyze, and optimize manufacturing and service systems planning problems
- Capability to formulate mathematical programming models for solving a variety of manufacturing and service systems planning problems, and have improved their skills in mathematical modeling
- Ability to understand the shortcomings and limitations of analytical models and quantitative solution techniques devised for solving the manufacturing and service systems planning problems and how qualitative decision making can be incorporated

- Skills in using basic mathematical programming and optimization software (such as LINGO, GAMS, CPLEX etc.) and coding an algorithm in a general purpose language

On successful completion of the course, all students will have:
- Improved their teamwork skills
- Awareness of ethical issues

Course Outline

Week 1: Introduction and background of production planning. Business strategies for being competitive. Components of operations strategy. Decision making and time horizons in production and operations management. Market-driven systems and global competition. The product life cycle. The process life cycle. Trade-off between production spectrum and production volume. Learning and experience curves.

Week 2: Classification of forecasting: Qualitative and quantitative approaches. Error analysis and evaluation of quantitative methods. Time series approach in forecasting. Methods for stationary series. Moving averages and exponential smoothing

Week 3: Methods for series with increasing or decreasing trend. Double exponential smoothing. Seasonal series. The seasonal trend model and Winter's method.

Week 4: Linear regression for causal forecasting and time series forecasting. Monitoring of forecasts. Tracking signal and corrective action.

Week 5: Hierarchy of decision making in production and operations management. Aggregation and aggregate units. Spreadsheet methods for aggregate planning. Alternative strategies for spreadsheet methods.

Week 6: Formulation of aggregate planning problems by linear programming. Fixed work-force models and the transportation problem approach for aggregate planning. Nonlinear programming models for aggregate planning. Solution approaches by mixed integer programming.

Week 7: Significance of inventories for production planning, conventional inventory policies, continuous review versus periodic review. Deterministic lot sizing and the economic order quantity (EOQ) model.

Week 8: Sensitivity of inventory problems. Infinite replenishment versus finite rate production systems and the economic production quantity (EPQ) model.

Week 9: Deterministic continuous review problems with backordering and finite production rate. EOQ models with all units discount and incremental discount.

Week 10: Resource constrained inventory problems. Multiple item EOQ models in the presence of budget and storage space limitations.

Week 11: Multi item ordering. Joint replenishment of multiple products lot sizing with multiple products or customers

Week 12: Mathematical programming models for deterministic demand discrete lot sizing inventory problems. Wagner-Whitin algorithm. Silver-Meal, Least unit cost, and Part period balancing methods. Trial-error solution techniques using spreadsheets.

Week 13: Supply chain management as a part of business strategy. Goals of the supply chain. Supply chain process cycles. Supply chain macro processes in a firm. Successful examples of supply chain management.

Week 14: Supply chain management modeled as a transportation problem. The Greedy Heuristic. The linear programming formulation. Distribution resource planning. Vehicle routing. Warehousing. Multilevel distribution systems.

Computer Usage

Computer packages might be required for some homework assignments. Lab tutorial sessions can be organized for the benefit of the students if necessary.

Grading

Homework	15%
Midterm-1	27.5%
Midterm-2	27.5%
Final Exam	30%

Lecture Hours

Section 1:
Tuesday   12:20—13:10 (L-111)
Wednesday   12:20—14:10 (HA-01, recitation)
Friday   15:20—17:10 (LB-05)

Lecturer

Hakan Özaktaş, Ph.D in Industrial Engineering
Office: L-323, x1377, ozaktas@cankaya.edu.tr
Office hour: Tuesday 14:20—15:10, Thursday 13:20—14:10

Assistant

Atıl Kurt, M.S in Industrial Engineering
Office: L-322, x1371, atilkurt@cankaya.edu.tr
Office hour: Monday 14:20—15:10

IMPORTANT NOTES

- Communication will be made through http://webonline.cankaya.edu.tr Announcements should be checked regularly. Students should check their accounts to make sure that they can access the page of IE 365 through *webonline*.
- Every student should study regularly from the textbook. Copies of the textbook are also available in the university library at the *Reserve* section.
- Regular attendance for lectures as well as recitation hours is expected. It is the responsibility of the students to avoid timetable clashes during registrations.
- Any student who has not attended at least 20% of the lectures and the recitation hours (attendance percentage is calculated by combining lecture and recitation hours) will not be admitted to the Final exam.
- Make-up exams are given only for students who have medical reports given (or approved) by Çankaya University Health Center. All medical excuse reports should be officially submitted within 7 working days (starting from the end-date of the medical excuse). Make-up exams will not be given for applications which are not submitted on time.