Fall 2020

IE 659-851: Supply Chain Engineering

Sanchoy Das

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COURSE DESCRIPTION

Supply Chain Management focuses on managing material and information flows across the product delivery enterprise. This course focuses on the key operational capabilities that a supply chain system must develop to support the business strategy of a firm, and the relationship between the desired capabilities and the structure of a supply chain. This course explores the key issues associated with the design and management of industrial Supply Chains (SC). SC are concerned with the efficient integration of suppliers, factories, warehouses and stores so that products are distributed to customers in the right quantity and at the right time. One of the primary objectives of SC management is to minimize the total supply chain cost subject to various service requirements.

Students will be able to describe and explain fundamentals of SC and to derive and compute optimal policies/variables, performance measures such as costs/profits, and be aware of SC practices. Students will gain exposure to quantitative methodologies and analysis that support operations and supply chain strategy and planning decisions, using case studies and development of analytical spreadsheet models.

CANVAS

The course will make extensive use of the Canvas system to optimize student-instructor communication. All course materials including lecture slides and homework etc. will be distributed through Canvas. All submission of homework and other assignments will also be through Canvas. To access the system please go to http://canvas.njit.edu/, you will need a valid UCID to login.

Several times during the semester we will have an online class session. During these sessions I will discuss course material, have discussions with students and initiate discussions. These sessions will be conducted through the WEBEX platform which is integrated with Canvas. To enter the WEBEX class click on ONLINE CLASS EVENT at the top of the course Canvas page.

ONLINE CLASS SESSIONS & WEBEX: Thursdays from 6.00 to 7.30 pm (optional as scheduled). Note the WEBEX sessions do not occur every week.

It is NOT mandatory to attend the online class sessions. Each class session will be recorded and archived. You can access these files at your convenience. From the course Canvas page you will see the archived WEBEX SESSIONS listed in the corresponding topic box and referenced by lecture number.
VIDEO RECORDING OF LECTURES – To maximize the online class experience, I have been recording the class lectures. These are integral to the course and made available under the corresponding topic # in Canvas. A key part of the weekly assignment is for all students to review the video recording of the lecture. When a lecture is presented during the online class session, it will be recorded and the corresponding Video lecture in Canvas will be updated.

WEEKLY ASSIGNMENTS

This is an online class, so success is greatly dependent on your study discipline. Every week I will send an email on Tuesday, which identifies the current topic and lists the tasks for the upcoming week. A key determinant of course success and learning effectiveness will be the discipline with which you complete the assigned tasks. The tasks are also listed under Weekly Tasks & Assignments at the top of the course Canvas page. Typical weekly activities include:

LECTURE: Attend the online class session and/or view the archived class session. You can also download and view the lecture at any time.

VIDEO: Click on the Video links in each topic and view the recordings. All videos are 7 minutes or less.

READINGS: Download and review the readings in each topic.

Q&A FORUM: Associated with each topic there will be a Q&A Forum in which I will post 2 questions. You will post your answers online. The questions will be related to the current topic and will contribute to your grade.

GRADING

Based in individual and team performance as follows:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Quiz 1</th>
<th>Quiz 2</th>
<th>Quiz 3</th>
<th>Q&amp;A Forums</th>
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<td>Tech Solution Project</td>
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Each quiz will consists of two parts: (i) Online section – consisting of numerical questions and multiple choice questions, both of which are uniquely generated for each student and responses are entered directly into Canvas (ii) Offline section – consisting of numerical questions which require solution on Excel, answers are recorded on an Excel and PDF/Word files which are then uploaded to Canvas.

Quiz assignment dates are listed below in the outline. Submission is usually within a week. FAQs for the online quiz will be posted on Canvas under the Quizzes module.

LECTURE SLIDES AND SUGGESTED READINGS

**IE 659 Supply Chain Engineering lectures slides** by Prof. Sanchoy Das will be distributed electronically through Canvas

Course Readings – Several papers/reports (R1 to R9) have been selected to complement the weekly topics. These are listed below, please complete each reading prior to the start of the topic.

TECHNOLOGY SOLUTION PROJECT:

Technology solutions are vendor provided solutions that a company will implement to improve the productivity of its operations. Such solutions range from purely software solutions to those with a significant analytical component. The technology solution project will be completed in teams. Use the Course Community Forum to solicit and build your teams.

This project is designed to be a technical sales presentation which your group (the vendor) is making to the rest of class (the prospective client) about a specific technology solution. As in any technical sales presentation your presentation objectives are: (i) to educate the client about what your proposed solution does (ii) how the solution is implemented (steps, phases, or components), and (iii) what are the likely benefits. Each team will be assigned a unique solution in the supply chain area.

Each team will consist of 4 students. You team will collaborate using available online and mobile technologies. The team is required to review and discuss the assigned solution and create a detailed PowerPoint report. The team will be making a 20 minute online presentation using WEBEX. Presentations will be scheduled as noted in the outline below. Teams are expected to communicate digitally through email, text message, and skype. You are encouraged to use the Google Drive (part of NJIT WebMail) to share project documents.

COURSE OUTLINE – Organized on a weekly schedule starting from Tuesday each week

<table>
<thead>
<tr>
<th>#</th>
<th>CHAPTER</th>
<th>TOPIC</th>
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<tbody>
<tr>
<td>1</td>
<td>1, 2, 3</td>
<td>Introduction to Supply Chain Management – Week of September 1</td>
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<tr>
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<td>- Supply Chain Strategic Goals</td>
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<td>- Supply Chain Performance Metrics and Strategic Objectives</td>
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<td>- Example Modern Supply Chains: McDonalds and Home Depot</td>
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<td>Lecture #1: Introduction to Supply Chain Management</td>
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<td>Video: V1. Adidas Omni-Channel Shopping</td>
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<td>Video: V2. Oracle - Consumer Goods in Supply Chains</td>
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<td>Reading: R1. Digitization Makes the Supply Chain More Efficient</td>
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<td>2</td>
<td>4,5</td>
<td>Network Flow Optimization – Week of September 8</td>
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<td>- Distribution Network Basics</td>
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<td>- Cross Docking Operations</td>
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<td>- Configuration of Logistics Networks</td>
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</table>
Lecture #2: Network Flow Optimization  
*Video:* V3. General Mills Global Sourcing  
*Reading:* R2. Best Value Supply Chains

3. **Demand Planning in Supply Chains – Week of September 15**  
   - Demand Management Objectives  
   - Forecasting Tools: Moving Average & Linear Regression  
   - The Bullwhip Effect

Lecture #3: Demand Planning in Supply Chains  
*Video:* V5. Sleep Better with SAP: Hastens Implementation  
*Video:* V6. Starbucks Global Supply Chain  
*Reading:* R3. SAP Demand Sensing & Shaping

**QUIZ #1 – Week of September 22**

4. **Inventory Control Models – Certain & Uncertain – Week of September 22 & 29**  
   - The Role & Cost of Inventory in the Supply Chain  
   - Economic Order Quantity Models and Extensions  
   - Reorder Point Inventory Systems  
   - Newsvendor Inventory Problem  
   - Risk Pooling: Centralized Inventory

Lecture #4A: Inventory Control in Supply Chains  
Lecture #4B: Uncertainty & Risk in Inventory  
*Video:* V7. SAP at Salvatore Ferragamo  
*Video:* V8. Vera Bradley Operations  
*Reading:* R4. Fresh Express: Six Day Perishable Supply Chain  
*Reading:* R5. Rapid Fire Fulfillment at Zara

**SECTION-2: Enterprise Perspective**

5. **Materials Requirements Planning (MRP) – Week of October 6 and 13**  
   - Bill of Materials & Process Plan  
   - MRP Scheduling Algorithm  
   - Advanced Lot Sizing Methods

Lecture #5: Materials Requirements Planning  
*Video:* V10. Logistics for an Omni-Channel World  
*Video:* V11. Lennox International - Supply Chain Integration  
*Reading:* R6. Supply Chain Game Changers

**QUIZ #2 – Week of October 20**

6. **Sourcing Decisions & Supplier Contracts – Week of October 20**  
   - Supply Contracts & Sourcing Flexibility
- Revenue Sharing Models

Lecture #6: Supplier Selection & Supply Contracts  
Video: V12. SAP Business One Demo - Inventory  
Reading: R7. Driving Supply Chain Excellence

7.  16  
**Supply Pricing & Revenue Management** – Week of October 27 and November 3  
- Pricing to Multiple Segments  
- Perishable Assets Dynamic Pricing  
- Supply Chain Analytics  
- Gartner Top 25: Metrics and Findings

Lecture #7: Supply Pricing & Revenue Management  
Video: V13. Lifetime Brands Makes Home Products Better with SAP  
Video: V14. Future Supply Chain 2016 – Cap Gemini  
Reading: R8. Gartner Supply Chain Top 25 – LlamaSoft Analysis

8.  
**Fast Fulfillment & Online Retail Supply Chains** – Week of November 10  
- The Amazon Fulfillment Warehouse  
- Online Fulfillment Key Differentiators  
- Analytics driven decision models

Lecture #8: Fast Fulfillment – The Machine that Changed Retailing  
Reading: R9. Product Flows & Models in Internet Fulfillment Warehouses

9.  17  
**Information Technology & ERP in Supply Chains** – Week of Nov 17 & Dec 1  
- Introduction to ERP Systems and their Modules  
- Introduction to SAP Modules  
- SAP Supply Chain Management

Lecture #9: Enterprise Resource Planning Systems  
Lecture #10: Introduction to SAP  
Video: V15. SAP The Digitalization of Supply Chains  
Video: V16. SAP Business One Inventory  

*SAP Learning Resources – Optional study*  
1. SAP-SCM Tutorial:  
   [https://www.tutorialspoint.com/sap_scm/sap_scm_tutorial.pdf](https://www.tutorialspoint.com/sap_scm/sap_scm_tutorial.pdf)  
2. SAP-SCM Overview Slides  
3. SAP Material Management (MM) Training Video  
   [https://www.youtube.com/watch?v=X8Q6lj-MuY](https://www.youtube.com/watch?v=X8Q6lj-MuY)  
4. SAP-MM Certification  
   [https://sap-certification.info/mm/](https://sap-certification.info/mm/)

No class week of November 24

10.  
**Technology Solution Project Presentations** – December 5 to 12
ACADEMIC INTEGRITY:

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.

If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu