

**DSO 599 – Supply Chain Analytics– Spring 2020**

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| **Time:** | Mon/Wed 5:00 – 6:20PM | | | **Room:** | Online | |
| **Instructor:** | Dr. Robert Wang | | | **Office:** | Online | |
| **E-mail:** | wangrobe@marshall.usc.edu |  | **Telephone:** | | TBD |
| **Office hours:** | Mon/Wed 3:00 -- 5:00PM (or by appointment) | | |  |  | |

**COURSE SCOPE AND TEACHING APPROACH**

While other courses currently offered may nominally focus on a similar topic, this course will provide students with unique, in-depth insight into four areas of Supply Chain Management: ***Data Driven Decision Making, Solving Real-World Problems, Utilizing Scalable Technology,*** and ***Current Industry Best Practices***. Each of the four aspects are heavily emphasized to develop the knowledge and skills students need to meet the demands in today’s job market and to begin a successful career. Most of the lecture contents, projects, and data used in the course are drawn from many years of first-hand management consulting practices in different industries, and internal consulting which involved the development of innovative supply chain solutions for a major CPG company. We designed the course with one simple ***goal*** in mind: ***to prepare you well for your first job and your long-term career****.* The business concepts, problem solving approach, technical skills, and business practices you will learn from this course will prepare you for your job interviews, help you to perform the most challenging assignments on your first job, and position you well for the modern supply chain management career.

***Data-Driven Decision Making***

Data-driven approach means to make decisions relying on a sophisticated system of predictive, and prescriptive analytical information and solutions developed within an organization. This analytical system is highly automated, run and managed by a team of data scientists and subject matter experts. Data-driven decision-making requires an analytical mind set, and an organizational structure and culture centered on analytics. Decisions must be made based on facts, rather than gut feeling or intuition because our personal experience is always biased and incomplete. With the advancement and adoption of Business Analytics, Data Science, and Artificial Intelligence, data-driven decision making has become the modern approach of supply chain management. Because of this new development, a general business understanding is no longer adequate in the workplace. Most competitive companies expect advanced, in-depth skills from students entering to the job market.

An ability to analyze and draw insights from data is a critical skill to have. At the beginning of the course, you will be provided with a large database with a comprehensive set of real supply chain data from a major food and nutrition manufacturing and distribution company. It includes but not limited to the following data:

* Demand Forecast
* Order History
* Shipment History
* Inventory History
* Material Master
* Customer Master
* Location Master

This dataset serves as a common thread and a real-world business case to be discussed throughout the entire course. As the course unfolds, we will cover the following topics

* Demand Planning
* Inventory Management
* Supply Planning or MPS
* Distribution Requirement Planning (DRP)
* Transportation
* Supply Chain Network Design

For each topic, the dataset will be used as a basis for principle and concept discussion, classroom demonstrations, data visualization, and student projects. You not only get to experience what is like to work with real-world ERP data, but also get exposed to the potential data issues you could run into. You will have the opportunity to learn a great deal about business terminology, business functions and processes, supply chain network, and organizational structure just from visualizing and analyzing the dataset. As you progress along the course, your understanding and knowledge will build very quickly. At the end of the course, you will have not only learned supply chain management, but also know the underlying company dynamics and its business process inside out. The exposure to, and the learning and insights you will develop from the realistic problems and issues discussed in the class would be equivalent to 1-2 years of working experience in a large manufacturing and distribution company.

***Practical Problem Solving***

There has always been a gap between what you learned from school and what is expected of you to know from job market and career. This is because our program curriculum is not always timely updated or designed to perfectly aligned with the constant changing market needs. The mismatch creates stress and anxiety for students in their job placement, and their deep learning curve, particularly in their first job. This course is designed to address the issue at its root. On the surface, the course may seem to cover the common topics without anything special. Under the hood, however, the approach and techniques used to discuss and solve the issues are all proven effective in real world. In fact, some of the methods introduced in the course may not be found in any textbook, but they are widely endorsed by industry practices. Coming out of the course, you will find yourself speaking a similar business language, thinking and using similar problem-solving approaches to the people who will interview you and work with you in the future. This will dramatically improve your chance to get a dream job upon graduation, perform well in your first job, and lead you to a successful career.

***Scalable Technology***

Companies looking for solutions to manage their supply chain, often use different technologies than those typically taught and used in the classroom. The most effective business solutions developed and deployed in real-world organizations need to be scalable and have the capability to be industrialized. It is of a great advantage for students have proficiency in scalable, industrialized technologies when they are on job market. This course will introduce you the latest technology in Data Visualization, Optimization Solver Engine, Database, and high-level Programming Language, etc. You will learn to use the following tools and software throughout the course in solving problems:

* Tableau Data Visualization
* Python (Jupyter Notebook)
* Gurobi Solver
* Relational Database
* Excel Solver
* Excel Pivot Table
* Interactive Inventory Calculator

It is important to note that the focus of the course is not on technologies, rather it is on Supply Chain Management. There are many dedicated courses out there for technologies. This course brings the popular technologies together as tools or enablers and makes use of them in the supply chain context. You will learn how the technologies are deployed and add value in real businesses.

***Industry Best Practice***

For every topic covered in the course, we will allocate sometime to discuss its business processes and common organizational structures in different industries. This gives you the perspective of how the issue and processes are managed in real-world, and what are best practices around it. We will also discuss change management, which is so important when a new business solution or process is being implemented. Throughout the course of the semester, you will be exposed to and learn to solve a variety of common problems and to work on improvement projects that are faced by supply chain professionals. You will learn and use the tools and software that are being used in industries. Everything you learn from this course, from supply chain principles to software tools, will be a significant addition to your current resume.

Obviously, the great benefits of the course come with a steep price tag – you will need to put a lot of work into it. The course is not a passive knowledge feeder. It requires your commitment, and initiative on your part to do well. The most effective way of learning is by doing. There will be many tutorials, and hands-on exercises that you may need to work through outside the classroom, particularly if you do not have an extensive database or technical background. The course is designed to be an invitation, an inspiration, and a discipline to keep you focused, and to learn some highly in-demand skills that you would not likely to acquire otherwise on your own in a short amount of time.

***Course Overview***

To show the unique approach and the practical perspective of the course, a Course Overview (Appendix) is provided in end of the syllabus. The course overview highlights the main topics discussed in each of the 6 supply chain areas. It also outlined the requirements for the 4 project assignments to be completed by the students. At the end of the deck, we also shared some of the feedbacks provided by the previous students who took the course.

**COURSE OBJECTIVES**

This course is mainly designed for residential (on-campus) master programs. Students with a few years of working experience, and some quantitative background will find it a natural fit and a great extension for their learning experience. With a minor modification of replacing the Network Optimization by Cost Benefit Analysis in the later part of the syllabus, the technical complexity of the course is greatly reduced, and the course will fit for the on-line programs as well.

Upon successful completion of this course, you will be able to:

1. Articulate the philosophy and approach in data-driven Supply Chain Management.
2. Understand the important role of change management, develop key skills to implement new business solutions and processes.
3. Explain the key principles of Supply Chain Planning, and a typical end-to-end planning process flow
4. Perform inventory optimization by identifying the main inputs that affect the inventory level, perform inventory optimization, and set inventory targets
5. Evaluate a variety of business constraints and inputs in Supply Planning, and develop a realistic constrained model to optimize Master Production Schedule
6. Assess various cost drivers for supply chain network, and develop a realistic model to optimize supply chain network to minimize the total delivered costs

**COURSE MATERIALS**

***Textbook:***

*Supply Chain and Logistics Management Made Easy: Methods and Applications for Planning, Operations, Integration, Control and Improvement, and Network Design,* by [Paul A. Myerson](https://www.amazon.com/s/ref=dp_byline_sr_book_1?ie=UTF8&text=Paul+A.+Myerson&search-alias=books&field-author=Paul+A.+Myerson&sort=relevancerank) (Author), Pearson FT Press; 1 Edition (May 10, 2015).

***Recommended Readings:***

*Truckload Transportation: Economics, Pricing & Analysis* by Leo J. Lazarus, Monument Press, 2010.

***Software***

To avoid technical issues, it is highly recommended to use a PC with windows 10 installed. Access Database is used throughout the course to store and analyze a very large dataset provided. Mac does not natively support Access Database. If you have to use a Mac, please configure a virtual window environment to act as a PC computer. Here is a list of software that will need to be installed:

* Microsoft Office (Access and Excel)
* Tableau Desktop: [Full Version for Student](https://www.tableau.com/products/trial)
* Tableau Reader: [Latest Version](https://www.tableau.com/products/reader)
* Excel OpenSolver: [Latest Version](https://opensolver.org/installing-opensolver/)
* Gurobi Solver: [For Academic User](https://user.gurobi.com/download/licenses/free-academic)
* Gurobi Python: [Latest](http://www.gurobi.com/downloads/get-anaconda)

***Other Learning Resources:***

* YouTube Videos
* Online Tutorials

It is recommended that you install all the software as soon as you decided to take the course, as it may take some time to setup your academic licenses. To ensure your smooth installation, it is very important to choose the same bit version consistently across all the software for the class. If you decided to use 32-bit software for example, please make sure that all your software (Access, Tableau, Gurobi, and Python) are in 32-bit. The ODBC data connection between the software requires the consistency, and otherwise it won’t work. You may get help from the software vendors directly for technical issues. There will be no help desk support for the course.

**COURSE POLICIES**

Active participation in class is important throughout the course. To ensure everyone’s participation, I will be providing random, specific students the opportunity to demonstrate their understanding throughout each class.

You are expected to arrive to classroom on time. If you have conflicting schedules that prevent you from that, please let me know at the beginning of the semester.

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| **GRADING** |  |
| Midterm and Exam | 40% |
| Course Projects (4) | 40% |
| Class Contribution and Effort | 20% |
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The four projects that you will be working on for the course are: 1) Inventory Optimization, 2) Production Planning, 3) Supply Chain Network Visualization, and 4) Network Optimization. These projects get you exposed to the most common and financially impactful supply chain problems encountered by companies in the manufacturing and retail industries. You can fine more details about the projects in the Course Overview (Appendix) in the end.

Course projects are evaluated based on the following 4 criteria:

* Approach 50%
* Effort 25%
* Correctness 25%

For each project assignment, you need to outline your thinking process and your approach in solving the problem. As you can see this is the most important part of evaluation. To obtain the highest score in Approach, you need to demonstrate clarity and logicality. There may be different approaches to solve a problem, a simplest and most creative method will get you the highest score on Creativity. Not all the assignments have a standard answer, but some quantitative analyses do have a correct answer. You will still get partial credit even if you failed on Approach, and Correctness as long as you have demonstrated your effort. Your attention to detail, thoroughness, and willingness in trying are what I am looking for in the Effort category. Failure to submit an assignment will result in score of zero for the assignment. Late submission can get partial credit depending on individual case and reason.

Due to the technical nature of the material, helping each other within the class is highly encouraged. Helping is showing how to perform a task, not performing the task on another’s behalf. ***Do not share your assignment files with your classmates! Plagiarism will not be tolerated.***  You can provide support via discussion board where everyone can benefit, or you can help in a one-on-one base. As a courtesy, anyone who received significant help should acknowledge the contributors in their homework. Making a public recognition of the specific contributions of colleagues is a professional practice that displays the recognizer in the best light as an appreciative team player.

**PROJECTS AND EXERCISES**

Learning is a direct function of the number of hours you put in. The most effective way of learning is by doing. It is particularly true for this course as the nature of the course is hands-on. Since nobody can learn for you, project submission is an important component in the grade evaluation. The project in this course maybe unlike your typical assignments in your other courses. They are drawn from real projects. In some cases, you are asked to prepare a presentation. To do well for the course, you must take each project seriously.

We can only cover some basic software features or functions in the classroom. To maximize your learning experience and to do well for the class, you are expected to spend at least 4 - 6 hours per week outside of the classroom learning the software. The more work you do outside of the classroom, the more you will learn, and get out from this course. In addition to the software tutorials provided below, YouTube videos, reading materials and exercises will be provided to you. The exercises will not be graded, but without the effort you made on these exercises you may not be able to complete the homework projects, and worst of all, to keep up with the class.

**TUTORIALS AND SELF STUDIES REQUIRED TO MASTER THE COURSE**

Here we provide you with a list of tutorials, YouTube videos, and other materials to be mastered to increase your success in this course. You don’t have to go through them all if you are already comfortable with some of topics. On the other hand, you should not limit yourselves to the list if you find them inadequate or you want to learn more. Everyone’s background is different, and therefore you should adjust your learning process to your own situation. Thanks to the Internet, there are innumerable resources for learning at hand. Identifying your learning needs and acquiring the knowledge yourself using the resources available to you has become an essential capability of a successful professional. You don’t need to time the tutorials with the progress of the course. In fact, I would highly recommend that you go through the list ahead whenever you have time for two good reasons. Your learning would be more effective when you prepare the subject prior to the class session. You also can manage your time much more effectively by spreading your work load. You will find that some tutorials worth going over multiple times. [lynda.com](http://lynda.com) is another great resource to learn a subject in great depth systematically.

***Access Database:***

Relational Database Concept (5 mins): [Relational Database Concepts](https://www.youtube.com/watch?v=NvrpuBAMddw)

Database Design Basics:[Database design basics](https://support.office.com/en-us/article/Database-design-basics-1eade2bf-e3a0-41b5-aee6-d2331f158280)

Access Database Basics 01 (23mins):[How to create tables](https://www.youtube.com/watch?v=pjQdzlVqKOk&list=PL4UezTfGBADCc5_Ow-5DoDvwx9vbcNk0b)

Access Database Basics 02 (16mins):[How to link tables and field](https://www.youtube.com/watch?v=FKObeVJQZN4&index=2&list=PL4UezTfGBADCc5_Ow-5DoDvwx9vbcNk0b)

Access Database Basics 03 (14mins):[How to create a query: Part 1](https://www.youtube.com/watch?v=uZ2C51n7TZs&list=PL4UezTfGBADCc5_Ow-5DoDvwx9vbcNk0b&index=3)

Access Database Basics 04 (21mins):[How to create a query: Part 2](https://www.youtube.com/watch?v=gkz7NHWpvwY&list=PL4UezTfGBADCc5_Ow-5DoDvwx9vbcNk0b&index=4)

Access Database Basics 05 (63mins):[More advanced query](https://www.youtube.com/watch?v=T5jLS5Ofwmo)

Access Functions: [A Comprehensive List](https://www.techonthenet.com/access/functions/index.php)

***Excel Pivot Table:***

Excel Pivot Table Tutorial (6mins): [Basic](https://www.youtube.com/watch?v=Vx-Fuw46VbY)

**Tableau Tutorials (Recommended List):** [Latest Link](https://www.tableau.com/learn/training)

Note that you need to register first before accessing the training link

* Getting Started
* Getting Started (34 mins)
* The Tableau Interface (4 mins)
* Connecting to Data
* Getting Started with Data (6 mins)
* Managing Metadata (4 mins)
* Managing Extracts (4 mins)
* Visual Analytics (129 mins)
* Go over as many as you can
* Mapping
* Getting Started with Mapping (3 mins)
* Maps in Tableau (4 mins)
* Calculations
* Getting Started with Calculation (3 mins)
* Calculation Syntax (4 mins)
* Introduction to LOD Expressions (6 mins)
* Intro to Table Calculations
* Aggregate Calculation (4 mins)
* Why is Tableau Doing That?
* Understanding Pill Types (5 mins)
* Aggregation, Granularity … (4 mins)
* Dashboards (40 mins)
* Go over as many as you can

**EXAMS**

There will be a midterm and a final exam, and they will contain both qualitative and quantitative questions. The questions are formulated to evaluate the level of your understanding about the key concepts and insights we developed over the course. The best way to prepare for the exams is to review what we have covered in the classroom and homework, and make sure that you fully understand them. The exams are not designed to test your memorization, rather to evaluate your understanding of the subject.

If there are extenuating circumstances that prevent you from taking the tests, you must discuss the reason with me well before the time of the exam. You will not be given a make-up exam unless you obtain a permission from me in advance. In addition, you must be able to document the extenuating circumstance. If you miss the exam due to a medical emergency that can be documented and verified, then a make‐up exam will be given. Otherwise, a grade of zero will be given for the missed exam. Note that a make-up exam cannot be taken before the actual exam date!

**CLASS CONTRIBUTION**

Class contribution requires that you study the tutorials, do exercises, and prepare yourselves well before each session of the class. For the nature of this course, keeping up or even trying to be ahead of the curve will be important for doing well in class contribution. You don’t have to be right to get contribution credit, your preparation and thoughtfulness is what matters most.

Individual contribution requires attendance in class and will be based on the quality of each student’s contribution to class discussion. “Quality” reflects many factors – for example, occasional thoughtful comments, questions and sharing of answers to problems that reflect effort are far more important in determining “quality” than are continual comments and questions that do not reflect thoughtfulness. Absence from class means that the maximum contribution score of zero.

I reserve the right to lower your contribution points for unprofessional conduct in class or not being prepared to discuss homework problems assigned. Unprofessional conduct includes, but is not limited to, coming to class late, leaving during the class, interrupting class with talking, noise from your cell phone; using a laptop or phone to text or email, or engaging in activities not supporting your learning in the day’s class, not respectfully paying attention to classmates’ questions or answers, and so forth.

The first opportunity to maintain your contribution grade will be the assignment to self-assess your proficiency in each software language, the amount of time needed to gain basic proficiency in each language and schedule the time to learn those areas where you have assessed a deficiency that may impact your success in the source. Your proficiency will enable you to thoughtfully contribute your perspective on the software’s benefit to supply chain management. Without that, you will be ill prepared to contribute to our exploration of the tools for optimal supply chain management.

**GETTING HELP**

If you have questions about any aspect of the course, you can always talk to me. If it is a quick question, you can contact me before or after the class. If you need more time or privacy, you can come to my office hours. If you cannot make my office hours, you can contact me and we can arrange for an alternative time. The best way to reach me is by e‐mail.

**GRADING**

Graded work will be posted on the Blackboard. Disputes over graded material should be brought to my attention as soon as possible.

**NOTICE ON ACADEMIC INTEGRITY**

The use of unauthorized material, communication with fellow students during an examination, attempting to benefit from the work of another student, and similar behavior that defeats theintent of an examination or other class work is unacceptable to the University. It is often difficult to distinguish between a culpable act and inadvertent behavior resulting from the nervous tensions accompanying examinations. Where a clear violation has occurred, however, the instructor may disqualify the student's work as unacceptable and assign a failing mark on the paper.

Academic dishonesty includes: (*Faculty Handbook*, 1994: 21-­‐22):

* Examination behavior -­‐ any use of external assistance during an examination shall be considered academically dishonest unless expressly permitted by the teacher.
* Plagiarism -­‐ the appropriation and subsequent passing off of another’s ideas or words as one’s own. If the words or ideas of another are used, acknowledgment of the original source must be made through recognized referencing practices.
* Other types of academic dishonesty -­‐ submitting a paper written by or obtained from another, using a paper in more than one class without the teacher’s express permission, obtaining acopy of an examination in advance without the knowledge and consent of the teacher, changing academic records outside of normal procedures and/or petitions, using another person to complete homework assignments without the knowledge or consent of the teacher.

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” <https://policy.usc.edu/scampus-part-b/>.  Other forms of academic dishonesty are equally unacceptable.  See additional information in SCampus and university policies on scientific misconduct, [http://policy.usc.edu/scientific-misconduct](http://policy.usc.edu/scientific-misconduct/).

**SUPPORT SYSTEMS**

Student Counseling Services (SCS) - [(213) 740-7711](tel:(213)%20740-7711) – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. [https://engemannshc.usc.edu /counseling/](%20https://engemannshc.usc.edu%20/counseling/)

National Suicide Prevention Lifeline - [1-800-273-8255](tel:(800)%20273-8255)

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. [http://www.suicidepreventionlifeline.org](https://urldefense.proofpoint.com/v2/url?u=http-3A__www.suicidepreventionlifeline.org_&d=DwMFAg&c=clK7kQUTWtAVEOVIgvi0NU5BOUHhpN0H8p7CSfnc_gI&r=_36nnFETM-Q6pZ6iq9FbkRLnOqB2hAKf3hpB7emICZo&m=E2UsZJRCMqi9OEfKUeqk9Y1uY3eDgl_cjSeDni9P-3s&s=twu831aNHupJnoiSEzsXZ1lmq9yCzJvEv35V5v5dYAY&e=)

Relationship & Sexual Violence Prevention Services (RSVP) - [(213) 740-4900](tel:(213)%20740-4900) - 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. <https://engemannshc.usc.edu/rsvp/>

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website:<http://sarc.usc.edu/>

Office of Equity and Diversity (OED)/Title IX compliance – [(213) 740-5086](tel:(213)%20740-5086)

Works with faculty, staff, visitors, applicants, and students around issues of protected class.<https://equity.usc.edu/>

Bias Assessment Response and Support

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response.<https://studentaffairs.usc.edu/bias-assessment-response-support/>

Student Support & Advocacy – [(213) 821-4710](tel:(213)%20821-4710)

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic.<https://studentaffairs.usc.edu/ssa/>

Diversity at USC – <https://diversity.usc.edu/>

Tabs for Events, Programs and Training, Task Force (including representatives for each school), Chronology, Participate, Resources for Students

USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. [emergency.usc.edu](http://emergency.usc.edu)

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.

Provides overall safety to USC community. [dps.usc.edu](http://dps.usc.edu/)

**STUDENTS WITH DISABILITIES**

USC is committed to making reasonable accommodations to assist individuals with disabilities in reaching their academic potential. If you have a disability which may impact your performance, attendance, or grades in this course and require accommodations, you must first register with the Office of Disability Services and Programs ([www.usc.edu/disability](http://www.usc.edu/disability)). DSP provides certification for students with disabilities and helps arrange the relevant accommodations.  Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to your TA) as early in the semester as possible. DSP is located in GFS (Grace Ford Salvatori Hall) 120 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is [(213) 740-0776](tel:(213)%20740-0776).  Email: [ability@usc.edu](mailto:ability@usc.edu).

**Emergency Preparedness/Course Continuity**

In case of a declared emergency if travel to campus is not feasible, the *USC Emergency Information*web site ([http://emergency.usc.edu/](https://mail.marshall.usc.edu/owa/redir.aspx?SURL=g07PVmQ75aTnQNrG7mxhtvSSZ2mWkNY9mIRMBLuRFFYyh05f7a7VCGgAdAB0AHAAOgAvAC8AZQBtAGUAcgBnAGUAbgBjAHkALgB1AHMAYwAuAGUAZAB1AC8A&URL=http%3a%2f%2femergency.usc.edu%2f)*)*will provide safety and other information, including electronic means by which instructors will conduct class using a combination of USC’s Blackboard learning management system (blackboard.usc.edu), teleconferencing, and other technologies.

**STATEMENT ON TECHNOLOGY USE**

Please note that communication devices such as cell phones, smart phones, tablets, etc. capable of sending and/or receiving electronic communication and all entertainment devices are to be turned off and kept off throughout the class session. Receiving or sending communication or entertainment during class disrupts the learning environment and is rude to those around you.

# Weekly Course Plan (Tentative)

## Week 01: Course Introduction

* Course Introduction
  + Course Overview
  + Rules and Policy
  + Expectations
* Supply Chain Process Overview
  + Organization Structure
  + Planning Process
  + Network Visualization
* Software Installation
* See links in the Course Materials section
* Tutorials
* Access Database Tutorials
* Pivot Table Tutorials
* Tableau Tutorials

## Week 02: Access Database and Excel Pivot Table

* Develop Basic Access Database and Pivot Table Skills
  + Data Aggregation Using Group By
  + Various Types of Queries: Union, Update, Append, Delete, etc.
  + Table Join: Inner Join vs. Outer Join
  + Data live link from Excel to Access
  + Pivot Table Configuration and Navigation
* Learn Supply Chain Network through Data
  + Supply Chain Dataset Walk-Through
  + Learn company’s business through the summarized volume
  + Sales Order History
  + Shipment History
  + Inventory History
  + Demand Forecast
  + Supply Chain Network: Plant, DC, and Customer Ship-To
  + Product Hierarchy
  + Customer Master
  + Location Master
* Exercises with Access Database and Pivot Table
* Query and Learn Company Product Profile
* Query and Learn Company Customer Profile
* Query and Learn Supply Chain Networks
* Query and Learn Pants, DCs, and Customer Ship-To’s

## Week 03: Demand Planning Principles

* 01/21: Martin Luther King Day Off
* Demand Planning Overview
  + Forecast Principles
  + Key Components of Forecasting
  + Types of Forecasting
  + Forecasting Approach
  + Forecast Performance Metrics: MAPE, Forecast Accuracy, and Bias
  + Forecast Lags, and Its Application
  + Forecast Accuracy Calculation

## Week 04: Forecast Applications

* Managing Demand Planning Process: Best Practice
  + One Source of Truth Principle
  + System Forecast vs Consensus Forecast
  + Planning Collaboration: Sales, Finance, Manufacturing, and Supply Chain
  + Various Levels of Aggregation for Different Applications
  + Impact on Downstream Process Planning and Execution
* Introduction to Tableau Visualization
  + Tableau Interface Overview
  + Connection to Database
  + Basic Features and Navigation
  + Data Feed Development
  + Visualization Development Methodology and Process
  + Tableau Reports and Dashboard
  + Classroom Demo: Demand Sales History Comparison
* Exercises with Tableau Visualization
  + Prepare Data Feed
  + Configure Tableau Reports and Dashboard
  + Explore and Develop Business Insights from the Visualizations

## Week 05: Project: Forecast Accuracy KPI

* Project 01: Forecast Accuracy KPI
  + Demand and Sales History Comparison
  + Insight on Product Turn Over
  + Forecast Accuracy KPI by Lags
  + Reporting by Product Hierarchy and Networks
  + Team Presentations

## Week 06: Inventory Optimization

* Inventory Management Introduction
  + Types of Inventory
  + Drivers for Each Inventory Type
  + Dive into Safety Stock
* Interactive Inventory Calculator
  + Calculate all 4 types of Inventory Interactively
  + Understand all Input Parameters and their Impact to Inventory
  + Weeks Cover Calculation
* Inventory Simulation Model
  + Identify all 10 Parameters that can Influence Inventory Decision
  + Understand the Impact of each Parameter to Different Inventories
* Project: Supply Chain Network Visualization
  + Network Locations: Plants, DCs, and Customers
  + Supply and Delivery Move
  + Volume Visualization

## Week 07: A Deep Dive to Safety Stock

* In Depth Discussions about Safety Stock
  + Various Service Level Measurements
  + Service Level and Safety Stock Impact
  + How to Set Service Level Target
  + We Create Our Own Forecast Errors
* Tableau Skills
  + Use of Product Hierarchy for Roll-Up and Drill-Down
  + Combine Multiple Data sources
  + Calculation
* Project: Inventory Optimization
  + Inventory Visualization
  + Develop an Inventory Visualization Report
  + Visualize Current Inventory Level and Cost

## Week 08: A Data-Driven Approach for Inventory Management

* 02/18: President’s Day Off
* A Data-Driven Approach for Inventory Management
  + Inventory Management System
  + How to Manage Input Data
  + System Architecture
  + Organization Structure
* Project: Inventory Optimization
  + Expand the project to Inventory Reduction
  + Conduct an Inventory Reduction Pilot (POC) for a Group of 40 Products
  + Using the data provided to calculate optimal inventory level
  + Estimate savings based on your calculation
  + Prepare a presentation to give your CSO an update for your findings

## Week 08: Wrap Up Inventory and Mid-Term

* Additional Optional Topics and Wrap-Up
  + Salvage Inventory Model
  + On-going Inventory Management Process
  + Inventory Reduction Approach
* Mid-Term: Close-Book
  + Date to be determined
  + Closed Notes/Book
  + No Cheat Sheet
* Project: Inventory Optimization
  + Finish Up
  + Project Due

## Week 09: Supply Planning -- A Realistic Approach

* Supply Planning
  + Master Production Schedule (MPS)
  + Short-term Production Scheduling
  + Business Environment and Key Constraints
  + Interactions with other Planning Functions
  + Basic EPQ Model
* Realistic MPS Optimization Model
  + Understand Key Concepts: Production Line, Setup Cost, Run-Rate, Line Capacity, Min/Max Inventory Targets, Inventory Cost, and Production Cost
  + Learn to use OpenSolver to develop a realistic MPSO model using Excel
  + Simulate and Understand various parameters and their impact to the production plan and costs
  + Compare the model with EOQ
* Understand the Insights from the MPSO model
  + Production Resources Shared by Multiple Products
  + Seasonal vs Regular Products
  + Impact of Change-Over cost

## Week 10: Spring Break

## Week 11: A Data-Driven Approach for Supply Planning

* Manage Salvage and Waste
  + Warehouse Shelf Life
  + Salvage Prediction Model
  + Potential Salvage Alter Model
  + Manage Salvage Proactive vs Reactive
* Role of Supply Planning
  + Traditional vs Data-Driven Approach
  + Develop a MPS Optimization System
  + System Architecture
  + Organization Structure
* Additional Topics in Supply Planning
  + Multi-Production Sourcing
  + Production Sourcing and its Impact to Supply Chain Network
  + Plant Direct
* Project: Production Planning
  + Develop Your Own Supply Planning Models
  + Two Products share a production line with capacity constraint
  + Develop a Production Plan using EPQ model
  + Develop Optimization model using Open-Solver to generate a plan
  + Compare the two plans, and draw insights

## Week 12: DRP

* Business Objective and Constraints
  + Business Objectives
  + Inventory Strategy: Push vs Pull
  + Multi-Production Sourcing
  + Inventory Target
  + Managing DC Storage Capacity
  + Load Optimization
  + Managing Salvage
* Introducing Python: A Powerful Language for Data Science
  + Jupyter Interface Overview
  + Language Basic
* Tutorials
  + Complete “Python: Data Analysis” online course by yourself

## Week 13: Transportation and Network Modeling

* Transportation: A Practical Overview
  + Transportation Modes
  + Common Carriers
  + Private vs Dedicated vs Regular Fleets
  + Route Guide
  + Truck Equipment
  + Transportation Economics and Costs
  + Carrier Management
* Network Model Overview
  + Strategic vs Operational Models
  + Scope of the Model
  + Costs Included in the Model
* Gurobi Package for Python Tutorials
  + Complete the online tutorials

## Week 14: A Boundary Realignment Model

* Develop a Conceptual Model
  + Model Dimensions and Index Set
  + Input Data
  + Decision Variables
  + Objective Functions
  + Constraints
* Develop Data Model
  + Data Model Design in Access Database
  + Input Data Preparation
  + Output Data
* Introduce Python Gurobi Data Structure
  + Multi-Dictionary
  + Dictionary
  + Tuplelist
* Convert the Conceptual Model into a Python Model
  + ODBC Data Connection
  + Input Data Preparation in Database

## Week 15: Develop Model Result Visualization

* Develop Model Report
  + Access Macro for Model Result Refresh
  + Design Model Result Visualization
  + Prepare Data feed for Visualization
* Expand the Model for Network Design
  + Scenario Management Data Model Design
  + Expand Python Model
  + Add Greenfield Scenarios
  + Add Fixed Cost Scenarios
  + Run Models and Manage Results
* Project: Network Optimization
  + Develop A Model Result Visualization
  + Scenario Summary
  + By Storage View
  + Boundary Map View
  + Prepare a Presentation for Final Recommendation

## Week 16: Expand the Model for Network Design

* Wrap-Up and Course Review

## Week 17: Final

* Final Exam
  + Date to be determined
  + Closed Notes/Book
  + No Cheat Sheet

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