

Syllabus: IENG343 – Production Planning and Control

Spring Term 2019, CRN 10525

Time and Location: Room 414, Evansdale Crossing from 11:00 AM – 12:15 pm, Tuesday and Thursday

Number of credit hours: 3

Type of course: Required

Description: Application of industrial engineering theory and practice to the area of operations management and production planning/control. Analysis and understanding of forecasting, aggregate planning, operations strategy, capacity planning, supply-chain management, just-in-time systems, lean manufacturing, agile manufacturing, materials requirement planning, material management, inventory management, short-term scheduling and sequencing, line balancing and other pertinent topics.

Prerequisite: Prerequisite IENG 220 and IENG 213

Textbook: Principles of Operations Management: Sustainability and Supply Chain Management, Student Value Edition 10e – Jay Heizer, Texas Luthern University – SBN – 13: 0134183959 / 9780134183954

Also, the textbook company has released the 11th edition of the textbook in DIGITAL format that is used in this class. [Principles of Operations Management: Sustainability and Supply Chain Management \(Subscription\), 11th Edition](#) ISBN-13: 978-0-13-517564-4. Company website is mypearson.com.

Other Class Materials: APICS Materials, ISM Materials, Instructor Handouts, Instructor Lecture

Course Web-Site: WVU eCampus

Instructor: Mr. Kenton Colvin, MS, CPIM, CIRM, C.P.M.
Adjunct Instructor

Room 331 ESB, Email: Kenton.Colvin@mail.wvu.edu

Office hours: Tuesday & Thursday 9:15 am–10:45 am & 12:15 pm–3:00 pm

Other hours: by appointment (Appointments must be kept or the student must cancel at least 1 hour prior to appointment time or grade will be impacted).

Teaching Assistants:

- **Mr. Alvin Guthrie, WVU IE Academy and Advisory Board Member.**
 - Teaching Assistant Part-time
 - Room 331 ESB, Email: **Alvin.Guthrie@mail.wvu.edu**
 - **Office hours:** 10:00 am to 10:45 am and 12:15 pm to 1:30 pm

- **Faujia Islam, Graduate Student - Masters Degree program**
 - Teaching Assistant
 - Room 305 ESB, Email: **fi0003@mix.wvu.edu**
 - **Office hours:** Wednesday 12:00 pm – 1:00 pm
 - **Other hours:** by appointment

- **Md Mushfiqur Rahman, Graduate Student - Masters Degree program**
 - Teaching Assistant
 - Room 305 ESB, Email: **mr0143@mix.wvu.edu**
 - **Office hours:** Monday 3:00 pm – 4:00 pm
 - **Other hours:** by appointment

Course Contribution to Professional Component:

Engineering Science - 50 %, Engineering Design - 50 %

Course Topics:

1. Course overview and Principles of Operations and Productivity (.5 week)
2. Operations Strategies (1 week)
3. Forecasting Demand (2 week)
4. Design of Goods and Services (1week)
5. Process Strategy and Capacity Planning (1 week)
6. Facilities Management: Layout Strategies (.5 week)
7. Supply-Chain Management (1 week)
8. Materials Management: Inventory Management and Problems (2.5 weeks)
9. Production Planning for New Technologies: Just-in-time Systems, Lean Manufacturing, and Agile Manufacturing (2 weeks)
10. Master Production Planning and Materials Requirements Planning (MRP) (2 weeks)
11. Production Planning: Line Balancing Methods (Heuristic and Stochastic) (1 week)
12. Production Planning: Aggregate Scheduling, Shop Loading, Sequencing (.5 week)

Course Goals:

1. To provide students with the basic concepts related to the interactions between the operations management system parameters and their impact on production and inventory control systems design.
2. To provide students with methodology and models for the generation of company forecasts, materials management cost elements, business operations analysis, productivity, operations strategies for competitive advantage, location strategies, and supply-chain management.
3. To provide students with information on the design and management of operations and production planning/control systems including capacity planning, materials

requirements planning, inventory models, scheduling and sequencing, and line balancing for various aspects of the manufacturing and service industry.

4. To provide students with all the production and inventory control systems related to Just-in-Time, Lean Manufacturing and Agile Manufacturing methodologies.

Student Learning Objectives:

Upon completing the course, the student will be able to:

1. Develop various operating cost components and business strategies for operations management.
2. Develop and analyze operations performance measurements and analysis for continuous improvement.
3. Describe and determine the effect of product, process, inventory costs, product forecasting, operations strategies, and schedule design parameters on design of materials requirements planning, inventory planning, capacity planning, and production planning/control systems.
4. Apply and analyze forecasting models to develop business enterprise forecasts for product demand, profits, sales, material requirements, capacity requirements, etc.
5. Identify the impact of production/inventory cost decisions and operations strategies on the break-even, return on investment and profit analysis of a business enterprise.
6. Develop and analyze production and inventory planning/control systems, and scheduling techniques by using engineering techniques for a complete production facility.
7. Develop and analyze the capacity planning process. Identify characteristics and relationship to business operations in regard to managing product demand versus product capacity.
8. Design, develop, and analyze a Master Production Schedule and a resultant Materials Requirement Plan (MRP) for a complete production facility.
9. Design, develop and analyze production and inventory control processes with respect to Just-in-Time, Lean Manufacturing and Agile Manufacturing methodologies.
10. Analyze the impact on the company workers with respect to their role in production and inventory control.

Course Relationship to Program Educational Outcomes:

The course relates strongly to the following program educational outcomes:

1. The course enables the student to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (Outcome 1).
The key abilities the students will acquire are as follows:
 - a) Students will be able to solve problems using various forecasting methods such as moving average, exponential smoothing, and linear regression based on trend.
 - b) Students will be able to use material requirements planning methodologies to determine planned order releases for the first 16 weeks of the student's company next year planning cycle.
 - c) Students will be able to apply material requirements planning methodologies to determine planned order release for various problems and utilizing a variety of lot-sizing techniques including: fixed order, fixed order multiple, fixed period, lot-for-lot, POQ and EOQ.

- d) Students will be able to solve problems using inventory model methodologies to determine planned order lot-sizes during the 16 weeks of the student's company next year planning cycle.
 - e) Students must solve problems using inventory model methodologies to determine inventory costs such as holding cost rate, purchase order cost and manufacturing order cost for their company.
 - f) Students will be able to apply ABC analysis using dollar value method of their inventory for their company and develop a cycle counting schedule for all of their company parts in inventory. They will be able to apply alternate methods of ABC analysis.
 - g) Students will be able to use inventory methodologies to develop their ending inventory balance and average inventory value for the previous full year of their company.
 - h) Students will learn how to determine the lead-times of their products through the use of the manufacturing Route Sheet. They will learn how the lead times are incorporated into the development of a Materials Requirements Plan for the first 16 weeks of the next year planning cycle.
 - i) Students will learn to develop a Production Plan as well as a Master Production Schedule for all of their salable parts that give independent demand for their salable parts. This would include the development of a 6 month direct labor person weekly and monthly requirements. They will also learn how to balance the number of employees required between 2 months.
2. The course enables the student to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (Outcome 2). The key abilities the students will acquire are as follows:
- a) Students will be able to apply capacity methodologies to determine design, effective and actual capacity for various problems and for their own company that they have set up.
 - b) Students will be able to apply various demand capacity methodologies to determine forecasted demand for a future year for their own company utilizing the demand from the previous three years.
 - c) Students will be able to solve problems based on the Johnson's rule.
 - d) Students will be able to determine the values for various criteria such as average lateness, number of jobs in the system when scheduling jobs.
 - e) Students will be able to apply facilities layout lean manufacturing methodologies to their company to improve productivity.
 - f) Students will be able to solve problems using JIT inventory techniques, Toyota Productive Systems, lean manufacturing, and Agile Manufacturing methodologies and apply them to their company to improve productivity.
 - g) Students will be able to apply lean manufacturing methodologies of the 5S + 2S Workplace Principles, Eight Wastes, Poka Yoke fail safe methodology, and Total Productive Maintenance System to their company to improve productivity and minimize costs.
 - h) Students are required to design their own company to manufacture three or four products. They must setup the company by developing their demand for the past three years and all of their fixed and variable costs. They must be able to analyze their variable costs and interpret their data to be able to accurately find the total labor hours for their finished salable parts and the unit costs for each part in the bill of materials for each finished part. Students are required to develop other costs such as inventory carrying cost rate, purchase and manufacturing order costs, productivity, capacity, etc. They will be able to analyze their various data elements to calculate various costs for their company. (2)
 - i) Students will learn to develop a complete Product Structure for their salable products. They will learn how to take the Product Structure to make an indented Bill of Materials (BOM).

3. The course enables the student to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. (Outcome 5).

The key abilities the students will acquire are as follows:

- a) Students will learn to work effectively in teams as the companies that are setup are made up of 2-3 partners. They will learn through the course projects how to develop individual company information and company wide information and to be able to understand the total effects on the company.
- b) Students will plan all future decisions, set objectives, and plan tasks for a future year of production and inventory management for the total company done as a team.

4. The course enables the student have the ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions. (Outcome 6).

The key abilities the students will acquire are as follows:

- a) Students will learn to evaluate location of company based on direct and indirect labor rates, property taxes, utility costs, and other costs that vary from state to state.
- b) Students will learn to be able to analyze and understand the viability of their company by calculating various measurements such as: Return on Investment (ROI), Inventory Turns (IT), Breakeven Point (BEP) in dollars and units, and a net profit analysis after both state and federal taxes.
- c) The focus of the course is for the student to be able to understand the company numbers, measurements and costs. The students will learn how numbers are developed to measure and make company decisions such as whether to take a supplier discount, how to develop margin of profit, develop lot-sizes, capacity constraints, etc.

Grading:

➤ Exams and/or quizzes	30%
➤ Projects	33%
➤ Homework	5%
➤ Other measurements as done by instructor	2%
➤ Final Exam	<u>30%</u>
Total	100%

This course is **project driven** with 5 projects that build upon the previous project. The student will set up their own company and products and apply all course material to their own company.

In class **quizzes** may be given during any class period without prior announcement. Homework and projects are due at the beginning of class on the due date. Classroom participation is expected.

Grading Scale:

- A = 90 – 100%
- B = 80 – 89%
- C = 70 – 79%
- D = 60 – 69%

➤ F = 59% or less

ATTENDANCE: I require everyone to regularly attend class. If you miss a class, you are responsible for keeping up with daily lecture material and obtaining lecture notes from a classmate. Please note that the lectures posted on eCampus will be incomplete. Attendance penalties are at the discretion of the instructor. After 4 unexcused absences, the next absence will cause a letter grade to drop, etc., unless excused by the instructor as his discretion. Note: Three late arrivals constitute one absence. In-class lectures and projects will represent the bulk of material required to complete homework assignments and examinations. No assignments, including exams, projects outside the Classroom or homework assignments, can be made up without an acceptable reason. Being late for 4 classes counts as one absence.

Acceptable reasons for missing exams or assignments (documentation required):

1. A death in the family
2. A medical emergency

Unacceptable reasons (examples) for missing exams or assignments:

1. Other exams or assignments the same day or printing projects and homework
2. Any university or non-university social event
3. Job interviews
4. Forgetfulness

COMMUNICATION: Students are encouraged to engage in communication with the Instructor especially if they feel they are falling behind in the class. Students should exercise exceptional professionalism and maturity when communicating with the course Instructor. Communication should be polite and respectful regardless of the issue or situation.

Electronic Devices: Laptops, Tablets, Cell phones, Graphical and/or programmable calculators, smart watches, or any other electronic media or communication device as well as ear phones are not allowed in class or in exams and in-class quizzes. I do not allow and do not consent to recording any part of my lectures or the use of any electronic device in class including bringing the class notes on a cell phone, laptop or a tablet to ask a question.

Homework & Quiz assignments will be collected at the beginning of every class. As you enter the class, place your HW package at the assigned homework collection location with your name..

Statement on Student Behavior in the Classroom: Since you are all professionals in training, you are expected to conduct yourself in a professional manner while in this class. For instance, while the class is in progress, everyone is expected to remove hats and sunglasses, put away the newspaper, *refrain from eating*, and *turn off cell phones*. Students are expected NOT to talk to other students or laugh or create any such unwanted noise or other disruptions during the class period. Disruptive students will be warned during the class period that such behavior will not be tolerated and will possibly be re-seated. If disruption continues, the student will be required to leave the class and be referred to the Department Chair and/or other administrators for disciplinary action. The following is not considered proper class etiquette:

- The use of electronic personal device, such as tablet devices, portable music devices cell phones, Blackberries, Strawberries, Blueberries, etc.
- Reading newspapers, doing crossword puzzles, etc. during class

- Falling asleep during class
- Leaving class early (unless you tell me beforehand)
- Habitually coming to class late
- Talking while the instructor is talking

Academic Integrity: The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, instructors will enforce rigorous standards of academic integrity in all aspects and assignments of their courses. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the West Virginia University Academic Standards Policy.

(<https://provost.wvu.edu/governance/academic-standards-resources/academic-integrity-policy>). Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see your instructor *before* the assignment is due to discuss the matter.

Days of Special Concern: WVU recognizes the diversity of its students and the needs of those who wish to be absent from class to participate in Days of Special Concern, which are listed in the Schedule of Courses. Students should notify their instructors by the end of the second week of classes or prior to the first Day of Special Concern, whichever is earlier, regarding Day of Special Concern observances that will affect their attendance. Further, students must abide by the attendance policy of their instructors as stated on their syllabi. Faculty will make reasonable accommodation for tests or field trips that a student misses as a result of observing a Day of Special Concern

WVU Inclusivity Statement: The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion. If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Accessibility Services (293-6700). For more information on WVU's Diversity, Equity, and Inclusion initiatives, please see <http://diversity.wvu.edu>.

Adverse Weather Statement: In the event of inclement or threatening weather, everyone should use his or her best judgment regarding travel to and from campus. Safety should be the main concern. If you cannot get to class because of adverse weather conditions, you should contact your instructor as soon as possible. Similarly, if your instructor(s) are unable to reach the class location, they will notify you of any cancellation or change as soon as possible, using agreed upon methods to prevent students from embarking on any unnecessary travel. If you cannot get to class because of weather conditions, instructors will make allowances relative to required attendance policies, as well as any scheduled tests, quizzes, or other assessments.

Campus Safety Statement: The WVU Police are committed to creating and maintaining a safe learning environment for all students, faculty, and staff. Part of this mission includes educating the campus community on how to respond to potential campus threats, such as the threat of an active shooter on campus or other suspicious behaviors. Fortunately, WVU Police offer training - both online and in-person - on how to handle a variety of campus safety scenarios. All students are encouraged to visit the [WVU Police](https://police.wvu.edu/) (<https://police.wvu.edu/>) webpage, in particular the content under the [Active Shooter](https://police.wvu.edu/training) (<https://police.wvu.edu/training>) training program. Students are

also encouraged to report any suspicious behaviors on campus using the [Report a Threat](https://police.wvu.edu/emergency-management/threat-assessment) (<https://police.wvu.edu/emergency-management/threat-assessment>) portion of the webpage. Additional materials on campus safety prepared by WVU Police, including special safety tips and training, will also be provided on our eCampus page.

Student Evaluation of Instruction Statement: Effective teaching is a primary mission of West Virginia University. Student evaluation of instruction provides the university and the instructor with feedback about your experiences in the course for review and course improvement. Your participation in the evaluation of course instruction is both strongly encouraged and highly valued. Results are strictly confidential, anonymous, and not available to the instructor until after final grades are released by Admissions and Records. Information about how you can complete this evaluation will be provided by your instructor.

Sale of Course Material Statement: All course materials, including lectures, class notes, quizzes, exams, handouts, presentations, and other course materials provided to students for their courses are protected intellectual property. As such, the unauthorized purchase or sale of these materials may result in disciplinary sanctions under the **WVU Student Conduct Code**.

Sexual Misconduct Statement: West Virginia University does not tolerate sexual misconduct, including harassment, stalking, sexual assault, sexual exploitation, or relationship violence [[BOG Policy 44](#)]. It is important for you to know that there are resources available if you or someone you know needs assistance. You may speak to a member of university administration, faculty, or staff; keep in mind that they have an obligation to report the incident to the [Title IX Coordinator](#). (<https://titleix.wvu.edu/staff>)

Incomplete Grades: A grade of I (Incomplete) is a temporary grade assignment used when unforeseen, non-academic circumstances arise that prohibit students from completing the last course assignments or examinations at the end of the semester. The grade of Incomplete is typically assigned because of an excused absence from the final examination, or because assignments are unavoidably incomplete, as determined by the instructor. Generally, the student will have been active in the course up until the last day of the 13th week of classes and earned at least a D- to be eligible to request an incomplete. An instructor may not assign a grade of I without the student's agreement and an Incomplete Contract on file. If a student has not requested an Incomplete, or the request for an Incomplete grade has been denied, the instructor should assign the grade earned in the course. Within the Incomplete Contract, the instructor is required to indicate a grade earned for the course assuming no additional work will be completed. Should the signed contract not be fulfilled, the instructor must either submit a grade of F or the grade indicated in the contract.

Prepared By: Kenton Colvin

Industrial and Management Systems Engineering – Spring 2020

January 12, 2020