

San José State University
Department of Aviation and Technology Department

Tech 147: Green Manufacturing Analysis and Management, Sections 1 & 11,
Fall 2018

Instructor: Dr. Samuel C. Obi

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Office Hours: M: 12:00 - 3:00 PM
W: 11:00 AM – 1:00 PM (and by Arrangement)

Class Room: E 103 for lecture and lab, and IS 122 for selected lab activities

Class Days & Time: M: 6:00 PM -7:45 PM; W: 6:00 PM -8:45 PM

Prerequisites: Tech 45. Tech 46. Tech 115. Pre/Co requisite: Tech 140

Course Materials

Copies of the course materials including the syllabus, lecture slides, projects, etc. may be found at <http://www.sjsu.edu/people/samuel.obi/>

I Course Description

Design, operation, and control of ‘green’ production systems using techniques to promote sustainability and minimize environmental impact. Emphasis on the physical design of high performance manufacturing including production flow, scheduling, work flow, layout of manufacturing plants, and material handling. Lecture 2 hours, Lab 3 hours. 3 units.

II Purpose of the Course

The purpose of this course is to develop an understanding and skills in the analysis, design, implementation, and management of efficient green production environments. Therefore, class activities will include responsible design and analysis of green and efficient manufacturing system models, including forecasting, analytical tasks, green auditing, production flow, scheduling, material handling, and layout of green manufacturing plants. Tech 147 is divided into five (5) instructional units. Each unit has associated objectives and assigned readings related to those objectives. There are also three (3) projects and several lab activities designed to help fulfill those objectives.

III Course Learning Goals

1. Demonstrate skills in the planning and design of manufacturing processes.
2. Describe the product life cycle and how products are manufactured.
3. Design and plan industrial facilities.
4. Select and operate computer numerically controlled and other machines.
5. Describe the uses, advantages, and disadvantages of current and evolving manufacturing techniques including laser machining, electrical discharge machining, water jet and abrasive water jet machining, and rapid prototyping.
6. Select, analyze and use polymers, composite materials, and materials in the design of manufactured products.
7. Apply the theory of computer-integrated manufacturing (CIM), including the computer-aided design/computer-aided manufacturing (CAD/CAM) interface to industrial problems and settings.
8. Use the principles of production scheduling & planning in an industrial environment.
9. Demonstrate an understanding of materials management including Just-in-Time (JIT) and Materials Resource Planning (MRP).
10. Integrate design, manufacturing, and materials into the design and development of new products.

IV General Course Goals and Objectives

In this course, the student will:

1. Develop general understanding of the definitions and terminologies employed in planning, designing, controlling and improving green production systems
2. Design and analyze different production systems
3. Employ appropriate management tools to plan and control green and efficient production systems
4. Develop a solid foundation in the tools and techniques for the greening of modern manufacturing, including waste control, environmental impact issues, and green production lines.
5. Develop an understanding of classical and state-of-the-art product development, production systems, control systems, management technology, cost systems, and evaluation techniques.
6. Learn and explore techniques for controlling environmental impact through control of waste stream, materials and process control, and product design.
7. Develop an understanding of current design, prototyping, and manufacturing technologies and techniques including CAD, CAM, and CIM, and the impact these new technologies have on productivity, product cost, quality, and environmental impact of products and manufacturing processes.
8. Obtain an overview of computer technologies including computers, data collection, networks, machine control, etcetera, as they apply to product design & development, production planning & management, and factory floor operations.
9. Acquire industrial responsibility and sensitivity to human-factors related issues as they affect decision making and worker conditions in the factory environment.

V Required Textbooks and Materials

- 1) Jacobs, F. Robert; Berry, William Lee; Whybark, D. Clay & Vollmann, Thomas E. (2011). Manufacturing Planning and Control for Supply Chain Management (6th. Ed). McGraw-Hill Professional Publishing; ISBN: 9780073377827
- 2) Obi, S. C. (2014). A Handbook of Productive Industrial Ethics. AuthorHouse. Available in Spartan Bookstore and at <http://www.amazon.com>
- 3) Handouts and outside materials on green and sustainability design and manufacturing
- 4) Student version of any generic manufacturing planning and control simulation software will be helpful but not required (eg: Simprocess, ProModel, MAST, SimKit, QNAP2 etc.)
- 5) A copy of “Simulation of Business Processes” by Raymond P. Jefferies III, available at: <http://muse.widener.edu/~rpj0001/courses/Engr670/Book/BookFile.pdf>
- 6) One flash drive or appropriate storage device with at least 8 gigs of storage capacity
- 7) Scientific hand calculator with trig and square root functions
- 8) Safety Glasses
- 9) Styrofoam and or modeling paper as needed
- 10) A laptop or notebook computer (**Highly recommended**)
- 11) A pack of 8 ½” X 11” printer blank white sheets of paper (highly recommended)
- 12) Other lab materials for assigned projects will be provided at no cost. Final projects may require a payment for material or the student may bring in material.

VI Outline of Course Content and Unit Objective

Unit 1: The Nature and Role of Analysis and Management in Green Manufacturing Systems

Objectives:

- a) Explore the details, components and practices of operations management as they apply to green manufacturing
- b) Define and explore analysis and management tasks and functions
- c) Investigate the importance of manufacturing planning, design and control in manufacturing industry
- d) Define the role of supply chain management in green manufacturing systems
- e) Define and describe technical vocabularies employed in green manufacturing analysis and management
- f) Investigate system analysis aspect of green and sustainable manufacturing
- g) Explore the human element of green and sustainable manufacturing

Reading List for Unit 1:

- 1) Jacobs et al Chapters 4 & 10A
- 2) Obi Chapter 1
- 3) Related Materials and Handouts

Unit 2: Green Manufacturing Information Flow and Planning Tools: Analysis

Objectives:

- a) Explore the sources and destinations of critical information channels in green manufacturing planning and control
- b) Determine and describe various analytical and management tools employed in green manufacturing systems
- c) Investigate analysis techniques employed in green manufacturing
- d) Explore and apply green and sustainable manufacturing analysis and auditing tools
- e) Apply spreadsheets and different charts such as root cause analysis and fishbone charts in analyzing manufacturing systems
- f) Apply various shop floor tools (Simprocess, ProModel, MAST, SimKit, QNAP2, etc.) for information processing
- g) Analyze the effects of irresponsible behavior in green and sustainable manufacturing

Reading List for Unit 2:

- 1) Jacobs et al Chapters 1 & 1A
- 2) Obi chapter 2
- 3) Related Materials and Handouts
- 4) Viking Pump Assembly Analysis Video (In-house Video)

Unit 3: Planning Modern Green Manufacturing Systems: Forecasting

Objectives:

- a) Explore the role of demand management in green manufacturing industry
- b) Define and apply forecasting techniques employed in green manufacturing planning
- c) Describe how materials requirements are determined in production environments
- d) Explore inventory models employed in production environments
- e) Integrate green design and manufacturing principles in production forecasting
- f) Explore the role of training of personnel in green and sustainable production

Reading List for Unit 3:

- 1) Jacobs et al Chapters 2 & 3
- 2) Obi Chapter 3
- 3) Related Materials and Handouts

Unit 4: Planning Modern Green Manufacturing Systems: Scheduling

Objectives:

- a) Investigate the role of scheduling as a management task in operations management
- b) Define various planning and scheduling terms employed in production environments
- c) Determine different scheduling techniques in production planning and control
- d) Explore the job shop scheduling process
- e) Apply green design and manufacturing principles in production scheduling
- f) Define characteristics of responsible personnel for green and sustainable manufacturing
- g) Determine sources of responsible personnel for green and sustainable manufacturing

Reading List for Unit 4:

- 1) Jacobs et al Chapters 5, 6 & 8

- 2) Obi Chapter 4
- 3) Related Materials and Handouts
- 4) Video (Layout Improvements for JIT XS2762)

Unit 5: Green Manufacturing Project Planning and Control

Objectives:

- a) Participate in a group project planning and control
- b) Investigate network planning techniques
- c) Design, develop, evaluate and review green manufacturing systems
- d) Employ different personnel and project scheduling techniques
- e) Play vital role in a team-oriented project management exercise
- f) Analyze effects of organization irresponsible behaviors in society

Reading List for Unit 5:

- 1) Jacobs et al Chapters 7 & 9
- 2) Obi Chapters 5 & 6
- 2) Related Materials and Handouts

VII Attendance

In order to benefit from the lectures and activities and to complete assignments on time, students are encouraged to attend every class meeting.

VIII A Note on Written Assignments

All assignments are due as scheduled and must be typewritten or they will not be accepted. NO PAPERS WILL BE ACCEPTED LATE UNLESS WRITTEN PERMISSION HAS BEEN OBTAINED. Assignments are due at the BEGINNING of the class period on the designated due date.

IX Course Requirements

Mid-Term and Final Exams (50 + 100 = 150 points)

A 50-point mid-term and one 100-point comprehensive final exam will be given in the semester. The exams will be announced approximately one week before they are taken. No make-up exams will be given unless prior written permission was obtained from the instructor. No exams will be rescheduled due to student perceived overloads (e.g. two mid-terms, finals, back-to-back) except for verifiable emergency situation, and only when the instructor can help out.

Quizzes (3 X 10 = 30)

There will also be three 10-point quizzes designed from materials discussed in the text and class. No make-up quizzes will be given. So be prepared to take all of them, to avoid losing any points.

Projects (50 + 50 + 60 = 160 points)

There will be three required projects in this course, which will provide each student with the opportunity to demonstrate his/her knowledge and understanding of the production planning, design and control in manufacturing environments. The first project will emphasize the student's ability to use analysis and system tools to analyze production systems. The second one will

emphasize forecasting, layout, scheduling and simulation techniques. The third project will be a group assignment designed to include project management content. The actual assignments for the projects will be handed out in the form of assignment sheets.

Outside Reading Assignments (3 X 15 = 45 points)

There will be three (3) out-of-class reading assignments. The readings are to be from a magazine or professional journal no more than three years old. The subjects to be read and reported on must be concerned with (and in the following order) one of the following three aspects of green manufacturing analysis and management: (1) Analysis as applied in modern Manufacturing, (2) Management as applied in modern Manufacturing, and (3) Green Design and Sustainability as applied in modern Manufacturing. Submit a summary of your topic and be prepared to discuss your paper in class on the day it is due. **Oral presentation of the synopsis will be emphasized.** The assignments must be typed in the "Outside Reading Assignment" format which will be provided.

Lab Assignments (5 X 20 = 100 points)

In addition to the outside reading assignments, there will be five (5) lab- or manufacturing-related assignments that will be issued at various times during the semester. Each assignment requires the student to perform certain analysis- and/or management-related tasks in our facility or at an outside facility. Each assignment has a required report. The fifth assignment is subdivided into 4 smaller, 5-point, in-class assignments that will be given at different days in class.

Term Paper (40 points)

This assignment requires the student to undertake an in-depth study of the specific **analysis and management tasks, issues, roles, functions and so forth** of an area of Green Production Systems: design, operation, control of production systems, production flow, scheduling, work flow, layout of manufacturing plants, lean manufacturing, and material handling. The paper must emphasize lean design and manufacturing.

The paper should be from 3 to 5 pages in length citing 5 or more references. The paper must be typewritten, double-spaced, and free of errors. Drawings or photocopies of drawings/pictures (not part of the 3-5 pages) may be included to show a unique feature of a process. Be sure to cite your references in a reference list on the last page of the paper, using APA format. A format for grading this paper will be provided. There will be an oral presentation of this paper at the end of the semester. This presentation constitutes 50% of the score on this paper, so make adequate preparation. Instructor will officially announce this paper and related information at the appropriate time during the semester.

X Grading

YOU, THE STUDENT, will have the major role in determining the final grade you receive for this course. To be taken into consideration will be objective and subjective evaluations. Objective evaluations will include quizzes, mid-term and final exams. Subjective evaluations will include outside reading assignments, individual exercises, projects which must be completed in the laboratory, and team projects.

An approximate numerical breakdown for grading is as follows and is subject to change:

Criteria	Possible
Quizzes (X 3)	30
Outside Reading Assignments (X 3)	45
Lab Assignments (X 5)	100
Term Paper	20
Term Paper presentation	20
Project #1 – Individual	50
Project #2 – Individual	50
Project #3 - Small Team	60
Mid-Term Exam	50
Final Exam – Comprehensive	<u>100</u>
TOTAL	525

Total/525 = % for final grade

93% - 100% = A	77% - 79% = C+
90% - 92% = A-	73% - 76% = C
87% - 89% = B+	70% - 72% = C-
83% - 86% = B	67% - 69% = D+
80% - 82% = B-	63% - 66% = D
	60% - 62% = D-
	Below 60% = F

XI Classroom Protocol, Lab Usage and Housecleaning

Since the bulk of the course will be undertaken using class and lab computers and other equipment, it is imperative that all students use those equipment and class rooms in a safe manner as outlined. Specifically, the following rules must be followed:

- a) No drinking, eating or smoking around any computing equipment
- b) No horse play or disorderly conduct in the classroom or lab environment
- c) All computer usage during class time must be related to the course (Tech 147) project at hand
- d) All workstations and surrounding must be cleaned by the students who made use of them at the end of class and lab sessions
- e) All computers and peripherals should be used in a responsible manner. Students may be charged for damages to any equipment resulting from their fault
- f) If any equipment is found to be in repair, report it to the instructor immediately. Do not attempt to use the equipment or repair it.
- g) No cell-phones are allowed during class.

XII University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>

XIII Fall 2018 Course Schedule/Outline

WEEK OF:	TOPICS TO BE DISCUSSED	ASSIGNMENTS	LAB DUTIES	DUE
Aug. 22	Orientation	Buy Materials Assignment 1	Basic Systems Analysis	
Aug. 27/29	Unit 1: The Nature and Role of Analysis and Management in Green ...	Jacobs et al Chapters 4 & 10A; Obi Chapter 1	Basic Systems Analysis	Ass. 1
Sep. 3/5	Unit 1: The Nature and Role of Analysis and Management in Green ...	Project 1 Assignment 2	Project 1	
Sep. 10/12	Unit 2: Green Manufacturing Information Flow and Planning Tools: Analysis	Jacobs et al Chapters 1 & 1A; Obi chapter 2	Project 1	1st. O.R.
Sep 17/19	Unit 2: Green Manufacturing Information Flow and Planning Tools: Analysis	Lab 1 Work	Project 1	Ass. 2
Sep. 24/26	Unit 3: Planning Modern Green Manufacturing Systems: Forecasting	Jacobs et al Chapters 2 & 4; Obi Chapter 3 Presentations Assignment 3	Lab Management	Project 1
Oct. 1/3	Unit 3: Planning Modern Green Manufacturing Systems: Forecasting	Mid-Term Exam/ Project 2	Project 2	Mid- term
Oct. 8/10	Unit 4: Planning Modern Green Manufacturing Systems: Scheduling	Jacobs et al Chapters 5, 6 & 8; Obi Chapter 4	Project 2	Ass. 3
Oct. 15/17	Unit 4: Planning Modern Green Manufacturing Systems: Scheduling	Lab 2 Work Assignment 4	Project 2	2nd. O.R.
Oct. 22/24	Presentations	Presentations	Lab Management	Project 2
Oct. 29/31	Unit 5: Green Manufacturing Project Planning and Control	Jacobs et al Chapters 7 & 9; Obi Chapters 5 & 6 Project 3	Project 3	Ass. 4
Nov. 5/7	Unit 5: Green Manufacturing Project Planning and Control	Lab 3 Work Assignment 5	Project 3	
Nov. <u>12</u> /14	Lab 3 Work	Lab 3 Work	Project 3	3rd. O.R.
Nov. 19/ 21	Lab 3 Work	Lab 3 Work	Project 3	Ass. 5

Nov. 26/28	Review/ Presentations	Presentations	Project 3	Term Paper
Dec. 3/5	Presentations	Presentations	Lab Management	Project 3
Dec. 10	Last Day of Class / Final Exam Review	Study for Final Exam		
Dec. 17	Final Examination	Monday, Dec. 17, 5:15 PM – 7:30 PM		

SUBJECT TO CHANGES DEPENDING ON CIRCUMSTANCES DURING THE SEMESTER

Posted Weeks are Mondays Unless Specified

All Assignments are Due on Wednesdays Unless Changed by Instructor.

Information in Bold Represent Key Assignments that are Due

Monday, September 3 is Labor Day (Campus Closed)

Friday, November 12 is Veteran's Day (Campus Closed)

Wednesday, November 21 is Non-instructional Day

November 22 – 23 is Thanksgiving Holiday (Campus Closed)