

SAN JOSE STATE UNIVERSITY
College of Engineering
Department of Aviation and Technology

Tech 147: Green Manufacturing Analysis and Management

Instructor: Dr. Samuel C. Obi
Semester: Fall, 2013
Class Rooms: IS 119, 121, 122 E 101 and E 103
Course Codes: S2: 50532; S12: 50533
Class Time: R: 3:30-5:15 PM; T: 3:30-6:15 PM
Office: IS 105
Office Hours: W: 11:00 AM-1:30 PM; (and by Arrangement)
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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. Prerequisites: Tech 46. Tech 45. Tech 145. Pre/Co requisite: Tech 140. 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 involve 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 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 sensitivity to human-factors related issues as they affect decision making and worker conditions in the factory environment.

IV Textbook/ Lab Materials

- 1) Vollmann, Thomas E., Berry, William Lee, Whybark, David C., & Jacobs, F. Robert (2011) Manufacturing Planning and Control for Supply Chain Management (6th. Ed). McGraw-Hill Professional Publishing; ISBN: 9780073377827
- 2) Handouts and outside materials on green and sustainability design and manufacturing
- 3) Student version of any generic manufacturing planning and control simulation software will be helpful but not required (eg: Simprocess, ProModel, MAST, SimKit, QNAP2 etc.)
- 4) A copy of “Simulation of Business Processes” by Raymond P. Jefferis III, available at: <http://muse.widener.edu/~rpj0001/courses/Engr670/Book/BookFile.pdf>
- 5) One flash drive or appropriate storage device with at least 4 gigs of storage capacity
- 6) Scientific hand calculator with trig and square root functions
- 7) Safety Glasses
- 8) A laptop or notebook computer (Highly recommended)
- 9) A pack of 8 ½” x 11” printer blank white sheets of paper (highly recommended)
- 10) 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.

References

- 1) Bedworth, David D. & Bailey, James E. (1987) Integrated Production Control Systems: Management, Analysis, Design. (2nd. Ed) John Wiley & Sons.

V 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

Reading List for Unit 1:

- 1) Vollmann et al Chapters 4 & 10A
- 2) 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

Reading List for Unit 2:

- 1) Vollmann et al Chapters 1 & 1A
- 2) Related Materials and Handouts

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

Reading List for Unit 3:

- 1) Vollmann et al Chapters 2 & 3
- 2) 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

Reading List for Unit 4:

- 1) Vollmann et al Chapters 5, 6 & 8
- 2) Related Materials and Handouts
- 3) 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

Reading List for Unit 5:

- 1) Vollmann et al Chapters 7 & 9
- 2) Related Materials and Handouts

VI Attendance

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

VII 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.

VIII Examinations/Quizzes

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.

Refer to the SJSU General Catalog, Undergraduate Studies, for policies on absences, incompletes, withdrawals, and plagiarism.

IX Required Projects/Assignments

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. Be prepared to discuss your paper in class on the day it is due. 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. One of these assignments should be presented to the class on a day that the student should schedule with the instructor. Students should inform the instructor at least one week in advance of their presentation so that they will be scheduled.

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/475 = % 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 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:

- No drinking, eating or smoking around any computing equipment
- No horse play or disorderly conduct in the classroom or lab environment
- All computer usage during class time must be related to the course (Tech 147) project at hand
- 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.

XII Note on Academic Dishonesty

Any assignment that violates the academic integrity policies of the university (see below) will receive zero credit and result in a report to the University. You will not be allowed to make-up any assignments that violate the academic integrity policy.

Academic integrity statement (from Office of Student Conduct and Ethical Development): Your own commitment to learning, as evidenced by your enrollment at San José State University, and the University's Academic Integrity Policy requires you to be honest in all your academic course work. Faculty members are required to report all infractions to the Office of Student Conduct and Ethical Development. The policy on academic integrity can be found at http://sa.sjsu.edu/student_conduct.

Plagiarism: At SJSU plagiarism is the act of representing the work of another as one's own (without giving appropriate credit) regardless of how that work was obtained, and submitting it to fulfill academic requirements. Plagiarism at SJSU includes but is not limited to:

1.2.1 The act of incorporating the ideas, words, sentences, paragraphs, or parts of, and/or the specific substance of another's work, without giving appropriate credit, and representing the product as one's own work; 1.2.2 Representing another's artistic/scholarly works such as musical compositions, computer programs, photographs, paintings, drawings, sculptures or similar works as one's own.

Self-Plagiarism or 'Recycling' is also not allowed. This is the practice of using a specific paper, with or without slight modifications, in more than one class.

Campus policy in compliance with the Americans with Disabilities Act:

If you need course adaptations or accommodations because of a disability, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities requesting accommodations must register with DRC to establish a record of their disability.

XIII Semester Schedule

TECH 147 SCHEDULE OF COURSE SEMESTER ACTIVITIES DR. SAMUEL C. OBI

WEEK OF:	TOPICS TO BE DISCUSSED	ASSIGNMENTS	LAB DUTIES	DUE
Aug. 22	Orientation	Buy Materials	Basic Systems Analysis	
Aug. 29	Unit 1: The Nature And Role Of Analysis and Management in Green ...	Vollmann Et Al. Chapters 4 & 10A	Basic Systems Analysis	Ass. 1
Sep. 5	Unit 1: The Nature And Role Of Analysis and Management in Green ...	Project 1	Project 1	

Sep. 12	Unit 2: Green Manufacturing Information Flow and Planning Tools: Analysis	Vollmann Et Al. Chapters 1 & 1A	Project 1	1st. O.R.
Sep 19	Unit 2: Green Manufacturing Information Flow and Planning Tools: Analysis	Lab 1 Work	Project 1	Ass. 2
Sep. 26	Unit 3: Planning Modern Green Manufacturing Systems: Forecasting	Vollmann Et Al. Chapters 2 & 3/ Presentations	Lab Management	Project 1
Oct. 3	Unit 3: Planning Modern Green Manufacturing Systems: Forecasting	Mid-Term Exam/ Project 2	Project 2	Mid-term
Oct. 10	Unit 4: Planning Modern Green Manufacturing Systems: Scheduling	Vollmann Et Al. Chapters 5, 6 & 8	Project 2	Ass. 3
Oct. 17	Unit 4: Planning Modern Green Manufacturing Systems: Scheduling	Lab 2 Work	Project 2	2nd. O.R.
Oct. 24	Presentations	Presentations	Lab Management	Project 2
Oct. 31	Unit 5: Green Manufacturing Project Planning and Control	Vollmann Et Al. Chapters 7 & 9/ Project 3	Project 3	Ass. 4
Nov. 7	Unit 5: Green Manufacturing Project Planning and Control	Lab 3 Work	Project 3	
Nov. 14	Lab 3 Work	Lab 3 Work	Project 3	3rd. O.R.
Nov. 21	Lab 3 Work	Lab 3 Work	Project 3	Ass. 5
Nov. 28	Review/ Presentations	Presentations	Project 3	Term Paper
Dec. 5	Presentations/Last Day	Presentations	Lab Management	Project 3
Dec. 11	Final Examination	Wednesday, Dec. 11, 2:45 PM - 5:00 PM		

SUBJECT TO CHANGES DEPENDING ON CIRCUMSTANCES IN THE COURSE OF THE SEMESTER
 SEPTEMBER 2 IS LABOR DAY; NOVEMBER 11 IS VETERAN'S DAY. CAMPUS WILL BE CLOSED.
 NOVEMBER 28-29 IS THANKSGIVING HOLIDAY: CAMPUS WILL BE CLOSED.