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## Control of the Manufacturing Floor and Processes

### INSY 5840 / INSY 6840

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Time and location: 8:00 – 9:15 AM (CST) T/R, SHLBY 1122

Bulletin Description: (3). Lec. 3. INSY elective. Concepts and techniques in facility layout planning, production planning and control, shop floor control and integration. With the Industry 4.0 on the horizon, several “enabler” technologies in smart manufacturing will also be discussed, such as additive manufacturing processes and quality control methods.

**Course Objective:** Upon completion of the course, students will be able to:

1. Understand the challenges and opportunities brought by Industry 4.0 in smart manufacturing.
2. Understand the cutting-edge technologies in smart manufacturing, such as additive manufacturing, automation, and quality control.
3. Learn the new perspective of integrating manufacturing floor and process control in smart manufacturing.
4. Identify, describe, and apply appropriate techniques and approaches for solving production planning and control problems.
5. Design a production plan including an aggregate production plan, master production schedule, and a material requirements plan for a given forecast and set of products.
6. Design and use operation scheduling for different machines and jobs in shop-floor control.
7. Identify and describe appropriate techniques for integrated production planning and control, such as Kanban system, CONWIP models, etc.

Instructor: Jia (Peter) Liu, PhD, [lzi0040@auburn.edu](mailto:lzi0040@auburn.edu).

Office Hours: T and TR 4:00-5:00 PM (CST). <https://auburn.zoom.us/j/88910080313> or by appointment.

GTA: Jiafeng Ye, [jzy0087@auburn.edu](mailto:jzy0087@auburn.edu)

Office Hours: M and W 4:00-5:00 PM (CST). <https://auburn.zoom.us/s/83646250978> or by appointment.

#### **Materials**

Notes and papers distributed by the instructor

#### **Optional References**

(2) D. Sipper, R. L. Bulfin, Jr. Production: Planning, Control, and Integration, ISBN 0-07-057682-3

(3) S N. Chapman. The Fundamentals of Production Planning and Control, ISBN 0-13-017615-X

(4) M.P. Groover. Fundamentals of Modern Manufacturing: Materials, Processes, & Systems, 4th edition, ISBN 978-0470-467002

(5) D.C. Montgomery. Introduction to Statistical Quality Control, 6<sup>th</sup> edition, ISBN 978-0-470-16992-6

**Course Website:** All course material that is provided to students will be on Canvas. Students are encouraged to communicate with the instructor, the GTA, and each other via Canvas. If you miss a class,

you are still responsible for what is communicated in class. Please review Canvas regularly for important information and announcements. We assume that if we place an announcement or assignment on Canvas, you see it and read it.

***Class delivery and schedule subject to change based on topic coverage and unforeseen events.***

**Lecture Tentative\* Schedule**

Lecture Class meets on Tuesday and Thursday from 8:00-9:15 a.m. in SHLBY 1122.

	Week	Topics
1	Aug. 17	Introduction; Manufacturing systems; Smart manufacturing
2	Aug. 24	Additive manufacturing; site visit
3	Aug. 31	Facility layout planning
4	Sept. 7	Facility layout planning; Forecasting
5	Sept. 14	Forecasting;
6	Sept. 21	Aggregate planning; Master production scheduling
7	Sept. 28	Material requirement planning
8	Oct. 5	Oct 5 Exam 1; Oct 7-8 Fall Break
9	Oct. 12	Single machine scheduling
10	Oct. 19	Parallel machine scheduling
11	Oct. 26	Flow shops
12	Nov. 2	Job shops
13	Nov. 9	Pull System; Kanban
14	Nov. 16	Kanban; Nov. 18 Exam 2
15	Nov. 23	Nov. 22-26 Thanksgiving Break
16	Nov. 30	Bottleneck System; Hybrid Push-Pull System; Dec 3 Classes End
17	Dec. 9	Final project report due

**Summary of Important Dates:**

Oct 5 – Exam 1

Nov 18 – Exam 2

Dec 09 – Final Project Due

**Exams**

All exams are individual. There will be two in-class exams. The format will be specified closer to the examination dates. No cell phones, laptops, or calculators that can store text or connect to Bluetooth, wireless/cell will be allowed in the exams. Please refer to Tiger Cub for academic dishonesty, cheating, and plagiarism policies.

**Project**

A full-semester project will be used to integrate the knowledge learned in this class and beyond into your selected topics. Undergraduate students can have 2-3 team members for the project, while graduate students can only have 1-2 members for the project. The project will be graded based on your

submitted report, which can be structured into five parts: Define, Literature Review, Design, Implementation/Simulation, and Conclusion. Please check the rubric on Canvas. For each part, please submit before the following dates. You are welcome to discuss with me about your selected topics and your work before each submission. Remember to find your team members with a common interest before you start project. For online students, you can use “Course Chat” on Canvas to post your ideas and find team members.

Sep 12 – Project (Define)

Oct 3 – Project (Literature review)

Oct 24 - Project (Design)

Nov 14 – Project (Implementation/Simulation)

Dec 9 – Project (Conclusion)

### Homework

Homework consists of a problem set aimed at reinforcing the material delivered during class and off-class activities. It is about bi-weekly. Homework should be finished independently.

**Deadlines:** Deadlines for submission of assignments or any other requirement of the course will be strictly enforced. Penalties for late assignments will be assessed as follows:

1 minute to 24 hours late: -25%

24 hours 1 minute to 48 hours late: -50%

48 hours 1 minute late or after: -75%

72 hours 1 minute late or after: -100%

### Grading:

	Undergraduate	Graduate	Online Graduate
Lecture Attendance/Participation	5%	5%	
Homework, In-class Assignments, Quizzes	25%	20%	25%
Exam #1	20%	20%	20%
Exam #2	20%	20%	20%
Project	30%	35%	35%

Grade percentages are rounded to 1 decimal place. Then, letter grades are assigned:

A: >= 89.5 B: >=79.5 C: >=69.5 D: >=59.5 F: <59.5

**Extra Credit:** In this class, you may earn up to 5 extra credits which will be added to your final grade for the course. For example, if your final grade is 89.4 and you have 1 extra credit, you will receive an A for the class because your final grade will be 90.4. Be careful not to plagiarize or collaborate for any of these opportunities. The extra credits can be earned from course-related activities, such as submitting undergraduate research proposal in school or other research organization (e.g. INFORMS, IISE) (3),

presenting in meeting or seminar (3), publishing research papers (5), or winning undergraduate research scholarship (5). Please provide relevant evidence to GTA for receiving the extra credit.

**Diversity & Inclusion Statement:**

It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, religion, sexuality, disability, age, socioeconomic status, veteran status, ethnicity, race, and culture. All students in this course are expected to respect their fellow classmates and actively participate in fostering an inclusive learning environment.

If you experience anything in this class that makes you feel uncomfortable, please bring it to my attention and we will formulate a response. If you would prefer to remain anonymous you may complete a Bias Incident Report which will maintain your confidentiality at:

<http://studentaffairs.auburn.edu/bert/submit-a-report-of-bias/>

Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups.

**Accommodations for Students with Disabilities:** Students who need accommodations should follow the steps as detailed here: <https://accessibility.auburn.edu/cm/prospective> . Once your part is completed, I receive the notice electronically so that I know which students need accommodation and what the accommodations are. We are supposed to meet and arrange for accommodation. Please email me on Canvas to arrange a meeting.

**Face Covering and Social Distancing:**

This class will adhere to the guidelines documented in A Healthier U – Comprehensive Health and Safety Plan. All students should read, become familiar with, and follow the guidelines in this safety plan: <http://ahealthieru.auburn.edu/>.

While students, faculty and staff are expected to follow all the guidelines, the following items emphasize expectations for in-person instruction and interactions:

- Students, faculty, and staff will use the STAY SAFE TOGETHER™ platform.
- Students, faculty, and staff will wear face coverings at all times when inside classrooms, laboratories, and any university buildings when in the presence of others. Face coverings must be worn properly (i.e., completely covering nose and mouth) at all times. Anyone not adhering to proper face coverings will be required to leave the building immediately.
- Students, faculty, and staff will practice social distancing when meeting in person. Though A Healthier U states that social distancing will be achieved by limiting classrooms to 50% capacity, it will be maintained in this class with a minimum of 6 feet between people. Anyone not adhering to proper social distancing will be required to leave the building immediately.

Noncompliance with these policies will be considered a violation of the AU Policy on Classroom Behavior. The offending student(s) will be charged in accordance with the AU Code of Student Conduct. Please note that A Healthier U may be updated, or additional guidance developed, as conditions change. This class will adhere to the latest guidance as it becomes available.

**Statement Concerning Mask/PPE Compliance:**

In response to COVID-19, and in alignment with Auburn University's Presidential directives, and local, state, and national health official guidelines face coverings are required at all times while on campus, except when alone in a private office. This includes the classroom, laboratory, studio, creative space, or any type of in-person instructional activity, and public spaces. "A "face covering" is defined as a "covering that fully covers a person's nose and mouth, including without limitation, cloth face mask, surgical mask, towels, scarves, and bandanas.

Anyone who is not wearing a face covering will be asked to put one on or leave the class immediately. Individuals may also be asked to leave class if they remove their face covering during the class, or have to be asked multiple times to wear it correctly.

Failure to comply with a request to leave class for not correctly wearing a face covering is a serious health issue, and may result in any or all of the following:

- Immediate cancellation of the entire class period or activity. All students will then be required to cover the material for that class or activity on their own
- Submission of a complaint to Student Conduct concerning the incident and the individual's refusal to wear, or correctly wear, the required face covering
- A final semester grade of an F for the course for the person refusing to wear, or correctly wear, the required face covering

**Attendance:** Attendance is encouraged because there is a high correlation between class attendance and academic success. Students who miss a lecture, quiz, exam, assignment, etc. must provide a written excuse to a GTA or instructor in order to make up the work and/or to not have your absence counted against your grade. Your excuses should be uploaded to the "Class Excuse" assignment on Canvas. Alternate assignments/exams/quizzes may be given for missed ones or, depending on circumstances, other work may be weighted more heavily and no alternates will be given.

One week will be allowed for students to arrange with the GTA or instructor for make-up exam, but make-up exam will be different and difficult. Exceptions to the "one week for make-ups" can only be made by the instructor and only in extreme circumstances (such as you are in the hospital for 2 weeks and unconscious).

Only Auburn approved class absences are excused: illness of the student or serious illness of a member of the student's immediate family; death of a member of the student's immediate family; trips for members of the student organizations sponsored by an academic unit, trips for university classes, and trips for participation in intercollegiate athletic events; religious holidays; subpoena for court appearance.

I am also giving you a free pass for two absences, meaning if you miss 2 classes only (unexcused), you still receive 100% attendance. If you need to miss a class for a job interview, you must use one of your free passes.

**INSY Departmental Academic Honesty Policy:** All portions of the Auburn University student academic honesty code (Title X11) will apply to this class

<https://sites.auburn.edu/admin/universitypolicies/Policies/AcademicHonestyCode.pdf> . All academic honesty violations or alleged violations of the SGA Code of Laws will be reported to the Office of the Provost, which will then refer the case to the Academic Honesty Committee.

Violations include, but are not limited to:

*Cheating on an examination.* This includes such things as copying from another's paper, using unauthorized notes, calculators, cell phones, blue-tooth and/or wireless devices, PDAs, laptop/pen tablet, etc., or giving or receiving unauthorized aid, such as trading examinations, whispering answers, passing notes, or using electronic devices to transmit or receive information.

*Plagiarism.* This is using someone else's work without giving credit. It is, for example, using ideas, phrases, papers, laboratory reports, computer programs, data - copied directly or paraphrased - that you did not arrive at on your own. Sources include published works such as book, movies, web sites, and unpublished works such as other students' papers or material from a research service. In brief, representing someone else's work as your own is academically dishonest. The risk of plagiarism can be avoided in written work by clearly indicating, either in footnotes or in the paper itself, the source of any major or unique idea or wording that you did not arrive at on your own. Sources must be given regardless of whether the material is quoted directly or paraphrased. Copying another student's assignment and putting your name on it is plagiarism. Copying an answer key from an instructor's guide is plagiarism. Copying work from a previous semester of the class is plagiarism.

*Unauthorized collaboration.* This is working with or receiving help from others on graded assignments without the specific approval of the instructor. If in doubt, seek permission from the instructor before working with others. Students are encouraged to learn from one another: Form study groups and discuss assignments, but each assignment must be individual work unless specifically stated and turned in as a group assignment. You are encouraged to talk to one another about your assignments, however, all assignments must be done by the student(s) whose name is (are) on it!

*Multiple submission.* This means using the same work to fulfill the academic requirements in more than one course. Prior permission of the instructor is essential.

**Calculator Policy.** Any violation of the academic honesty code will be reported to the Academic Honesty Committee. To avoid academic dishonesty, students are not to have calculators that store text and/or can connect to Bluetooth devices during class. The only calculators acceptable for in-class exams or quizzes are: TI-30XA, TI-30XIIB, TI-30XIIS, and TI-34II.

**Use of Cell Phones during Lecture/Lab:** I consider it disruptive for you to use your cell phone during lecture unless it is used as part of a class assignment including Reef Polling. Personal calls should not be taken or made in the classroom.