ISE514-Advanced Production Planning and Scheduling

Units: 4
Fall 2024 Tu/Th 2:00 pm -3:50 pm
Location: RTH 115
http://courses.uscden.net

Instructor: Dr. Shalini Gupta
Office: GER 207
Contact Info: shalinig@usc.edu
Office Hours: Thursday 4:30 pm – 5:30 pm
(Via zoom)

Teaching Assistant: TBD

Course Description
Dependencies among long, intermediate, and short-range planning and scheduling of production systems considering objectives, technological constraints, and solution algorithms.

Learning Objectives
To provide students with fundamental knowledge of and hands-on experience with advanced level production and scheduling algorithms, operations planning, job shop scheduling, batch processing, batch sequencing and shop floor control in a contemporary manufacturing environment.

Learning Outcomes:
Students will be able to:

- Explain the application of advanced level production and scheduling algorithms, and major operation functions.
- explain current concepts of master scheduling, material requirements planning, inventory planning, scheduling, and shop floor algorithms, as well as learn emerging and yet-to-be-developed approaches in these areas.
- evaluate how 'scheduling practices' are incorporated in production sectors and service sectors.
- identify the best strategies, procedures and practices to perform the operations smoothly.
- Apply the concepts of algorithms to determine the optimal sequence to reduce the scheduling cost.
- analyze and evaluate the underlying behavior of manufacturing systems using a systematic approach.

Required Textbooks:

- Michael Pinedo, Scheduling, Second Edition, Prentice Hall, 2002 ISBN – 0-13-028138-7 T.E. Morton and D.W. Pentico, Heuristic Scheduling Systems, Wiley, 1993
- Introduction to the Mathematics of Planning and Scheduling", Geza P. Bottlik, Taylor and Francis, 2017, ISBN 978-1482259216.

References:

- Silver, Pyke and Peterson, Inventory Management and Production Planning and Scheduling, 3rd Ed. John Wiley, 1998
- R.W. Conway, W.L. Maxwell and L.W. miller, Theory of scheduling, Addison Wesley, 1967
- S. E. Dreyfus and A.M. Law, The art and theory of dynamic programming, Academic press 1977
- F.S. Hillier and G. J. Lieberman, Introduction to Operation Research, McGraw-Hill, 1990
- George W. Plossl, Orlicky's Material Requirements Planning, Second Edition, McGraw-Hill, Inc. 1994
- K. R. Baker, Elements of sequencing and scheduling, 2002 ISBN 0 – 9639746 – 1 – 0 D.R. Sule, Industrial Scheduling, PWS Publishing, 1997, ISBN – 0-534-95456-1
- "The fundamentals of production planning and control", Stephen N. Chapman, Pearson Prentice Hall, 2006, ISBN 0-13-017615-X
- "Principles of Sequencing and Scheduling", Kenneth R. Baker and Dan Trietsch, John Wiley and Sons, 2009, ISBN 978-0-470-39165-5
- Factory Physics, 3rd edition, Wallace J. Hopp and Mark L. Spearman

DEN and WebEx Instructions

- Each class will be conducted in person and recorded "Live" using WebEx or Zoom software.
- DEN students can access live class by clicking on the "Virtual Meetings" link located in the D2L main menu of our course homepage.
- Your microphone will initially be muted. When you want to talk, simply un-mute yourself by pressing and holding down your space bar. When you release your space bar, you will continue to be muted.
- Later in the day following class, the recording of the session will be updated to that week's D2L module.

Required Software: You will need Microsoft Excel for solving the production and scheduling algorithms.

Course Material: All assigned sections of the texts, plus topics discussed in lecture by the instructor.

Examinations: The exams will not be comprehensive. Points will be assigned to each section of the exam. No retakes will be allowed. No make-up exam will be given. All answers should be clearly and fully justified. If the steps are unclear, points will be deducted even if the final answer is correct. Any person caught cheating on an examination will be referred to the Office of academic integrity.

Project: The final project for the Advanced Production and Scheduling course is designed to allow students to apply the concepts and scheduling algorithms learned throughout the course to a real-world production and scheduling problem. This project requires students to explore and understand various advanced level production and scheduling algorithms widely implemented in the assigned domain to solve practical issues. The goal is to help students learn the practical implementation of scheduling algorithms to create effective solutions. Additionally, this project may include identifying bottlenecks and constraints, analyzing capacity utilization, and developing strategies to improve efficiency and effectiveness. Overall, the goal of the final project is to develop the skills needed to identify and solve complex production and scheduling challenges. The presentation should be approximately 20 minutes for each student and should cover all aspects of the project such as introduction, background, methodology, challenges, calculations, solution and final outcomes. You need to submit PowerPoint. Content should be phrases in bullets, not prose. Do not read word-for-word from your slides! The project should be documented with a written report. The main text of the report will typically be 10–14 pages (single-spaced, 1" margins, 11pt Times or 10pt Arial or similar) plus appendices (graphs, data, etc.).

Quizzes: Quizzes will address concepts and calculations related to topics covered in the previous week's classes. The specific guidelines will be posted on D2L for DEN students. Late submissions will not be accepted. Everybody must write their own solution independently and make sure to fully understand it. All answers should be clearly and fully justified. Exchanging solutions, consulting other class members, finding solutions online or elsewhere, etc. are not allowed. Violations result in losing the credit for the entire quiz set in addition to a significant percentage of the overall course grade, all with the discretion of the instructor. All quizzes are open-book and open-notes. No make-up quiz will be given.

Classroom Rules and Policies

Any form of academic dishonesty is strictly prohibited and may result in severe penalties, including suspension and expulsion. To ensure a conducive and respectful learning environment for everyone, please take note of the following guidelines and academic integrity policies:

1. **Distracting Others:** Please avoid activities that may distract your peers, such as engaging in side conversations during the class.
2. **Late Arrival or Early Departure:** It is essential to attend the entire class session. Repeatedly arriving late or leaving early without a valid reason can disrupt the flow of the class.
3. **Use of Devices:** Laptops, phones, iPads, or similar devices are not permitted during classes, exams and quizzes.
4. **Cheating or Plagiarism:** Do not engage in any form of cheating or plagiarism.
5. **Food Consumption:** Eating during class can be disruptive. Please consume food outside the classroom to maintain a focused and respectful atmosphere.

6. **Frequency of Questions:** While questions are encouraged, repeated interruptions with numerous questions may disrupt the teaching rhythm and the learning experience for others. Please consider holding questions until appropriate times or utilizing office hours for further clarification.
7. **Respectful Conduct:** Disruptive behavior will not be tolerated, and students are expected to express their views in a calm and reasonable manner. Familiarize yourself with the Academic Code of Conduct. Persistent disruptive behavior may result in disciplinary action.
8. **Attendance and Punctuality:** Attendance will be taken at every lecture. Please arrive on time and be attentive during the class.

Classroom Policies

Any form of academic dishonesty is strictly prohibited and may result in severe penalties, including suspension and expulsion. Examples of academic offenses include:

1. Falsifying data or research results.
2. Sharing quizzes/assignments.
3. Benefiting from others' work.
4. Seeking an unfair advantage.
5. External assistance during exams.
6. Possession of unauthorized materials/collaboration or devices during exams/quizzes.
7. Copying without proper citation.
8. Allowing another student to copy your work.
9. Unauthorized communication during an exam.

These guidelines are in place to ensure a fair and ethical learning environment for everyone.

To quote from a USC guidebook: "Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. Such behavior inhibits other students' ability to learn, and an instructor's ability to teach. A student responsible for disruptive behavior may be required to leave class pending discussion and resolution of the problem and may be reported to the Office of Student Judicial Affairs for disciplinary action."

Grading Breakdown

Exam 1	**20 %**
Exam 2	**20 %**
Exam 3	**25 %**
Project	**25 %**
Quizzes	**10 %**
Total	**100%**

The final grade for this course will be based on the total percentage earned in the grading breakdown shown above and will not be curved/averaged. There will not be any additional assignment substitute to improve the final grade. Also, students are encouraged to participate actively. However, there is no grade percentage assigned for active participation.

F	0
D-	60
D	63
D+	67
C-	70
C	73
C+	77
B-	80
B	83
B+	87
A-	90
A	95

Week	Date	Topic	Text Chapters	Deliverables
1	August 27th	Introduction to production planning and scheduling	Ch. 1 and Ch. 2 & Suppl.	No assignment this week.
1	August 29th	Production Planning	Ch. 4 & Suppl.	
2	Sep. 3rd	Job shop scheduling rules & Gantt chart, Case study	Ch. 6 & Suppl.	
2	Sep. 5th	Job shop scheduling rules & Gantt chart, Case study	Suppl.	**(Quiz -1)**
3	Sep. 10th	Algorithms for one machine problems	Ch. 8 & Suppl.	
3	Sep. 12th	Algorithms for two machine problems	Ch. 8 & Suppl.	**(Quiz -2)**
4	Sep. 17th	Implicit Enumerations & Branch and Bound	Ch. 10 & Suppl.	
4	Sep. 19th	Implicit Enumerations & Dynamic Programming	Ch. 10 & Suppl.	**(Quiz – 3)**
5	Sep. 24th	Heuristics Approaches	Ch. 12 & Suppl.	
5	**Sep. 26th**	**Examination 1**		
6	Oct. 1st	Project Scheduling	Suppl. Material	
6	Oct. 3rd	Project Scheduling		**(Quiz -4)**
7	Oct. 8th	Parallel Machine Scheduling	Ch. 13 & Suppl.	
7	**Oct. 10th**	**Fall Recess**		
8	Oct. 15th	Batch Processing		
8	Oct. 17th	Batch Processing		**(Quiz -5)**
9	Oct. 22nd	Batch Sequencing	Ch. 14 & Suppl.	
9	Oct. 24th	Scheduling of Flexible Assembly Systems	Suppl. Material	**(Quiz -6)**
10	Oct. 29th	Scheduling of Flexible Assembly Systems	Suppl. Material	
10	**Oct. 31st**	**Examination 2**		
11	Nov. 5th	Lot Scheduling	Suppl. Material	
11	Nov. 7th	Lot Scheduling		**(Quiz -7)**
12	Nov. 12th	Lot Scheduling	Suppl. Material	
12	Nov. 14th	Workforce scheduling	Suppl. Material	**(Quiz -8)**
13	Nov. 19th	Workforce scheduling		
13	Nov. 21st	Workforce scheduling		**(Quiz -9)**
14	**Nov. 26th**	**Project Presentations**		
14	**Nov. 28th**	**Thanksgiving Holiday**		
15	**Dec. 3rd**	**Project Presentations**		
15	**Dec. 5th**	**Examination 3**		
	Thursday, December 12	**Graded Exam 3 Review** 2-4 p.m.		

Statement on Academic Conduct and Support Systems

Academic Integrity:
The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the student handbook or the Office of Academic Integrity's website, and university policies on Research and Scholarship Misconduct.

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

988 Suicide and Crisis Lifeline - 988 for both calls and text messages – 24/7 on call
The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL) – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - (213) 740-0411
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101
Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call
Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.