



UNIVERSITY OF PUERTO RICO  
MAYAGÜEZ CAMPUS  
COLLEGE OF ENGINEERING  
INDUSTRIAL ENGINEERING DEPARTMENT



## COURSE SYLLABUS

### General Information

Course Number: **ININ 4077**  
Course Title: **Work Systems Design**  
Credit-Hours: Three

### Course Description

Strategies and models used in work systems design including methods engineering, human factors, and ergonomics.

### Prerequisites

ININ 4010 - Probability and Statistics for Engineers

### Textbook and References

- Konz, S., and Johnson, S., 2008, Work Design: Occupational Ergonomics, Publishing Horizons Inc., 7th. Ed. (T)
- Eastman Kodak Company, 2004, Ergonomic Design for People at Work, 2<sup>nd</sup> ed. Chengalur, S. N., Rodgers, S.H. and Bernard, T.E. (R1)

### Course Goals

After completing the course, the student should be able to:

- Apply the strategies for work systems design.
- Develop Operational Process Charts.
- Design products, workstations, and systems using anthropometric tables, data, and design principles.
- Evaluate, improve and/or design workstations, industrial chairs, and VDT workstations according to ergonomic principles.
- Evaluate, improve and/or design manual material handling tasks according to ergonomic principles.
- Assess force lifting requirements using the NIOSH Lifting Equation and evaluate alternatives for improvement when force requirements exceed recommended levels.
- Evaluate, improve and/or design environmental conditions through noise and illumination studies.
- Perform ergonomic assessment for the identification of occupational risk factors.

## Department and Campus Policies

**Attendance and Behavior:** Class attendance is mandatory. Attendance to some conferences may be required through the semester. Conference dates will be announced in advance. If a student must be absent, he or she will report the situation in advance. Class attendance will be recorded daily. Students are expected to be in class on time. Excessive or frequent tardiness will affect the course grade. The University of Puerto Rico at Mayagüez prohibits in the classroom the presence of babies, children or any other person who is not registered for the course during the semester. Students will be required to conduct themselves with utmost consideration of the rights and property of others. Any behavior on the part of a student that interrupts or impedes quality instruction shall not be permitted. Students are advised to participate in general class discussions. The University of Puerto Rico, Mayagüez Campus, reserves the right to deal at any time with individual cases of non-attendance. Professors are expected to record the absences of their students. Frequent absences affect the final grade, and may even result in total loss of credits. Arranging to make up work missed because of legitimate class absence is the responsibility of the student (Bulletin of Information Undergraduate Studies).

**Absence from examinations:** Students are required to attend all examinations. If a student is absent from an examination for a justifiable reason acceptable to the professor, he or she will be given a special examination. Otherwise, he or she will receive a grade of zero or "F" in the examination missed (Bulletin of Information Undergraduate Studies).

**Final examinations:** Final written examinations must be given in all courses unless, in the judgment of the Dean, the nature of the subject makes it impracticable. Final examinations scheduled by arrangements must be given during the examination period prescribed in the Academic Calendar, including Saturdays (see Bulletin of Information Undergraduate Studies).

**Partial withdrawals:** A student may withdraw from individual courses at any time during the term, but before the deadline established in the University Academic Calendar (see Bulletin of Information Undergraduate Studies).

**Complete withdrawals:** A student may completely withdraw from the University of Puerto Rico, Mayagüez Campus, at any time up to the last day of classes (see Bulletin of Information Undergraduate Studies).

**Disabilities:** After been identified with the professor and the institution, the students with disabilities will receive reasonable accommodations in their courses and evaluations. For more information, please contact *The Office of Quality of Life* at the Student Dean's Building, 787-265-5467 or 787-832-4040 exts. 5467, 3107, 3894.

**Ethics:** Any academic fraud is subject to the disciplinary sanctions described in article 14 and 16 of the revised General Student Bylaws of the University of Puerto Rico contained in Certification 018-

1997-98 of the Board of Trustees. The professor will follow the norms established in articles 1-5 of the Bylaws.

**Sexual Harassment: Certification 130-2014-2015 states:** Sexual harassment in the workplace and in the study environment is an illegal and discriminatory act and is against the best interests of the University of Puerto Rico. All persons who understand they have been subject to acts of sexual harassment at the University of Puerto Rico may file a complaint and request that the institution investigate, where necessary, and assume the corresponding action by the university authorities. If the complainant is a student, he or she must refer his or her complaint to the Office of the Student Ombudsperson or that of the Dean of Students.

**Hostigamiento Sexual: La Certificación 130-2014-2015, indica:** El hostigamiento sexual en el empleo y en el ambiente de estudio es una práctica ilegal y discriminatoria, ajena a los mejores intereses de la Universidad de Puerto Rico. Toda persona que entienda ha sido objeto de actuaciones constitutiva de hostigamiento sexual en la Universidad de Puerto Rico podrá quejarse para que se investigue, de ser necesario, y se tome la correspondiente acción por parte de las autoridades universitarias. Si quien reclama fuera estudiante, deberá referir su queja a la Oficina de la Procuradora Estudiantil o al Decanato de Estudiantes.

**Certification 36 (2018-2019): Discrimination by Sex and Gender on Modality of Sexual Violence:** "The University of Puerto Rico prohibits discrimination based on sex, sexual orientation, and gender identity in any of its forms, including that of sexual harassment. According to the Institutional Policy Against Sexual Harassment at the University of Puerto Rico, Certification Num. 130, 2014-2015 from the Board of Governors, any student subjected to acts constituting sexual harassment, may turn to the Office of the Student Ombudsperson, the Office of the Dean of Students, and/or the Coordinator of the Office of Compliance with Title IX for an orientation and/or formal complaint."

**Certification 06-43 of the Academic Senate states, "The academic guidelines for offering online courses," defines:** Traditional face-to-face courses are those that have less than 25% of the course's regular contact hours via the Internet. Therefore, a three-credit course will be considered "face to face" if, of the 45 hours of regular contact, 11 or less are taught via the Internet. According to certification 16-43 of the Academic Senate, a course may include up to 25% of its total contact hours via the Internet. The objective of this is so that all professors have this alternative in the case of any unscheduled eventuality.

**Law 51:** The Comprehensive Educational Services Act for People with disabilities states that after identifying with the instructor and the institution, the student with disabilities will receive reasonable accommodation in their courses and evaluations. For more information contact the Department of Counseling and Psychological services at the Office of the Dean of Students (Office DE 21) or call 787-265-3864 or 787-832-4040 x 3772, 2040 and 3864.

## Campus Resources

General Library and University Computer Center is available to obtain professors reference materials. The University's Counseling Office has a tutorial program for students who need extra help

## General Topics

Lectures (2 hr. each)	Topic	Reference
1 - 2	<b>Brief Historical Background</b>	T: Ch. 1, R: Ch. 1
	Ergonomics and Human Factors in the Industry	
	Productivity (Work Labor, Materials, Machinery and Equipment)	
3 - 4	<b>Strategies for Work System Design</b>	Instructor Notes
	Methods Engineering	
	Lean Manufacturing	
5 - 12	<b>Operations, Methods and Motion Analysis</b>	T: Ch. 9
	Operator Process Chart	
	Operation Process Chart	
	Flow Process Chart and Flow Diagram	
	Value Stream Mapping	
	Cross Functional Map	
	Worker and Machine Process Chart (3 labs, 2 hours each)	
13 - 16	<b>Anthropometry</b>	T: Ch. 5
	Methods for Anthropometric Measurements (One two-hours lab)	R1: Ch. 3, Appendix A
17 - 20	<b>Material Handling</b>	T: Ch. 15
	NIOSH Lifting Guide (One two-hours lab)	
21 - 22	<b>Work Design</b>	T: Ch. 13 & 14; R1: Ch. 2 (p. 121-181)
	Principles of motion economy	
23 - 25	<b>Noise</b>	T: Ch. 24
	Noise Units of Measurement	R1: Ch8 (p. 578-588)
	OSHA Occupational Noise Exposure Standard (One two-hours lab)	
26 - 28	<b>Illumination</b>	T: Ch. 23
	Illumination Units of Measurement	R1: Ch. 8 (p. 565- 576)
	OSHA Lightning Standards	
	Illuminating Engineering Society	

Lectures (2 hr. each)	Topic	Reference
	American National Standards Institute	
	Number of Light Sources Required in a Workplace (One two-hours lab)	
29 - 30	<b>Design of video Display Terminal (VDT) workstations</b>	T: Ch. 12

**ABET Student Outcomes**

A	B	C	D	E	F	G	H	I	J	K
X		X			X					X

February 2017