New Jersey Institute of Technology
Department of Mechanical and Industrial Engineering

IE 355-102 Human Factors in Industrial Engineering, Fall 2025
Class Schedule: Monday 6:00 – 8:50 pm
Location: Kupfrian Hall 107

Instructor: Prakash Kothari, CIH, CSP, SMS, MS-OSHE
(973) 602-7172 pak24@njit.edu Office hours: 30 min after each class Kupfrian Hall 107

Program Educational Objectives

1. Program graduates use the fundamental principles and major areas of Industrial Engineering in their professional practice.
2. Program graduates are life-long learners, pursuing graduate education, and professional growth in Industrial Engineering and related fields.
3. Program graduates become seasoned professionals through diverse career paths in a variety of industries.
4.

Student Outcomes

(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social and economic factors.
(3) An ability to communicate effectively with a range of audiences.
(4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and social contexts.
(5) An ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks, and meet objectives.
(6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
(7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

1. COURSE NUMBER AND NAME	**IE 355 – Human Factors**
2. CREDITS AND CONTACT HOURS	3 Credits. 3 Contact Hours
3. COURSE INSTRUCTOR	Prakash Kothari, CIH, CSP, MS - OSHE
4. TEXT BOOK	Proctor & VanZandt. *Human Factors in Simple and Complex Systems*, 3rd Edition, CRC Press
4A. OTHER MATERIAL	Sanders, M. S., & McCormick, E. J. (1993). *Human factors in engineering and design* (7th ed.). McGraw-Hill Book Company.
5A. CATALOG DESCRIPTION	Human-machine systems analysis includes study of workplace layout, measurement of employee efficiency and productivity, criteria for tool and fixture design or selection, industrial fatigue, environmental

	influences on performance including the effects of illumination, noise, vibration, thermal, and other atmospheric factors. Basic ideas of industrial hygiene; the impact of OSHA; and special techniques for experimenting with human subjects, via demonstrations and supervised experiments. The central theme is the illustration of how the achievement of the two primary human factors objectives (i.e., functional effectiveness and human welfare) can be influenced by the extent to which relevant human considerations have been taken into account during the design of the object, facility, or environment in question. This theme is followed as it relates to some of the more commonly recognized human factors content areas (such as the design of displays for presenting information to people, human control processes, and physical environment)
5B. PREREQUISITES	Junior standing
5C. REQUIRED, ELECTIVE OR SELECTED ELECTIVE	Required
6A. SPECIFIC OUTCOMES OF INSTRUCTION	The students will: 1. Students learn about ergonomic principles, usability, safety, and user-centered design. (1,2,3) 2. Objectives include designing systems, equipment, or products that consider human capabilities and limitations. (1,2,3) 3. Learn the fundamentals of human information processing and their applications (1, 2). 4. Evaluate and design user-friendly human-system interfaces (1, 2). 5. Learn the use of computer systems and equipment in human factors studies (1). 6. Complete weekly quizzes, midterm and final exams (4) 7. Group Project (5,6,7)
6B. CRITERION 3 OUTCOMES ADDRESSED	The mapping of the three (3) outcomes of instruction of item 6A to the Criterion 3 outcomes (1 - 7) is as follows: 1. Satisfies Criterion 3 outcomes 1 and 2. 2. Satisfies Criterion 3 outcomes 1 and 2. 3. Satisfies Criterion 3 outcomes 1.
7. TOPICS COVERED	1. Introduction, human factors definitions 2. Human factors research methodologies 3. Human information processing 4. Visual presentation - static and dynamic information 5. Auditory and other displays; Speech communication 6. Motor skills, human control systems, data entry devices 7. Physical work and manual materials handling 8. Hand tools, RSI and CTS 9. Applied anthropometry 10. Workplace environment: illumination and atmospheric conditions 11. Workplace environment: noise, vibration and motion 12. Human error, accidents and warnings

	13. Usability and human-computer interaction Project Objective: Find a human-machine system you think needs improvement. Do research on the problem by consulting the literature and conducting your own limited evaluation / data collection. Outline proposed changes or remedies (may include a mock-up, drawing, working prototype, etc.).

Lecture	Date	Topic	Readings
1	Sep 08	Introduction, History, & Systems	Ch. 1 Ch. 3: pp. 54-58 & 65-68
2	Sep 15	Human Information Processing Assignment: Quiz 1	Ch. 4
3	Sep 22	Research Methods Assignment: Quiz 2	Ch. 2 Ch. 3: Box 3.1 pp. 69-70
4	Sep 29	Visual & Auditory Perception Assignment: Quiz 3	Ch. 5 Ch. 7
5	Oct 06	Memory, Attention, & Mental Workload Assignment: Quiz 4	Ch. 9 Ch. 10
6	Oct 13	Decision Making Assignment: Quiz 5	Ch. 11 Ch. 12: pp. 327-328 Ch. 12: Box 12.1 pp. 331-333
	Oct 20	Midterm Exam	
7	Oct 27	Static, Dynamic, & Auditory Displays Assignment: Quiz 6	Ch. 8
8	Nov 3	Controls & Tracking Assignment: Quiz 7	Ch. 15 Ch. 16: Box 16.1 pp. 443-444
9	Nov 10	Compatibility Assignment: Quiz 8	Ch. 13
10	Nov 17	Cognitive & Motor Skills Assignment: Quiz 9	Ch. 14 Ch. 12: pp. 316-327
11	Nov 24	Hand Tools, RSI, & Anthropometry Assignment: Quiz 10	Ch. 16
12	Dec 1	Human Error, Accidents, & Warnings Assignment: Prepare your presentations	Ch. 3 Ch. 19: pp. 549-551
	Dec 8	Project Presentations	
	Dec 15	Final Exam and Project Papers Due	

Textbook: Robert W. Proctor & Trisha Van Zandt (2017) *Human Factors in Simple and Complex Systems*, Third Edition. CRC Press ISBN 978-1482229561

- All required readings are in the textbook
- Yes, you need a copy of the textbook
- The text can be purchased or rented, also can be purchased or rented as a Kindle e-book

Evaluation:

- Midterm Exam – 25%
  - Lectures and reading up to exam day
  - Closed book and closed notes, in-class exam
  - Multiple choice and/or short written answer questions
  - No make-ups
- Weekly quizzes – in total: 25%
  - All quizzes are taken in class
- Final Exam – 25%
  - Second half of course
  - Closed book and closed notes, during final exam period
  - Multiple choice and/or short written answer questions
- Attendance and participation in class/discussion board - 10%
- Project – 15%
  - Group project: groups of approximately 5-6 students
  - Topics reviewed via 1-paragraph written proposal (Print and Canvas/email)
  - Proposals due after midterm (proposals are not graded)
  - Presentations on last day of regular class (one per group)
  - Each group must also submit a single combined paper
  - Grade is combination of your paper and group presentation

I expect all students to follow the NJIT Student Honor Code (i.e. no cheating on exams); this is enforced.

Class Website: Canvas will be used for this class: http://canvas.njit.edu/

Canvas will be used for content distribution, distribution of homework, and general announcements. I do *not* plan to make much use of Canvas's interactive and chat features. Also I do not use Canvas for your semester grade, only for quizzes; *ignore* Canvas's overall grade reports.

Lecture slides will be available on Canvas in PDF format *on the morning of each lecture day.* Class announcements and study guides will also be made available on Canvas and through email.

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to

the Dean of Students Office. ***Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.*** *If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"*