



University of Puerto Rico  
Mayagüez Campus  
College of Engineering  
Department of Mechanical Engineering  
M.S./Ph.D. in Mechanical Engineering



## **Course Syllabus**

<b>1. General Information:</b> Alpha-numeric codification: INME 6045 Course Title: Automatic Assembly Systems Number of credits: 3 Contact Period: Three hours of lecture per week
<b>2. Course Description:</b> English: Introduction to assembly systems; mechanics of vibratory and non-vibratory feeders; parts feeding and orienting devices; natural resting aspects of parts; performance and economics of automatic assembly and robotic assembly systems; product design improvement for ease of assembly.  Spanish: Introducción a los sistemas de ensamblaje; mecánica de alimentadores vibratorios y no vibratorios; alimentación y orientación de componentes; tendencia natural de Descanso de los componentes; rendimiento y economía de sistemas de ensamblaje automático o sistemas de ensamblaje mediante robots; diseño de productos para facilitar el ensamblaje.
<b>3. Pre/Co-requisites and other requirements:</b> Pre-requisite: Authorization of the Director of the Department
<b>4. Course Objectives:</b> <ul style="list-style-type: none"><li>• Explaining and identifying the different types of assembly systems covered in the course.</li><li>• Performing economic analysis of indexing systems and free moving systems up to six stations.</li><li>• Analyzing manually and automatically assembled products to identify characteristics that aid or impede assembly and propose recommendations for redesign to facilitate easy assembly.</li><li>• Analyzing feeder mechanisms and assembly systems to determine their performance.</li><li>• Designing feeder mechanisms that comply with the required specifications.</li><li>• Evaluating one topic in the course and gain knowledge of the latest development in this area.</li></ul>
<b>5. Instructional Strategies:</b> <input checked="" type="checkbox"/> conference <input checked="" type="checkbox"/> discussion <input checked="" type="checkbox"/> computation <input checked="" type="checkbox"/> laboratory  <input type="checkbox"/> seminar with formal presentation <input type="checkbox"/> seminar without formal presentation <input type="checkbox"/> workshop  <input type="checkbox"/> art workshop <input type="checkbox"/> practice <input type="checkbox"/> trip <input type="checkbox"/> thesis <input type="checkbox"/> special problems <input type="checkbox"/> tutoring  <input checked="" type="checkbox"/> research <input type="checkbox"/> other, please specify:

**6. Minimum or Required Resources Available:**

None

**7. Course time frame and thematic outline**

<b>General Topics</b>	<b>Contact Hours</b>
Introduction, overview of assembly stems	2
Transfer systems and indexing mechanisms	3
Mechanics of vibratory bowl feeders	9
Natural resting aspects of parts for feeding and orienting	3
Design for assembly	12
Non-vibratory feeders	3
Feed tracks and escape mechanisms	3
Economics of assembly systems	3
Study of recent trends in assembly automation	4
Exams	3
<b>Total hours: (equivalent to contact period)</b>	<b>45</b>

**8. Grading System** Quantifiable (S/NS)  Not Quantifiable**9. Evaluation Strategies**

	<b>Quantity</b>	<b>Percent</b>
<input checked="" type="checkbox"/> <b>Exams</b>	<b>2</b>	<b>40</b>
<input checked="" type="checkbox"/> <b>Final Exam</b>	<b>1</b>	<b>20</b>
<input type="checkbox"/> <b>Short Quizzes</b>		
<input checked="" type="checkbox"/> <b>Oral Reports</b>	<b>1</b>	<b>20</b>
<input type="checkbox"/> <b>Monographies</b>		
<input type="checkbox"/> <b>Portfolio</b>		
<input checked="" type="checkbox"/> <b>Projects</b>	<b>1</b>	<b>20</b>
<input type="checkbox"/> <b>Journals</b>		
<input type="checkbox"/> <b>Other, specify:</b>		
<b>TOTAL:</b>		<b>100%</b>

**10. Bibliography:****Textbook:**

Schütz, Daniel and Friedrich M. Wahl. 2010. *Robotic Systems for Handling and Assembly*. New York: Springer. <http://dx.doi.org/10.1007/978-3-642-16785-0>. [Available via Springer eBooks, UPRM General Library Databases]

**Other resources:**

- Boothroyd, G. 2005. *Assembly Automation and Product Design*. Florida: CRC Press. <http://dx.doi.org/10.1201/9781420027358>. [Available via Mechanical ENGINEERINGnetBASE, UPRM General Library Databases] (\*)
- Boothroyd, G., Dewhurst, P., and Winston A. Knight. 2011. *Product Design for Manufacture and Assembly*. Florida: CRC Press. [Available at the Circulation Collection (TS171.4 .B66 2011), UPRM General Library]
- Bralla, James E. 2007. *Handbook of Manufacturing Processes: How Products, Components and Materials Are Made*. New York: Industrial Press. [Available at the Circulation Collection (TS183. B73 2007), UPRM General Library] (\*)

4. Crowson, Richard. 2006. *Assembly Processes: Finishing, Packaging, and Automation*. Florida: CRC Press. <http://dx.doi.org/10.1201/9781420003666>. [Available via CRCnetBASE, UPRM General Library Databases] (\*)
5. Derby, S. 2004. *Design of Automatic Machinery*. Florida: CRC Press. <http://dx.doi.org/10.1201/9781420030846>. [Available via MechanicalENGINEERING netBASE, UPRM General Library Databases] (\*)
6. Groover, Mikell P. 2008. *Automation, Production Systems, and Computer-Integrated Manufacturing*. New Jersey: Prentice. [Available at the Circulation Collection (TS183. G76 2008), UPRM General Library]
7. Groover, Mikell P. 2007. *Fundamentals of Modern Manufacturing: Materials, Processes, and Systems*. New Jersey: Wiley. [Available at the Circulation Collection (TS183. G78 2007), UPRM General Library]. (\*)
8. Society of Manufacturing Engineers. 1983-1998. *Tool and Manufacturing Engineers Handbook: A Reference Book for Manufacturing Engineers, Managers, and Technicians (Vols 1-8)*. Michigan: SME Press. [Available at the Reference Collection (TS176. T63 1983), UPRM General Library] (\*)
9. Electronic resources available through the Library's website:  
<http://www.uprm.edu/library/cre/listdbsp.php?l=1&st=0&topic=77>.

\* These are classical handbooks

#### **11. 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.

#### **12. Academic Integrity**

The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR Students General Bylaws (Board of Trustees Certification 13, 2009-2010) states that academic dishonesty includes, but is not limited to: fraudulent actions; obtaining grades or academic degrees by false or fraudulent simulations; copying the whole or part of the academic work of another person; plagiarizing totally or partially the work of another person; copying all or part of another person answers to the questions of an oral or written exam by taking or getting someone else to take the exam on his/her behalf; as well as enabling and facilitating another person to perform the aforementioned behavior. Any of these behaviors will be subject to disciplinary action in accordance with the disciplinary procedure laid down in the UPR Students General Bylaws. —

#### **13. Certification 06-43 of the Academic Senate**

"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 06-43 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.

#### **14. 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.

*Revised: February, 2019*