



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 6008 Course Title: Advanced Metal Cutting Number of credits: 3 Contact Period: Three hours of lecture per week	
<b>2. Course Description:</b>	
English: Mechanics of machining process including friction and temperature. Tools wear analysis, cutting fluids and surface finish. Economics of machining processes. Flexible manufacturing and group technology process design.	
Spanish: Mecánica del proceso de maquinaria incluyendo; fricción y temperatura. Análisis de gastos de herramientas, fluidos y terminación de superficie. Economía de procesos de maquinado. Diseño de procesos de sistemas flexibles de manufactura y tecnología en grupo.	
<b>3. Pre/Co-requisites and other requirements:</b>	
Prerequisites: Authorization of the Director of the Department.	
<b>4. Course Objectives:</b>	
<ul style="list-style-type: none"> <li>• Understanding the relationship between the tool, work and the environment.</li> <li>• Finding the appropriate machining parameters for traditional and non-traditional machining processes in industrial applications.</li> <li>• Designing products for ease of machining using a group technology approach.</li> <li>• Finding machining costs.</li> <li>• Designing the machining process by selecting suitable machining parameters to minimize costs, production time as well as potential machining problems.</li> </ul>	
<b>5. Instructional Strategies:</b>	
<input checked="" type="checkbox"/> conference <input checked="" type="checkbox"/> discussion <input type="checkbox"/> computation <input 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 type="checkbox"/> research <input type="checkbox"/> other, please specify:	
<b>6. Minimum or Required Resources Available:</b>	
Classroom with computer data display.	
<b>7. Course time frame and thematic outline</b>	
<b>General Topics</b>	<b>Contact Hours</b>
Introduction, review of conventional materials removal processes	2
Mechanics of cutting: theories and experiments	6

Temperatures in metal cutting	3
Tool life, tool wear and chip control	3
Cutting fluids and surface roughness	3
Economics of metal cutting	3
Machine tool vibrations	3
Grinding	4
Manufacturing systems, automation and CAD/CAM	5
Design for machining using group technology methods	3
Non-traditional machining processes	7
Exams	3
<b>Total hours: (equivalent to contact period)</b>	<b>45</b>

### 8. Grading System

Quantifiable (letters)  Not Quantifiable

### 9. Evaluation Strategies

	Quantity	Percent
<input checked="" type="checkbox"/> Exams	3	50-75
<input checked="" type="checkbox"/> Final Exam	1	25
<input type="checkbox"/> Short Quizzes		
<input type="checkbox"/> Oral Reports		
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input type="checkbox"/> Projects		
<input type="checkbox"/> Journals		
<input checked="" type="checkbox"/> Other, specify: Quizzes, Homework	0-8	0-25
<b>TOTAL:</b>		<b>100%</b>

### 10. Bibliography:

#### Textbook:

Knight, Winston A., and Geoffrey Boothroyd. 2006. *Fundamentals of Machining and Machine Tools*. Florida: CRC Press. [Available at the Circulation Collection (TJ1185. B7713 2006), UPRM General Library] (\*\*)

#### **Other resources:**

- Cheng, Kai. 2009. *Machining Dynamics: Fundamentals, Applications and Practices*. New York: Springer. UPRM Library Number: TJ1185 .M234 2009. <http://dx.doi.org/10.1007/978-1-84628-368-0>. [Available via Springer eBooks, UPRM General Library Databases].
- Gnecco, Enrico. 2007. *Fundamentals of Friction and Wear*. New York: Springer. [Available at the Circulation Collection (TJ1075. F86 2007), UPRM General Library (\*\*)]
- Groover, Mikell P. 2013. *Fundamentals of Modern Manufacturing: Materials, Processes, and Systems*. New Jersey: Wiley.
- Ispas, Constantin, Marinescu, Ioan D. and Dan Boboc. 2002. *Handbook of Machine Tool Analysis*. CRC Press. <http://dx.doi.org/10.1201/9780203909201>. [Available via MechanicalENGINEERING netBASE, UPRM General Library Databases] (\*)

5. Oberg, Erik. 2004. *Machinery's Handbook: A Reference Book for the Mechanical Engineer, Designer, Manufacturing Engineer, Draftsman Toolmaker and Machinist*. New York: Industrial Press. [Available at the Reference Collection (TJ151. O245 2004), UPRM General Library] (\*)
6. Davim, J. Paulo. 2012. *Machining of complex sculptured surfaces*. New York: Springer. <http://dx.doi.org/10.1007/978-1-4471-2356-9>. [Available via Springer eBooks, UPRM General Library Databases]
7. Society of Manufacturing Engineers. 1983-1998. *Tool and Manufacturing Engineers Handbook: A Reference Book for Manufacturing Engineers, Managers, and Technicians (Vols 1-9)*. Michigan: SME Press. [Available at the Reference Collection (TS176 .T63 1983), UPRM General Library] (\*)
8. Youssef, Helmi A., and Hassan El-Hofy. 2008. *Machining Technology: Machine Tools and Operations*. Florida: CRC Press. <http://dx.doi.org/10.1201/9781420043402>. [Available via MechanicalENGINEERINGnetBASE, UPRM General Library Databases]
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

\*\* These books are key classic references and remain as the top books for the subjects covered in the course and there are no up-to-date textbooks to substitute these books.

### **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*