

PaSCoR



Course Development Guidelines

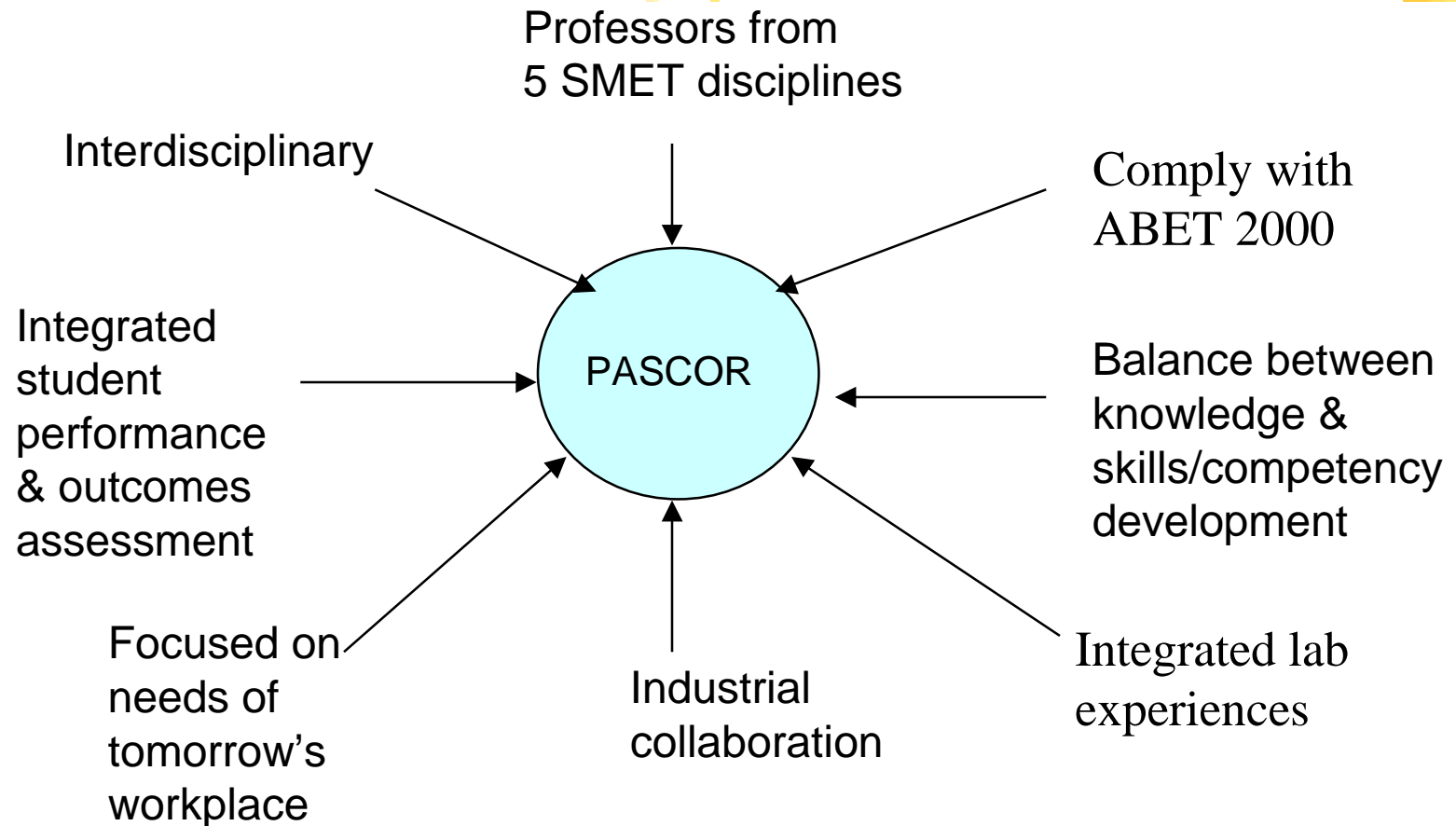
Lueny Morell

December, 1998



PaSCor

Undergraduate Program Option Attributes



Courses' Main Focus



- practice-based, hands-on educational experience
- balance traditional scientific & mathematical principles with practical experiences
- development of skills
- compliance with ABET 2000

Educational Paradigm



INCOMING STUDENTS	EDUCATIONAL PROCESS	GRADUATES
Who are our students? What is their back-ground? Skills?	What do we need to do in order to develop the professional we want? Experiences?	What do we want? What kind of engineer we want? Profile? Skills?

Paradigm...



- Education should:
 - increase ***both knowledge & skills***
 - promote new attitudes & values
- Educational process should be designed to:
 - maximize & enhance the student's knowledge base & skills
 - develop an individual who is a self-learner & thinks critically

Course Design



- Common format/template
- Be available through electronic means
- Team developed

Course Design...



- Course Template:
 - Course objectives
 - | Content & Skills
 - Educational activities to achieve goals/objectives
 - | lab interaction & industrial interaction highly desirable
 - | hands-on, practice-based
 - Outcomes Assessment
 - | traditional and custom-made
 - | criteria & tools

Template



Topics (content)	Skills	Teaching/ Learning Activity(ies)	Assessment Tool(s)

Course Development Steps



- Step 1: Establish Course Rationale, Objectives, Content
 - this is the traditional course design activity
 - involves:
 - | course rationale
 - | course objectives
 - | content/themes/topics
 - | class size
 - | faculty/student ratio
 - | role of instructor

Steps...



■ Step 2: Define Student Outcomes

| Student Outcomes

- What do you expect students to learn?
- What do you expect students will be able to do with what they learn?

| Determine what specific skills & competencies will be developed in the students

- ABET 2000 a-k skills & competencies
- recommended by constituents
 - industry
 - other

ABET 2000 a-k competencies



- ability to apply knowledge of math, science & engineering
- ability to design & conduct experiments, analyze data
- ability to design a system component or process
- ability to function on multi-disciplinary teams
- ability to identify, solve & formulate engineering problems
- understanding of professional & ethical responsibilities
- ability to communicate effectively
- understand the impact of engineering solutions in a global & societal context
- life-long learning
- knowledge of contemporary issues
- ability to use techniques, skills & engineering tools necessary for engineering practice

Steps...



■ Step 3: Design Teaching/Learning Activities

- | What classroom/lab activities will be necessary for students to learn the desired concepts?
- | What classroom (or otherwise) activities will be necessary for students to develop desired skills & competencies?
- | Examples:
 - lectures, labs, demos, field trips, professionals in the classroom, working in teams, coop learning, oral presentations, written reports, etc.

Steps...



- Step 4: Develop Criteria/Tools to Assess Student Performance/Outcomes
 - specific criteria
 - | how will you know if students have learned concepts and developed skills?
 - traditional tools (tests, quizzes, homework)
 - non-traditional assessment tools/ instruments

Steps...



- Step 5: Determine Special Contacts Needed
 - Laboratory Facilities
 - Industry collaboration
 - Other

Steps...



- Step 6: Pilot test
 - All course materials & assessment tools ready by April, '99
 - Word/Power Point format & in electronic means (to be posted on PaSCoR web-site)
 - Course development team presentations in May '99
 - First pilot offerings: II Sem 98-99 & I Semester 99-00

Steps...



■ Step 7: Carry Course Outcomes Assessment

■ Course evaluation

- | formative (process feedback & re-engineering)
- | summative (outcomes)

■ Criteria can include:

- | #students completing, attrition/pass rates, student & faculty attitudes, effect on student's interest, values, motivation, interpersonal relationships, communication skills; appropriateness of teaching methodologies, etc.

Steps...



- Step 8: Analyze Outcomes Results and Re-engineer

Example of Student Outcomes



- Clearly defines a product/market/need/problem and analyzes the situation
- Clearly establishes goals & objectives for product/process & defines a work-plan
- Timely follows a work-plan
- Accurately demonstrates knowledge from his/her area of expertise, & integrates other areas
- Communicates ideas clearly, both in written reports & oral presentations
- Facilitates effective interpersonal/inter-team relationships

Example of Course Activities to Achieve Outcomes



- Lectures
- In-class demonstrations
- Laboratory experiences
- Consultations
- Field trips to industry
- Oral presentations
- Written reports
- Working in teams

A Sound Outcomes Assessment Strategy



- Should have the following elements:
 - internal (self-assessments by faculty & students)
 - external (industry?)
 - wholistic (all elements)
 - quantitative
 - qualitative

Student Performance



- Depends on course goals/objectives
- Tools:
 - exams, quizzes, homework,
 - oral reports
 - written reports
 - team experiences
- Assessment Tools Examples

Course Development Timeline



- December 17, 1999
 - general guidelines for course development
- January 19 to April 15, 1999
 - Course materials & assessment tools development
 - Some courses pilot tested
- May, 1999
 - Report and Presentation of course materials & assessment tools
 - Include materials in web-site
- August, 1999
 - Pilot testing of courses

PaSCoR Courses Pilot test schedule

DEPARTMENT	COURSES	PILOT TEST DATE	STUDENTS
Freshman Year Course	<ul style="list-style-type: none"> ▪ University 101 (revised) 		2200/year
Electrical & Computer Engineering	<ul style="list-style-type: none"> ▪ Introduction to RS (new) 		25/semester
	<ul style="list-style-type: none"> ▪ Introduction to GIS (new) 		25/semester
	<ul style="list-style-type: none"> ▪ ECE 4xxx Fundamentals of Image Processing (new) ▪ ECE 4xxx Fundamentals of Pattern Recognition and Signal Analysis (new) 		25/semester
Geology	<ul style="list-style-type: none"> ▪ GEOL 3xxx. Images of Earth (new survey course—all majors) GEOL 3047. Laboratory. (revised) 		100/semester
	<ul style="list-style-type: none"> ▪ GEOL 4048. Geological Applications of Remote Sensing (revised) 		15/semester
	<ul style="list-style-type: none"> ▪ GEOL 5xxx. GPS geodesy in Earth Science (new) 		15/year
	<ul style="list-style-type: none"> ▪ GEOL 5xxx. Field verification (new) 		10/year
Agricultural Sciences	<ul style="list-style-type: none"> ▪ CFIT 3005. Fundamentals of Crop Production (revised) 		200 to 225/year
	<ul style="list-style-type: none"> ▪ AGRO 4018. Physical and Chemical Properties of Soils (revised) 		10/year
	<ul style="list-style-type: none"> ▪ AGRO 4037. Soil Fertility and Fertilizers (revised) 		10/year
	<ul style="list-style-type: none"> ▪ AGRO 5xxx. Application of remote sensing to agriculture (new) 		15/year
	<ul style="list-style-type: none"> ▪ AGRO 4998. undergraduate research course (new area) 		15/year
Mathematics	<ul style="list-style-type: none"> ▪ MATE 4061 Numerical Analysis (revised) 		120/semester
	<ul style="list-style-type: none"> ▪ ESMA 3xxx Statistical Data Analysis (new) 		40/semester
	<ul style="list-style-type: none"> ▪ COMP 4yyy Computer Graphics (new) 		20/year

SAMPLE ASSESSMENT TOOLS



- MEEP Industry Survey
- MEEP Student Survey
- ADMI 3100 Teamwork Experiences Assessment Form
- ADMI 3100 Written Report Assessment
- ADMI 3100 Oral Presentation Assessment
- ADMI 3100 Peers Evaluation Form
- ADMI Lecturer Evaluation Form
- MEEP GENERIC Course Evaluation and Assessment of Skills and Knowledge

**Manufacturing Engineering Education Partnership
MEEP
INDUSTRY SURVEY**

The Learning Factory is a new practice based curriculum and physical facilities for product realization that has been developed at three institutions: Penn State, the University of Washington, the University of Puerto Rico at Mayagüez in collaboration with Sandia National Labs. Its goal is to provide an improved educational experience that emphasizes the interdependency of manufacturing and design in a business environment. The key element in this approach is active learning - the combination of curriculum revitalization with coordinated opportunities for application and hands on experience.

This questionnaire has been designed to assess the performance and products of this program. Please answer it to the best of your knowledge.

Name:

Company:

Partner University:
 UPR-M PSU UW Other _____

Your Involvement with the program:
 Member of Industrial Partner Board Expert in the classroom Involved with students projects
 Other _____

Instructions:

The following items reflect some of the ways in which the Manufacturing Engineering Partnership (MEEP) can be described. Please fill in the numbered circle which indicates THE DEGREE TO WHICH YOU AGREE that each item is descriptive of the experiences you were exposed to and provided by the program. If you have no information or feel an item does not apply, please fill in the N/A circle.

The program allowed students to practice engineering science fundamentals in the solution of real problems.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

Professional communications skills were enhanced.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

Team work skills were enhanced.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

The partner schools learned from each other's experience.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

Resources and ideas were shared, avoiding redundant efforts.

The local IAB supported MEEP's activities providing financial and/or non financial resources.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

There was good communication between industrial sponsors and the institution.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

Each institution provided the IAB the right information in a timely fashion.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

The MEEP's Industrial Advisory Board (IAB) evaluated the overall progress of the program.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

The partnership reported progress and activities related to participation in curriculum development.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

The MEEP's IAB provided support in actions/activities that are relevant to the program.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

The partnership reported progress and activities related to participation in the classroom teaching.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

Students completing the MEEP program are more useful to our industry.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

My Industry and company is more likely to hire a MEEP trained student than a traditionally trained student.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

Would you encourage other companies to participate in the program and coalition? Why?

What can be improved with MEEP?

Comments:

**Manufacturing Engineering Education Partnership
MEEP
STUDENT SURVEY**

The Learning Factory is a new practice based curriculum and physical facilities for product realization. Its goal is to provide an improved educational experience that emphasizes the interdependency of Manufacturing and design in a business environment. The key element in this approach is active learning - the combination of curriculum revitalization with coordinated opportunities for application and hands on experience.

University:
 UPR-M PSU UW Other _____

Major:
 Mechanical Eng. Chemical Eng. Industrial Eng.
 Other _____

Graduate student Undergraduate student

Involvement with MEEP:
 Taken 1 course Taken more than 1 course Research Assistant
 Other _____

The program courses at your institution were offered as: (Check all that apply)
 as part of a minor as electives as part of a degree option required for the major
 Other _____

The courses were:
 interdisciplinary engineering students only students from only one department

Instructions:

The following items reflect some of the ways in which the Manufacturing Engineering Partnership (MEEP) can be described. Please fill in the checkbox which indicates THE DEGREE TO WHICH YOU AGREE that each item is descriptive of the experiences you were exposed to and provided by the program. If you have no information or feel an item does not apply, please fill in the N/A checkbox.

The program allowed you to practice engineering science fundamentals in the solution of real problems.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

Professional communications skills were emphasized.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

Team work skills were emphasized.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

Case studies were extensively used in the courses.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

Active learning activities were extensively used in the courses.

The MEEP courses you took had more design/manufacturing content than other similar courses at your institution.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

The Learning Factory (LF) provided you with a fully integrated activity center for the creation and implementation of products and processes.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

The LF facility was well equipped to give me real life experience in "state of the art" processes.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

The LF facility was professionally staffed to allow me to experiences the product/process realizations.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

I feel that my participation in the MEEP Program has improved my career opportunities.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

I learn better from classroom lecture than hands-on laboratory experience.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

The MEEP courses provided more to my professional development than typical courses.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

My MEEP course(s) were more fun than my typical engineering courses.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

Because of the MEEP courses, I have a much better understanding of what engineering is.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

As a result of this course, I am more confident in my ability to solve real-life problems.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

As a result of this course, I feel more confident in my abilities to process information, and teach myself new things, without the aid of an instructor.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

The MEEP instructors were superior to my typical university instructors.
 Strongly Agree Agree Neutral Disagree Strongly Disagree
 N/A

COMMENTS:

University of Puerto Rico
Mayagüez Campus
ADMI 3100 - TECHNOLOGY BASED ENTREPRENEURSHIP

WRITTEN REPORT ASSESSMENT

Name _____

Team _____ date _____

Evaluator _____

Report Title _____

CATEGORY	ASSESSMENT
Cover, title page, table of contents, list of figures, etc.	/10
Abstract	/15
Introduction*	/10
Body*	/20
Conclusions/recommendations*	/15
Language/grammar/clarity	/05
Figures/tables	/05
Bibliography/references	/05
GENERAL	/15
TOTAL	/100

* Considerations for the FINAL REPORT ONLY:

- Market definition/product need
- Goals & objectives of design
- Work/action Plan
- Knowledge & application of concepts
- Engineering method
- Other

COMMENTS:

University of Puerto Rico
Mayagüez Campus
ADMI 3100 – TECHNOLOGY BASED ENTREPRENEURSHIP

ORAL PRESENTATION ASSESSMENT

Name of the Company: _____

Team _____ Date _____ Evaluator _____

Part 1 - PRESENTATION

CATEGORY	0	1	2	3	4	5
Organization						
Level						
Knowledge of Material						
Time						
Delivery/Transmission of Material						
Quality of Language						
Order						
Management of Questions						
Ability to Discuss Project and Methodology						
Personal Appearance/Manners						
<i>TOTAL</i>						

PART 2 - CONTENTS

CATEGORY	0	1	2	3	4	5
Introduction/Background						
Body						
Conclusion						
<i>TOTAL</i>						

Part 3 – Overall

CATEGORY	0	1	2	3	4	5
Overall Quality of the Presentation						
Perception of Potential Success in a Competitive Forum						
Perception of Potential in Achieving Results						
<i>TOTAL</i>						

GRAND TOTAL						
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COMMENTS:

University of Puerto Rico
Mayagüez Campus
ADMI 3100 – TECHNOLOGY BASED ENTREPRENEURSHIP

PEER EVALUATION FORM

Name of the Company: _____

Team _____ Date _____

Evaluator (VOLUNTARY) _____

Please describe the effort of your peers so far.

Use the following code for evaluation:

- | | |
|-----------------------------------|-----------------------|
| 3 Excellent job | 2 Did his/her share |
| 1 We had to force him/her to work | 0 Did not work at all |

Write the name of your team members in the table below and evaluate them.

Student Name	Evaluation (From 0 to 3)	Evaluation (From 0 to 100%)

Comments:

**MANUFACTURING ENGINEERING EDUCATION PARTNERSHIP
- MEEP**

**University of Puerto Rico
Mayagüez Campus**

**COURSE EVALUATION
And
ASSESSMENT OF SKILLS and KNOWLEDGE**

Course: _____
Instructor: _____

The purpose of this assessment is:

- to determine your perception of mastery/level of knowledge and skills developed by the students in this course, and
- to establish the effectiveness of lectures and experiences, as well as of the logistics used.

The results of this assessment will help the instructor in charge of the course to better plan and adjust the course's agenda in the future.

PART I: GENERAL OBJECTIVES AND SKILLS

Directions:

Using the scale below, please evaluate (*) your perception of the mastery of skills and experience the students developed in this course in the areas specified.

- N:** no skills/no experience
R: rudimentary skills/very little experience
F: functionally adequate skills/some experience
A: advance skill/extensive experience

area	*
skill 1	
skill 2	
objective 1	
objective 2	

PART II: CONTENT, LECTURES AND EXPERIENCES

Directions:

In this part, please indicate (*) your perception of the lectures and activities' effectiveness, using the following scale:

- 0:** not effective; would eliminate
1: moderately effective; significant changes (specify)
2: effective; minor changes (specify)
3: very effective; would not change

module/lectures	*	comments
Module 1: TITLE		
Module 2: TITLE		
Module n: TITLE		

PART III: COURSE LOGISTICS

Directions:

Please indicate (*) how you feel regarding the various aspects designed for the course, using the following scale:

- 0:** inadequate; disliked, needs re-engineering!
1: somewhat adequate; needs enhancement
2: adequate; minor changes
3: adequate; no change

area	*	comments
Number of meetings		
Kinds of assessment techniques		
Requirements		
Number of lectures		
Number of plant trips		
Topics covered		
Course coordination		
Other:		

Would you recommend this course to other students? Explain.

Do you think your expectations were met?
YES/NO. Explain.

Suggestions: