

## **Internship Development for a New Baccalaureate Degree Program: Student Preparation, Sponsor Development, and Internship Follow-Up**

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### Abstract

Penn State Altoona College is in its third year of offering a Bachelor of Science program in Electro-Mechanical Engineering Technology (BSEMET) which is a 2+2 engineering technology program. Students matriculate to the BSEMET program from the ABET-accredited associate degree program in either electrical or mechanical engineering technology. They spend their first year in the BSEMET program (the junior year) cross-training in their alternate discipline. Students spend the senior year of the program learning specialized technical knowledge in selected areas of engineering technology related to the electro-mechanical discipline. Both components (associate degree and the junior and senior years) consist of highly structured curriculum schedules. While a large number of baccalaureate degree engineering programs at US institutions encourage students to participate in co-op programs (programs which require students to work in industry at least one full-time semester per year), Penn State Altoona BSEMET students cannot participate in a co-op program without falling out of the BSEMET course sequence.

Considering the importance of industry-based internships for engineering technology students, the Penn State Altoona's School-to-Work coordinator has developed an innovative program for the BSEMET students to secure and complete industry-based internships during flexible schedules. These internships are coordinated by the School-to-Work coordinator. As many as thirty BSEMET students complete industry-based engineering internships every year during summer. In addition, fifteen to twenty students complete internships on a part-time basis during the school year.

This internship program has been very successful because of the support from regional business and industry. Many times, the industrial organizations in Penn State Altoona's service region have expressed a need for engineering technology students to work on a specific engineering project. This need is usually met through our BSEMET students. Students' records are maintained in an active employment file so that the industry internship requests can be expedited in days. The experiences gained by students are invaluable to them and often lead to long-term employment.

This paper begins with an introduction to the Penn State Altoona BSEMET program. The obstacles which hinder the implementation of a co-op program are described. Next, the paper provides a detailed account of the innovative student internship program developed and coordinated by the Penn State Altoona's School-to-Work coordinator. Finally, the paper

describes the outcomes and the assessment of the above mentioned internship program for students.

## Introduction

### The BSEMET Degree at Penn State Altoona

The Bachelor of Science in Electro-Mechanical Engineering Technology (BSEMET) program at Penn State Altoona is designed to meet industry's needs for professionals who can work on systems, machines, and products that have both electrical and mechanical elements.

The program emphasizes a breadth of knowledge in all fields of engineering technology related to typical manufacturing, production, and assembly plant process. Basic coverage is provided in all major areas involved in the operation and control of manufacturing and production processes, including instrumentation and monitoring methods, principles of machine design, automated control techniques, thermal and fluid sciences, computerized manufacturing systems, principles of electrical and electronic circuit operation, computer-aided drafting and design, economics of production, and statistical analysis and quality control.

Students complete two years of engineering technology in either the electrical (EET) or mechanical (MET) discipline. They then complete 21 credit hours of study in the opposite discipline – METs take an electrical sequence and EETs take a mechanical sequence. The students then complete a 25 credit hour sequence of courses that focus on electro-mechanical topics, and 18 credits of general education.

Students entering the BSEMET program with an associate degree in Electrical Engineering Technology study :

- calculus and differential equations
- process control and instrumentation
- production system and product design
- spatial analysis and CAD
- engineering mechanics
- technical writing

Students entering the BSEMET program with an associate degree in mechanical Engineering Technology study:

- calculus and differential equations
- process control and instrumentation
- electrical/electronics/microcontrollers
- electrical machines
- technical writing

During the senior year, all BSEMET students study:

- analog control systems
- automation control techniques
- quality control methods

- fluid and thermodynamics
- chemistry
- project design course

**Program Requirements – An associate degree in EET or MET (67 credits) plus 63-64 credits**

For students entering with a 2EET degree		For students entering with a 2MET degree	
<b>Third Year-Fall Semester</b> CMPSC 101C Algorithmic Programming 3 EMET 322 Mechanics for Technology 3 EMET 311 Spatial Analysis and Advanced CAD 3 ESACT Physical Education 1.5 MATH 141 Calculus with Analytical Geometry 4  Total 14.5	<b>Fourth Year-Fall Semester</b> CHEM 12 Chemical Principles 3 EMET 410 Auto Control Systems 4 EMET430 Auto Machine Control Technology 3 ENGL 202C Technical Writing 3 MET 281 Elementary Fluid and Thermodynamics 4  Total 17	<b>Third Year-Fall Semester</b> CMPSC 101C Algorithmic Programming 3 EMET 310 Digital Electronics 3 EMET 320 Discrete Electronics 3 ESACT Physical Education 1.5 ESACT Physical Education 1.5 MATH 141 Calculus with Analytical Geometry 4  Total 16	<b>Fourth Year-Fall Semester</b> CHEM 12 Chemical Principles 3 EMET 410 Auto Control Systems 4 EMET 430 Auto Machine Control Technology 3 MET 281 Elementary Fluid & Thermodynamics 4 ENGL 202C Technical Writing 3  Total 17
<b>Spring Semester</b> EMET 330 Measurement Theory & Instrumentation 3 IET 215 Production Design 2  IET 216 Production Design Lab 2 MATH 250 Calculus & Differential Equations 3 MET 210W Product Design3  S/H/A Social Science/ Humanities/Arts Elective 3  Total 16	<b>Spring Semester</b> EMET 350 Quality Control Inspection & Design 3 EMET 440 Electro-mechanical Project Design 3 IET 105 Economics of Industry 2 S/H/A Social Science/ Humanities/Arts Elective 3 S/H/A Social Science/ Humanities/Arts Elective 3 ESACT Physical Education 1.5 HLED Health Education 1  Total 16.5	<b>Spring Semester</b> EET 211 Microprocessors 3  EMET 330 Measurement Theory & Instrumentation 3 EMET 321W Electrical Machines 3 HLED Health Education 1 MATH 250 Calculus & Differential Equations 3 S/H/A Social Science/ Humanities/Arts Elective 3  Total 16	<b>Spring Semester</b> EMET 350 Quality Control, Inspection & Design 3 EMET 440 Electro-mechanical Project Design 3 IET 105 Economics of Industry 2 S/H/A Social Science/ Humanities/Arts Elective 3 S/H/A Social Science/ Humanities/Arts Elective 3  Total 14

Figure 1

The program requirements for the BSEMET degree are illustrated in Figure 1. As shown in Figure 1, the tightly packed BSEMET program schedule does not allow students to go through a structured internship experience for academic credit. However, they are encouraged to develop a resume and go through the process of investigating non-credit bearing internships in the geographic region of the student’s choice. Out of 20 students constituting the 1997 BSEMET class, a total of 9 individuals participated in non-credit bearing internships.

Our Clientele

Clientele in the past has predominately been students with local or regional (small-town/rural) background. Many of them were nontraditional students with families, and many were first in the family to receive college degree. However, at present the percentage of out-of-town students steadily increasing along with engineers taking leaves of absence from their jobs to complete our program.

### Importance of Internships

Our BSEMET degree program is unique in that it is structured as a 2+2 articulation. Therefore, it is very difficult for our students to take a semester off to complete a structured co-op. Summer internships or part-time internships during the academic year are the best fit for the students. Many times they are able to combine class assignments with the internship.

Our students in particular benefit greatly by the internships in many ways. They are able to apply immediately the skills they learn in the classroom. They make valuable contacts with engineers in the field. Most importantly, they develop self-confidence that greatly enhances their job search at graduation.

Five years ago when we first started placing students in internships, they were difficult to find. Now many companies have begun to view internships as the "first rung of the ladder". Companies historically invest incredible amounts of money on training new recruits. Internships offer companies the opportunity to hire a student for a limited time and establish a relationship to determine if the student and company are a good match. The worst case scenario is the student is not offered permanent employment but still has valuable experience on his/her resume. Another plus is that there are no "finder fees" for interns, therefore the companies have a wealth of talent to choose from at a much-reduced price.

### Internship Coordinator

Salary and office expenses for the internship coordinator are generated from state and federal educational grants. The Carl Perkins Local Vocational Grant provides funding for internship and job development/placement for associate degree students. The Blair, Bedford and Cambria Counties School-To-Work Grants provide funding for the continued development of internships and job placement for four-year graduates. The internship coordinator's responsibilities resemble those of a multi-task unit. The coordinator is expected to teach resume writing, interviewing and job search skills, and business correspondence. Other duties include individual counseling which often involves personal problems, and most importantly keeping the students highly motivated.

### Student Preparation

#### The Role of the Penn State Altoona's Internship Office

1. *We require all students to complete a Students Profile/Interest form.* This form is very valuable in aiding the student by matching his/her skills and interests to the proper internship, location and time available to commit to the experience.

2. *We offer in-class resume writing, interview skills and job search strategy workshops.* The engineering faculty is usually willing to allow a minimal amount of class time for the workshops.
3. *We keep complete student resume files,* including records of all companies which receive the student's resume, responses, internships accepted evaluations, etc.
4. *We work diligently to interact with the engineering faculty,* both formally and informally. They are key to cementing the relationships among the student, our office, and potential employers.
5. *We make extraordinary efforts to get to know the students.* Our clientele shows a dramatic response to individual attention in the form of calls to the home, at night, weekends, etc., visiting them on campus, e-mail, open office hours, etc. In general getting to know the students personally is very important.

#### Responsibilities of Students Seeking Internships

1. The student must prepare a professional resume and keep it updated in the resume file. This is probably one of the hardest responsibilities to encourage, but generally once a student has missed one good opportunity he/she is diligent in updating the resume
2. The student must be honest about his/her engineering interests. Many students have a preference and this must be clearly expressed so that a good match is made. If the student does not yet have a specific interest (and that is not unusual) he/she can still secure an internship that will expose he/she to many different facets of Engineering.
3. Students must be willing to prepare for interviews by dressing and presenting themselves properly. Often the students come from blue-collar backgrounds and do not understand the necessity to wear a suit or other proper attire to interviews
4. Our students who attend career fairs are encouraged to share information about the BSEMET program to recruiters. This gives students a chance to present a public relations approach to recruiters and at the same time articulate the value of the program.
5. We impress upon our students that they are "goodwill ambassadors" for their college and that their performance may well influence the company, one way or the other, to consider other students in the program.
6. Preparing students for career fairs is an enormous task. Students seeking internships must have at least 30 copies of their resume on quality paper, research in advance what companies they wish to visit and determine proper dress for the fair. Since there are fewer internships available than permanent positions, the students often require help in planning the best strategy.

#### Student Feedback

We have heard many accounts of students back from internships from "I hated doing AutoCAD all day" to "my first day I was asked to start designing a new production line, it was incredible". One student explained it all so well by stating " sometimes I had to do mundane tasks, but I learned what went on in and engineering department. Now I have so many engineers I can

network with to learn more. And I learned how many different people doing different tasks as a team make a department successful".

The most impressive feedback is when students tell us that the company has asked them to stay on, part time during the academic year and to come back the following summer. Business organizations are increasingly telling out students that they are valuable.

## Sponsor Development

### Establishing Relationships and Networks

1. We have benefited from memberships of our staff in service organizations such as Kiwanis, Rotary, and the local Chamber of Commerce.
2. We recommend involvement in parallel technology education programs, where appropriate, such as School-To-Work, Tech Prep and your Technology Advisory Committees.
3. The engineering faculty has professional contacts in industry, which they are willing to share. These relationships, if utilized with proper professional sensitivity, can generate long-lasting faculty/sponsor/student opportunities.

## Career Fairs

Our experience with career fairs has been mixed, and we recommend careful selection of these time-consuming and expensive events. Our participation in the large bi-annual career fairs at Penn State's main University Park Campus, which is 40 miles from Penn State Altoona, has greatly promoted our new BSEMET program and generated excellent placement success. Over 350 companies are represented every year, and there is a special day for engineering, science and math. Our internship coordinator meets with as many companies as possible and distributes information on the BSEMET program, and gathers information for follow-up contact. At this fair, an increasing number of companies are becoming interested in our cross-disciplinary program and we are seeing a sharp rise in recruitment efforts by those companies. Chosen wisely, smaller regional career fairs are successful especially for the students who wish to remain in the area.

## Examples of Local Corporate Relationships

Creative Pultrusion, Bedford, PA. Our relationship with Creative Pultrusion began through the local School-to-Work Program. Later, they contacted us with an interest in interviewing BSEMET students for summer internships. They hired two of our incoming juniors, and by the end of the summer offered them full-time positions, and reimbursed their tuition for the last two years of the program. One of the students now holds a managerial position with Creative Pultrusion.

General Electric, Erie, PA. General Electric is in the process of producing locomotive engines for rail industry. General Electric took one of our BSEMET students for an intensive, paid, summer internship. He was exposed to many areas of the production industry as well as

classroom training. The student will graduate in May 1999 and has already accepted a permanent position with GE.

Corning Fiberglass, Huntingdon, PA. Manufactures fiberglass strands for insulation, etc. This is a local facility, just a 40 minutes drive from our campus. Corning has hired several students for the past three summers. One of our recent graduates is now working there as a production supervisor for Corning.

JLG, Industries, Bedford, and McConnellburg, PA. Manufactures hydraulic, scissor lifts. This company has employed seven of our students in such areas as technical writing, AutoCAD, and production design. Two students have now accepted full-time positions with them.

McLanahan Corp, Hollidaysburg, PA Manufactures specialty mining equipment throughout the world. They are active in recruiting our BSEMET students for internships and job placement. Often they send employees back to our program for further studies.

Berg Electronics, Mt. Union, PA is another local company, which is a leading manufacturer of electronic components for communication systems. They hire our students as interns for a training period and then make them permanent staff members. Three students are currently employed with them in production positions.

Other local companies that continue to hire our students for both internships and permanent placement include Westvaco (large regional manufacturer of paper products), PPG (formerly Pittsburgh Plate Glass, a manufacturer of automotive glass), Corning Asahi Video Products Co, (manufacturer of television picture tubes), Conrail (Norfolk Southern Shipping and Rail manufacturing), SKF (manufacturers of ball bearings), Cannondale, (manufacturers of bicycles and wheelchairs), F.L. Smithe , (manufacturers of specialty envelop machine components), Fry Metals, (manufacturers of specialty metals), and Penn Jacobson, (manufacturers of tool and die specially parts).

## Conclusion

When a company contacts us concerning a possible internship, we secure as much information as possible about the position. If we are unsure of the appropriateness of the position, we take it to a faculty member to determine whether it should be released to the students. Our internship program is only five-years-old and the success grows each year. Repeat business from industry is a strong indicator that our program is doing well.

One of the best assessment tools is the frequent, repeat business from companies. Some companies have requested interns every year for the last five years. Students who have graduated and are working in the field often call the internship coordinator's office in search of other BESEMET students to complete internships. There is such a demand for our students that frequently we have positions that go unfilled.

#### SOHAIL ANWAR

Sohail Anwar obtained a Ph.D. in Industrial and Vocational Education from The Pennsylvania State University in December 1995 and an M.S. degree in Electrical Engineering from the University of Texas at Arlington in May 1982. He completed additional graduate coursework in control theory and applied mathematical sciences at the University of Texas at Arlington during 1982-1984. Since August 1992, Sohail has been working as an assistant professor of engineering and Department Coordinator of Electrical Engineering Technology at Penn State Altoona. He is the Subscriptions Editor of the Journal of Engineering Technology.

#### FRANCES WINSOR

Frances Winsor received her Master's degree in Adult Education in 1992 from The Pennsylvania State University. She has over six years of career counseling experience with high school, post-secondary and adult populations. She was responsible for the development of job placement and internship program at the Altoona College of The Pennsylvania State University. Ms. Winsor has worked primarily with engineering students through the School-To-Work and the Tech Prep Programs. From 1995-1998 her work was supported by School-To-Work and Carl J. Perkins grants.