On behalf of the College of Engineering, I am sending you this requested summary report of all student technology fee income, expenditures and carryover funds.

A. Summary Page:
ISU’s summary page is attached to this email. It provides an overview of all College of Engineering technology fees. Note that in this canned report, the funds received and the funds expended are over-stated. Actual numbers are as follows: carry forward from FY14 ($1.5M); funds received ($3.0M); expended ($3.1M); and carry forward to FY16 ($1.4M).

B. Carryover Totals:
The June 30, 2015 free balance in the College’s technology fee accounts was $826,219, as compared to $971,834 a year ago. These carryover funds are available to our department chairs to spend in support of student learning. Department chairs have the flexibility to use as needed. They formulate plans and propose expenditures as they make decisions throughout the year.

C. Current Year Narrative:
The College had allocated anticipated technology fee revenue proportionally to the academic departments at the start of the fiscal year. This was based on the past enrollment of students and the amount of instruction taught. This has been the practice for 5 years now and provides a departmental incentive for the recruitment, retention, and academic success of students.

The student technology fee income to the College was estimated to be $2.7 million in spring 2014. A portion “off the top” was used to support central computing that benefits the entire college. The remaining estimated resources were allocated to the academic departments at the start of the fiscal year. The intention and philosophy here is to improve the ability of departments to allocate resources under their local control for the benefit of student learning.

When actual revenues were trending higher than budget, Dean Rajala allocated an additional $700,000 to departments in spring 2015, dedicating this additional funding to student throughput, to more efficiently and effectively serve our growing enrollment in the engineering college. Examples of projects funded include: additional data storage for students; remodel of open computer labs with new furniture and infrastructure to support increased student counts; and purchasing technology based equipment to be used in teaching laboratories.

The attached summary page shows the allocations made to each department and project including college-wide operational expenses, computer lab upgrades, and a software portfolio.
D. Expenses requiring CAC Approval:
Attached is a summary of the pre-approved unusual expenses. This process is coordinated by Belinda Schafbuch in the Dean’s Office. In addition to the CAC annual audit process, we have reviewed e-Data and believe this complies with the CAC reporting guidelines.

The fall 2016 enrollment includes over 9,300 engineering students, the largest college on campus. We will continue to use these student technology fees to achieve the college’s highest priority of improving the quality of the student learning experience, including improving the quality and quantity of space needed to achieve this aim.

Thank you.

Copy:
S Rajala, R Cox, G Mirka, A Somani, L Genalo, J Shuck, B Schafbuch

Attached:
CAC Allocation and Expenditure Summary Report; &
CAC Requests for Advance Approval of Unusual Expenses
### CAC Allocations and Expenditure Summary

**Thru Fiscal Period Jun 2015**

**Expenditures**

- FY2015 Allocations
  - Expenditures/Transfers Out - FY2015: $9,748,446.28
  - Project Commitments yet to be realized: $1,425,564.27

**Total Available - FY2015**: $11,130,010.62

**Allocations and Carryover**

- Thru Fiscal Period Jun 2015
- FY2014 Carryover: $1,498,095.21
- Total Available - FY2015: $11,130,010.62

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<th>Account Name</th>
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<th>BENEFITS</th>
<th>TRAVEL &amp; TRANS</th>
<th>SERVICES &amp; IT</th>
<th>SUPPLIES</th>
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**Total** | 1,498,095.21 | 450.00 | 9,631,405.41 | 6,610,959.58 | 0.00 | 37,048.83 | 138,387.45 | 129,164.72 | 2,513.81 | 345,571.14 | 1,442,710.67 | 57,901.93 | 22,976.22 | 580,563.68 | 7,093,466.77 | 1,425,564.27 | 599,345.64 | 826,218.61
## CAC Requests for Advance Approval of Unusual Expenses

### Thru Fiscal Period Jun 2015

<table>
<thead>
<tr>
<th>Resource Unit</th>
<th>Dept &amp; Location</th>
<th>Description</th>
<th>Total Project Cost</th>
<th>CAC Funds Requested</th>
</tr>
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<tbody>
<tr>
<td>Engineering</td>
<td>ME; 2081 Black Engineering</td>
<td>Add nine new computer workbenches in the expanded ME 370 lab.</td>
<td>17,073.54</td>
<td>17,073.54</td>
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<tr>
<td></td>
<td>ME; 2095 Black Engineering</td>
<td>Add three new computer workbenches in the expanded ME 421 lab.</td>
<td>6,302.03</td>
<td>6,302.03</td>
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<tr>
<td>AERE; 0642 Howe Hall</td>
<td>Two networked Flight Simulators including flight control consoles, aircraft instrumentation and visual displays in support of AeroE 301 Flight Experience course.</td>
<td>32,000.00</td>
<td>32,000.00</td>
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<tr>
<td>ENTS; 2255, 2260, 2264 &amp; 2268</td>
<td>Remodel of college computer labs with new furniture and infrastructure to support increased student count.</td>
<td>205,000.00</td>
<td>205,000.00</td>
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<tr>
<td>IMSE &amp; ME; 36 Black Engineering</td>
<td>Purchase two Coordinate Measuring Machines for use in teaching laboratory. These computer controlled devices are critical to the education of 2500 undergrads in ME and IMSE.</td>
<td>110,980.00</td>
<td>110,980.00</td>
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<tr>
<td>ME; 1260 Black Engineering</td>
<td>Replace broken Milltronics VM-15 CNC mill with a new Haas MV-2 mill.</td>
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<tr>
<td>ECPE; Basement of Durham</td>
<td>A remote VDI solution is needed that has the capability of running software that requires up to 16GB of RAM per VDI session. The current VDI environment in ITS can be expanded to support this type of large scale VDI solution and handle 50-60 student sessions at the large capacity.</td>
<td>91,000.00</td>
<td>91,000.00</td>
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**Total:** $537,924.57
APPENDIX A

Request for advance approval of unusual* expenses

[*Categories of unusual expenses are listed in paragraph 2, Section III of the “Guidelines for Appropriate Expenditure of Income from the Student Technology Fee.”]

Department: Mechanical Engineering

Building/room location: Black 2081

Description:
Add nine (9) new computer workbenches in the expanded ME 370 lab.

Total Project Cost: $17,073.54

Category of unusual expense(s) within the project (see http://www.cio.iastate.edu/committees/cac/policies/expenditures_2011-2012.pdf):

Furniture

Costs associated with these unusual expenses: $17,073.54

Date(s) of proposed expense: July 2014

Justification*:
Due to the large increase in undergraduate enrollment in mechanical engineering, we need to expand the size of the Measurements and Instrumentation Lab (ME 370). We need nine (9) computer workbenches to accommodate additional students in each lab section. Each workstation will have computers with data acquisition equipment as well as electronic voltmeters, wave generators, and other electronic equipment that attach to the individual computers.

*(Please attach PIQ of employee if requesting greater than 50% of base salary support from CAC.)

Requested by: Nate Jensen

College approval: [Signature] 7/14/14
Wright Line Quote for Iowa State University- Facilities

Customer Name: Cindy Howe  
Address: 128 General Services Bldg  
Ames, IA 50014  
Customer Phone: (515) 290-2617  
Email Address: chowe@iastate.edu  
Lotus Quote No: Q36006_05266 Rev 2  
Today's Date: 7/10/2014

Ship Contact: Cindy Howe  
Ship Phone: 515 2902617  
Shipping Comments:  
Billing Comments:  
Installation Comments:  
Transportation Comments:

WL Rep Name: Julie Bell  
WL Rep Address: PO 66  
Melbourne, IA 50162  
WL Rep Phone: 641-844-3757  
WL Rep Fax: 506-365-6129  
WL Rep Email: JulieJBell@eaton.com

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<th>Unit Price</th>
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**Benches 60x30**

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**Benches without pegbd**

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Transportation: $480.00  
Inside Delivery and Debris Removal: $2,068.04  
Installation:  
Tax: Plus Applicable Ste  
Total: $17,073.54
Terms
NET 30, pending credit approval.

Disclaimers
Installation, Tax and Transportation Charges, if provided, are estimates only.

Accepted By

Prepared by Wright Line:

Date

Customer Signature

Wright Line Signature

7/10/2014

Customer Printed Name

- The foregoing constitutes a written order accepted by the customer and Wright Line for the purchase of the goods described. Terms and conditions which also apply to this purchase order appear on the Terms & Conditions of Sale form and Warranty provisions, which constitute material parts of this order.
- Proposal valid for 30 days, except during special promotions. Proposals with special promotions are valid for the term of the promotion only, but not to exceed 30 days.
- Buyer to provide color requirements on their Purchase Order. If buyer fails to identify color requirements on the Purchase Order, buyer accepts the colors identified on the sellers quote as the approved configuration, and the Sales Order acknowledgement.

Wright Line's remit-to address is: Federal Tax ID: 03-0471268
Wright Line
CIO Eaton Corp
PO Box 93531
Chicago, IL 60673-3531

Duns#: 001438084
Cage Code: 81824

Send purchase orders to:
Julie Bell
160 Gold Star Blvd
Worcester, MA 01606
APPENDIX A

Request for advance approval of unusual* expenses

[*Categories of unusual expenses are listed in paragraph 2, Section III of the “Guidelines for Appropriate Expenditure of Income from the Student Technology Fee.”]

Department:  Mechanical Engineering

Building/room location:  2095 Black Engineering

Description:
Add three (3) new computer workbenches in the expanded ME 421 lab.

Total Project Cost:  $6,302.03

Category of unusual expense(s) within the project (see http://www.cio.iastate.edu/committees/cac/policies/expenditures_2011-2012.pdf):

Furniture

Costs associated with these unusual expenses:  $6,302.03

Date(s) of proposed expense:  May 2015

Justification*:
Due to the large increase in undergraduate enrollment in mechanical engineering, we need to expand the size of the System Dynamics and Control Lab (ME 421). We need three (3) computer workbenches to accommodate additional students in each lab section. Each workstation will have computers with data acquisition equipment as well as electronic voltmeters, wave generators, and other electronic equipment that attach to the individual computers.

*(Please attach PIQ of employee if requesting greater than 50% of base salary support from CAC.)

Requested by:  Nate Jensen

College approval:  [Signature]  3/10/15
Wright Line Quote for Iowa State University- Facilities

Customer Name: Cindy Howe
Address: 128 General Services Bldg
          Ames, IA 50014
Customer Phone: (515) 290-2617
Email Address: chowe@iastate.edu
Lotus Quote No: Q34003_01659 Rev 2
Today's Date: 3/5/2015
Ship Contact: JENSEN NATE
Ship Phone: 515 2902617
Ship Address: 2081 BLACK ENGR BLDG
          Attn: JENSEN NATE
          Ames, IA 50011
Shipping Comments: All items must ship together. Inside delivery debris removal
Billing Comments: 
Installation Comments: 
Transportation Comments: 

WL Rep Name: Melinda Maxwell
WL Rep Address: 3226 Hardwood Hollow
          Medina, OH 44256
WL Rep Phone: 330-242-6393
WL Rep Fax: 508-365-8167
WL Rep Email: MelindaMaxwell@Eaton.com

Inside Delivery: Yes
Receiving Dock: No
Remove Debris: Yes
Union: No
Truck with Lift Gate: Yes

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| SubTotal | $5,312.66 |
| Transport | $233.00 |
| Installation | $756.38 |
| Tax | Plus Applicable S:
| Total | $6,302.03 |

Terms
NET 30, pending credit approval.

Disclaimers
Installation, Tax and Transportation Charges, if provided, are estimates only

Accepted By
Prepared by Wright Line:

Date
- The foregoing constitutes a written order accepted by the customer and Wright Line for the purchase of the goods described. Terms and conditions which also apply to this purchase order appear on the Terms & Conditions of Sale form and Warranty provisions, which constitute material parts of this order.
- Proposal valid for 30 days, except during special promotions. Proposals with special promotions are valid for the term of the promotion only, but not to exceed 30 days.
- Buyer to provide color requirements on their Purchase Order. If buyer fails to identify color requirements on the Purchase Order, buyer accepts the colors identified on the seller's quote as the approved configuration, and the Sales Order acknowledgement.

Wright Line's remit-to address is: Wright Line
CIO Eaton Corp
PO Box 93531
Chicago, IL 60673-3531

Federal Tax ID: 03-0471268
Duns#: 001438084
Cage Code: 81824

Send purchase orders to: Melinda Maxwell
160 Gold Star Blvd
Worcester, MA 01605
APPENDIX A

Request for advance approval of unusual expenses

Department: Department of Aerospace Engineering

Building/room location: Howe Hall, Rm 0642

Description: Two (2) networked Flight Simulators including flight control consoles, aircraft instrumentation and visual displays in support of AeroE 301 Flight Experience course.

Total Projected Cost: Approximately $32,000

Category of unusual expense(s) within the project: Consulting CAC for the purchase of major educational technology equipment (greater than $25K per system.)

Costs associated with these unusual expenses: Approximately $32,000. See quote.

Date(s) of proposed expense: Approximately February 20, 2015, delivery not later than April 1, 2015 in support of summer Spaceflight Operations course and Fall 2015 AeroE 301 class schedule

Justification*: The previously purchased flight simulators have been successful in transitioning AeroE 301 to a simulator based course instead of an actual flight. Annually there are approximately 150 students that need this mandatory class. With only four simulators the first two lessons of the course can only be taught to four students at a time. This has created a limit to the number of students trained per semester and has forced some students to push the class off until their senior year. Adding two simulators will alleviate congestion during scheduling and can open each lab period to a total of 18 students per period. This adds 50% more capacity in the lab.

AeroE 301 Course Content

Lesson 1: Introduction to Flight (2 hours)
Lesson 1 will be completed individually
Quick start introduction to taxi, takeoff, flight, approach and landing
Introduction to checklists, aircraft switchology and cockpit set-up

Lesson 2: Free Flight Experience (2 hours)
Lesson 2 will be completed individually
Practice checklist procedures
Practice ground operations, taxi, takeoff, flight, navigation and landing
Introduction to dynamic flight with different aircraft configurations

Lesson 3: Flight Test Mission Prep (1.5 hour in simulator lab briefing room)
    Lesson 3 will be completed as a team
    Final project teams (4-person) will be assigned by instructor
    Final Project Prep
        Exercise Description
        Assigning responsibilities
        Practice and Dry Run

Lesson 4: Flight Test Mission (.5 hours in sim and 1 hour in briefing room)
    Lesson 4 will be completed as a team
    Final Project – Create, Brief, Execute and Debrief a Flight Test Mission

Requested by: Robert Martin, Col (ret) US Air Force
    ISU Department of Aerospace Engineering, Flight Simulator Lab
    Program Director
    Office: (515) 294-6597
    Cell: (641) 757-1669

College approval: [Signature] 3-9-15
## Precision Flight Controls, Inc.
### 11340 White Rock Road, Suite 100
### Rancho Cordova, CA 95742

### Invoice

<table>
<thead>
<tr>
<th>Date</th>
<th>Invoice No.</th>
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</thead>
<tbody>
<tr>
<td>2/10/2015</td>
<td>215065</td>
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</tbody>
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### Bill To
Iowa State University  
Attn: Purchasing Payables  
3617 Administrative Services Bldg.  
Ames, IA 50011-3617

### Ship To
Iowa State University  
Attn: Robert Martin  
1200 Howe Hall  
Ames, IA 50011  
641-757-1669 / rsmartin@iastate.edu

<table>
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<tr>
<th>Revised</th>
<th>Crew Chief</th>
<th>P.O. Number</th>
<th>Terms</th>
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<th>Comp/Ship</th>
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### Quantity | Item Code | Description                                                                 | Price Each | Amount |
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<tr>
<td>2</td>
<td>C2-PRO-CNS1-B</td>
<td>C2 PROFESSIONAL FLIGHT CONSOLE (USB) WITH BEECH STYLE YOKE AND 3-LEVER SEL (TPM) AND 6-LEVER MEL (TPM) INTERCHANGEABLE THROTTLE QUADRANTS</td>
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<td>CRP-GA-USB</td>
<td>CIRRUS RUDDER PEDALS GENERAL AVIATION (USB)</td>
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<td>SPEAKERS-DOM</td>
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<td>XPLANE-9-RETAIL</td>
<td>X-PLANE V9 RETAIL SOFTWARE PACKAGE</td>
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<td>XPLANE-9-AC-CR</td>
<td>X-PLANE V9 CR-12 AIRCRAFT FLEET (X-PLANE PROFESSIONAL SOFTWARE SOLD SEPARATELY)</td>
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<td>8</td>
<td>LCD-24</td>
<td>24&quot; WIDESCREEN LCD DISPLAY</td>
<td>325.00</td>
<td>2,600.00</td>
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<td>2</td>
<td>MULTI-STD-4</td>
<td>MULTIPLE MONITOR STAND FOR CR-12 (FOUR SCREEN)</td>
<td>795.00</td>
<td>1,590.00</td>
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<td>4</td>
<td>PC-EXT</td>
<td>COMPUTER SYSTEM EXTREME WITH SOLID STATE DRIVE, BACK-UP DRIVE, KEYBOARD AND MOUSE (2) CR-12 MASTER (2) CR-12 VISUAL</td>
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<td>7</td>
<td>FLTSTN-2472-B</td>
<td>FLIGHTSTATION ADJUSTABLE TABLE (BLACK) 24 X 72</td>
<td>425.00</td>
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<td>2</td>
<td>LPS-STBASE</td>
<td>LEATHER PILOT'S SEAT W/ STATIC BASE (CAPTAIN'S SEAT)*</td>
<td>1,495.00</td>
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<td>PARTS</td>
<td>(4) EXTRA LONG CABLES FOR NETWORKED INSTALLATION OF TWO ADD'L SYSTEMS (FOUR COMPUTERS) ACROSS THE ROOM</td>
<td>80.00</td>
<td>80.00</td>
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</tbody>
</table>

**Thank you for choosing Precision Flight Controls. We appreciate your business!!**  
Shipment date to be determined upon receipt of payment. Restocking fee of 15% applies to all items returned for refund.

<table>
<thead>
<tr>
<th>Phone No.</th>
<th>Fax No.</th>
<th>Federal Tax ID</th>
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<tbody>
<tr>
<td>(916) 414-1310</td>
<td>(916) 414-1326</td>
<td>68-0359546</td>
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</table>

### Sales Tax (0.0%)  
### Total  
### Payments/Credits  
### Balance Due
Precision Flight Controls, Inc.
11340 White Rock Road, Suite 100
Rancho Cordova, CA 95742

Invoice

Date | Invoice No.
---|---
2/10/2015 | 215065

Ship To
Iowa State University
Attn: Robert Martin
1200 Howe Hall
Ames, IA 50011
641-757-1669 / rsmartin@iastate.edu

<table>
<thead>
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<td>3/13/2015</td>
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<td>COMMENT</td>
<td>COMMENTS: PLEASE INSTALL X-PLANE (RETAIL WITH PFC AIRCRAFT FLEET) ONTO EACH SET OF PCS (CR-12 CONFIGURATION)</td>
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<tr>
<td></td>
<td>COMMENT</td>
<td>COMMENTS: PLEASE ADD THESE TWO SYSTEMS TO EXISTING ONE INSTRUCTOR/FOUR SYSTEMS NETWORK</td>
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<td></td>
<td>FREIGHT</td>
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<td>950.00</td>
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<td>1</td>
<td>INSTALL-DOM</td>
<td>ON-SITE (DOMESTIC) INSTALLATION AND TRAINING: $1,200 PER DAY</td>
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<td>2</td>
<td>TRAVEL</td>
<td>TRAVEL DAY: $400 PER DAY</td>
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<td>TRAVEL EXP</td>
<td>TRAVEL EXPENDITURES</td>
<td>1,700.00</td>
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THANK YOU FOR CHOOSING PRECISION FLIGHT CONTROLS. WE APPRECIATE YOUR BUSINESS!!
Shipment date to be determined upon receipt of payment. Restocking fee of 15% applies to all items returned for refund.

<table>
<thead>
<tr>
<th>Phone No.</th>
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</tr>
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<tbody>
<tr>
<td>(916) 414-1310</td>
<td>(916) 414-1326</td>
<td>68-0359546</td>
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</table>

Sales Tax (0.0%) | $0.00
Total | $31,878.00
Payments/Credits | $0.00
Balance Due | $31,878.00

Page 2
APPENDIX A

Request for advance approval of unusual* expenses

[*Categories of unusual expenses are listed in paragraph 2, Section III of the "Guidelines for Appropriate Expenditure of Income from the Student Technology Fee."]

Department: Engineering Technology Services

Building/room location: Hoover, Rooms 2255, 2260, 2264, & 2268

Description: Remodel of college computer labs with new furniture and infrastructure to support increased student count.

Total Project Cost: $178,000 - $205,000

Category of unusual expense(s) within the project (see http://www.cio.iastate.edu/committees/cac/policies/expenditures_2011-2012.pdf):

Furniture and renovation

Costs associated with these unusual expenses: $178,000 - $205,000

Date(s) of proposed expense: Spring 2015

Justification*: College computer labs have not been modified since the building’s opening nearly 10 years ago. This remodel would expand available computers, update electric and network infrastructure to handle the load, and create a more engaging environment for students to work.

These labs are used by all engineering students for their coursework, available 107 hours per week. We frequently see students waiting to use computers in these labs. This update will add additional seats, addressing throughput, to more efficiently and effectively serve our growing enrollment in the college of engineering.

*(Please attach PIQ of employee if requesting greater than 50% of base salary support from CAC.)

Requested by: [Signature]

College approval: [Signature] 3-30-15
Cost Range Estimate

PREPARED BY: DESIGN SERVICES, FACILITIES PLANNING AND MANAGEMENT, IOWA STATE UNIVERSITY

Project Number: PR018694  Date of Estimate: 03/25/15
Building: Hoover Hall - Furniture in 2260 and Remodeling all rooms.
Project description: Room 2255, 2260, 2264 & 2268 remodeling
Project square footage: 4210

Project Scope Description

This project will remodel the existing computer lab 2260 and three classrooms 2255, 2264 & 2268.
Scope of work: Rooms 2255, 2264 and 2268 - Add new chairs. Paint walls. Install new carpet and wall base.
Install new light fixture above white boards. Add Data points in ceiling. Room 2260 - Install new desks, chairs,
monitor arms and CPU slings. Paint walls. Install new carpet and wall base.

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<tr>
<th>Construction</th>
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<tbody>
<tr>
<td>Carpet &amp; Base</td>
<td>$22,000</td>
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<tr>
<td>Paint walls</td>
<td>$4,500</td>
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<tr>
<td>Electrical Lights Data</td>
<td>$15,000</td>
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<table>
<thead>
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<th>Furniture</th>
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<tr>
<td>New tables and chairs</td>
<td>$100,500</td>
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<td>Coordination Storage 2%</td>
<td>$2,010</td>
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<tr>
<td>8% Design Services</td>
<td>$11,400</td>
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<tr>
<td>5% Project and Construction Management</td>
<td>$7,800</td>
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<tr>
<th>Project Contingency</th>
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<tr>
<td>10% of project estimate</td>
<td>$14,200</td>
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PROJECT COST RANGE: $178,000 to $205,000
Cost per Square foot: $42.28 to $48.69

This is only an opinion of probable cost. Please let us know if you need a more detailed estimate. A schematic design with scope of work will be prepared on an hourly basis and charged to the departmental account submitted with your request.

Assumptions:
Please note that there are many circumstances within an existing facility that can significantly impact this cost range estimate. It is important to understand that this estimate was made on our knowledge of the facility and without extensive or exhaustive review to either the site or related documents to determine the condition or capacity to existing conditions of systems. The cost range assumes the following:

* The mechanical and electrical systems that currently serve the area have sufficient capacity to serve the remodeled space.
* There may be undiscovered hazardous materials present that will require abatement or special treatment.
* There are no concealed conditions that would require unusual or extensive measures to correct or modify to accommodate the work requested.
* The level and quality of finishes in the remodeled area will be similar to adjacent areas and other spaces in the building.
APPENDIX A

Request for advance approval of unusual* expenses

[*Categories of unusual expenses are listed in paragraph 2, Section III of the “Guidelines for Appropriate Expenditure of Income from the Student Technology Fee.”]

Department: IMSE And Mechanical Engineering
Building/room location: Rm 36 Black Engineering
Description: Purchase 2 Coordinate Measuring Machines for use in teaching laboratory. These computer controlled devices are critical to the education of 2500 undergrads in ME and IMSE.

Total Project Cost: 70,980 from CAC with IMSE and M.E. contributing 20K a piece to bring the total to 110,980.

Category of unusual expense(s) within the project (see http://www.cio.iastate.edu/committees/cac/policies/expenditures_2011-2012.pdf):

This would be a hardware and software purchase. The CMM machines are controlled by software provided at additional costs from the supplier.

Costs associated with these unusual expenses:

Date(s) of proposed expense: Immediately

Justification*: The current CMM machines are outdated and no longer supported by the company that manufactured them. These machines are critical to instruction and are technology driven in application.

Requested by: _Nate Jensen, Mechanical Engineering

Requested by: _Jeff Eichorn for IMSE

College approval: _[Signature]_ 6/1/15
PROPOSAL FOR
Iowa State University
4.5.4 SF

HEXAGON
METROLOGY
27-May-2014

Wyman Martinek
Iowa State University
1043 Black Engineering Bldg
Ames IA, 50011

PROPOSAL NO.050614_2

Dear Wyman:

Thank you for the opportunity to propose the 454SF to you. We are confident it will meet your application requirements and provide years of reliable service.

Our commitment to producing accurate and reliable CMMs is recognized around the world. Our installed base encompasses millions of tools and machines, and tens of thousands of seats of software. Hexagon Metrology offers products and services for metrology applications in over 200 industry segments. We support our customers with actionable measurement information throughout the complete life cycle of their products – from development and design to production, assembly and final inspection. We empower our customers with control of their manufacturing processes, enhance the quality of their products and increase efficiencies in their manufacturing plants anywhere in the world.

We hope the following proposal will prove favorable to you. It will remain valid for 60 days. Hexagon Metrology, Inc. standard terms and conditions will apply.

We offer comprehensive support to our customers. Please visit the following sites for more information:

Online Support
HexagonMetrologyU
Online Store

For any additional question you might have, please do not hesitate to contact me or our office anytime. We look forward to being your partner in all your measurement needs.

Sincerely,

Troy Anderson
Productivity Quality, Inc.
763-249-8137
troy.anderson@pqi.net
I. SYSTEM SUMMARY

MACHINE
The 4.5.4 SF CMM offers a robust dimensional inspection capability in a fully automated and economical CMM designed and built to excel in harsh manufacturing environments, shoulder-to-shoulder with machine tools. Linear bearings and heavy-duty components provide you with a highly reliable, low maintenance measurement solution.

- 4.5.4 SF Metrology Frame
- UMP-360 Controller
- Next Jog Box
- TESASTAR Touch Trigger Manual Swivel Integral Probe Head and Probe
- TESASTAR Stylus Kit #103
- LED Workspace Illumination
- Probe Qualification Sphere and Clamp Kit
- Demonstration Block

COMPUTER & SOFTWARE SYSTEM
The computer and software offering have been optimized for walk up and multi-task interface operation. Computer and software upgrades are available for part programming environments.

- Dell OptiPlex 7010 DT or current model
- 15" LCD Touch Screen
- PC-DMIS PRO

SERVICE & SUPPORT

- Installation¹
- Onsite Performance Verification²
- Online Help Files, PC-DMIS
- System User’s Manual on CD
- PC-DMIS PRO Training (one student for four days at Hexagon Metrology)³
- One Year System Warranty with Telephone Applications Support⁴

¹ Customer should uncrate and move the CMM to the intended installation location at least 24 hours prior to arrival of the Hexagon Metrology service technician in order for the machine to reach ambient temperature. If the customer requires, Hexagon Metrology can provide this service for an additional fee (see quotation for details).

² Upon completion of the measuring system installation, a technician will verify performance to either ISO or ASME B89 standards.

³ Software training credits are valid for one year from the date of shipment and do not include travel and living expenses of attendees.

⁴ Successful completion of the basic PC-DMIS software training is prerequisite for telephone applications support.
II. TERMS OF QUOTATION

IOWA STATE SYSTEM SUMMARY

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<td>BASIC SYSTEM PRICE</td>
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<td>Upgrade from PC-DMIS PRO to PC-DMIS CAD++ and Autopath</td>
<td>$13,000.00</td>
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<tr>
<td>25 licenses of PCDMIS CAD++ Offline ($12,900.00 ea)</td>
<td>$322,500.00</td>
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<tr>
<td>PC-DMIS Online Programming Station Option 2:</td>
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<td>Sell Price</td>
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ADDITIONAL TRAINING CREDITS

*PC-DMIS CAD Level 1 DCC Software Training (5 Days) $1,800.00

Purchase Orders made to: Hexagon Metrology, Inc.
250 Circuit Drive
North Kingstown, RI 02852

Terms & Conditions:
Hexagon Metrology, Inc. Standard Terms & Conditions Apply; any sale is expressly conditioned on acceptance of such terms. The Standard Terms & Conditions and Third Party Software Terms & Conditions, are viewable at:
www.hexagonmetrology.us/terms

CAGE CODE: 1WUK4

Submit PO To: Hexagon Metrology, Inc.
Email: cos_hmi.us@HexagonMetrology.com
FAX: (401) 886-2768

Tax Exemption: If applicable, a Tax Exemption Certificate must be submitted to Hexagon Metrology, Inc. with the Purchase Order

Delivery: 4 to 6 weeks for standard configurations, plus time for shipping, A.R.O., to be confirmed at the time of order placement

Shipping Terms: Prices quoted are F.C.A. ("free carrier at") North Kingstown, RI in accordance with the International Chamber of Commerce INCOTERMS 2010.

Title Transfer: Title transfers to Buyer upon shipment from factory of origin including all risks and rewards of ownership

Quotation Validity: 60 Days

Remit Payment Only To: Hexagon Metrology, Inc.
Lockbox No. 771742
1742 Solutions Center
Chicago, IL 60677-1007
III. CUSTOMER QUOTATION DETAILS

INCLUDED IN PACKAGE

4.5.4 SF
The 4.5.4 SF is like a machine tool for quality control—no other CMM performs like it in tough shop-floor conditions. The SF series draws its design inspiration from over fifteen years of shop floor machine production experience and thousands of units in the field worldwide. It is designed from the ground up to surpass the demanding requirements of shop floor users. This rugged CMM excels in the harsh environment of machine shops and manufacturing cells with advanced thermal compensation, covered ways, built-in vibration resistance and shop-hardened design. It's flexible — using standard 110/220 volt outlets with no need for shop air. The compact footprint and roll-around stand, specifically designed to fit through a standard door, lets users easily move the SF series anywhere in the shop where precise dimensional inspection is required. It's economical to own and operate, with low up-front cost and simple maintenance. Using the touch screen interface and PC-DMIS STI+, operators can run inspection programs on the shop floor with little training. Gaining immediate insight into quality control helps you react quickly to process variations, reducing scrap and increasing productivity.

UMP-360 Control System
Controller electronics supports touch-trigger capability and temperature compensation models on Global Classic systems. The UMP-360 is also compatible with the jog box which comes standard with all Global CMMs. The UMP-360 comes in a compact IP-32 rated electrical cabinet that is mounted to the back of the machine.

Next JogBox (NJB)
Our new jogbox with ergonomic design and improved durability. NJB system comes packaged with a cradle and cradle holder to allow for a safe placement when not in use.

TESASTAR
The TESASTAR is a manual swiveling unit with the probe and head integrated into one compact unit. The TESASTAR has an M3 thread stylus interface and articulated probe head which can be manually rotated to an infinite number of non-repeatable angular positions. The built-in compact touch-trigger probe features a user adjustable trigger force.

TESASTAR Stylus Kit #103
M3 threaded stylus kit includes:

(Qty. 1) Mounted probe ø 6.35 mm
(Qty. 1) Ball stylus ø 2 mm x L 21 mm, Steel
(Qty. 1) Ball stylus ø 3 mm x L 21 mm, Steel
(Qty. 1) Ball stylus ø 4 mm x L 21 mm, Steel
(Qty. 1) Extension L 10 mm, Steel
(Qty. 1) Extension L 20 mm, Steel
(Qty. 1) 5-way stylus center, Steel
INCLUDED IN PACKAGE

PC-DMIS PRO Software
This software option provides a user friendly interface, reporting tools, and includes the full library of GD&T functions for the comprehensive inspection of manufactured parts. Calibration of probe tools is made easy through a graphical utility that enables the user to build assemblies exactly as they appear and calibrate them automatically. Part alignments are also made easy through step-by-step routines that guide the user with graphics illustrating when a part becomes fully constrained. Its unique and intuitive graphical user interface makes it suitable for operators of all skill levels. PC-DMIS PRO includes a four day training course at a Hexagon Metrology Precision Center for one person.

Measurement Volume Lighting - LED Lighting
Sometimes measuring tasks require a brightly illuminated work area. Rather than improvise fixed or handheld solutions, this feature provides an engineered solution to illuminate the 4.5.4 SF measuring volume with bright LED lights that turn on automatically when the CMM is powered on.

Standard Steel Qualification Sphere

Table Clamp Kit
This convenient kit consists of the following items:
(Qty. 24) M8 studs
(Qty. 8) Flanged nuts
(Qty. 8) Coupling nuts
(Qty. 6) Step blocks
(Qty. 6) Serrated end clamps
(Qty. 1) Kit holder

Computer
Dell Optiplex 7010 Desktop or current model
PROCESSOR: INTEL CORE i5 3225 Processor (Dual Core 3.3GHz, 3MB)
RAM: 4GB, Non-ECC, 1600MHz DDR3
HD: 500GB 2.5, SATA 3.0Gb/s and 16MB Data Burst Cache
DVD: 16X DVD+/-RW SATA, Data Only
GRAPHICS: Intel Integrated Graphics
MOUSE: Dell MS111 USB Optical Mouse
OS: Windows 7 Professional (64Bit OS)
LAN: 1 Onboard Ethernet Adapter
PORTS: 1 Serial Ports

Monitor
15" LCD Touchscreen (1024x768) or current model
COMPUTER UPGRADES INCLUDED IN PACKAGE

Upgrade Option 2:

PC-DMIS Online Programming Station Option 2: $1,290
Replaces the touch screen monitor and small form factor computer with a workstation desk, computer upgrade, and large screen LCD monitor. This option is ideal for customers where shop floor space is not too limited and the 4.5.4 SF will be used for online part program development.

Computer
Dell Precision T3600 or current model
PROCESSOR: Four CORE XEON E5-1607, 3.0GHz
RAM: 8GB DDR3 UDIMM 1600,NECC,4x2GB
HD: 500GB,SATA,3.5",7200,NCQ,16M
DVD: 16X DVD+/-RW and 8X DVD, Data Only
GRAPHICS: 1GB nVIDIA Quadro 600, Dual Monitor, 1DP and 1DVI
MOUSE: Dell MS111 USB Optical Mouse
OS: Windows 7 Professional, 64-bit
LAN: 2 Gigabit Ethernet Ports
PORTS: 1 Serial Port

Monitor
Dell 21.5" P2214H Monitor (1920 x 1080) or current model

Computer Workstation Table
The computer workstation is a high quality ergonomic and movable operator workstation desk designed specifically for accommodating the computer and probe electronics equipment. Table dimensions are approximately 1200 mm (47.2") long by 680 mm (26.8") wide by 849 mm (33.5") high.

The PC-DMIS Online Programming Station Upgrade is required for PC-DMIS CAD and CAD++.

Upgrade from PC-DMIS PRO to PC-DMIS CAD and Autopath $8,000
PC-DMIS CAD lets customers create inspection programs and evaluate measurement results taking full advantage of their CAD models. The software provides the tools needed to work with CAD files ranging from simple 2D drawings through complex 3D solid models. Includes the PC-DMIS Autopath module – exciting new measurement software technology that automatically optimizes feature measurement and probe path creation. Includes PC-DMIS CAD training which is a five day class for one operator at a Hexagon Metrology Training Facility (travel expenses excluded).
## SOFTWARE UPGRADES AND OPTIONS INCLUDED IN PACKAGE

<table>
<thead>
<tr>
<th>Upgrade</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upgrade from PC-DMIS PRO to PC-DMIS CAD++ and Autopath</td>
<td>$13,000</td>
</tr>
<tr>
<td>PC-DMIS CAD++ includes all of the features included in PC-DMIS CAD plus full scanning support and sheet metal functions. Includes the PC-DMIS Autopath module — exciting new measurement software technology that automatically optimizes feature measurement and probe path creation. Includes PC-DMIS CAD++ training which is a nine day class for one operator at a Hexagon Metrology Training Facility (travel expenses excluded).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Option</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC-DMIS Offline Software License</td>
<td></td>
</tr>
<tr>
<td>Use an offline software license to create part programs while the CMM is being used to measure parts. This special price is valid with the sale of a new CMM and includes the Autopath Bundle.</td>
<td>$12,900</td>
</tr>
<tr>
<td>CAD++ Offline</td>
<td></td>
</tr>
</tbody>
</table>
IV. SPECIFICATIONS

WEIGHTS AND DIMENSIONS

<table>
<thead>
<tr>
<th>Overall Dimensions with Touchscreen</th>
<th>Overall Dimensions without Touchscreen</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>1105 mm</td>
<td>1556 mm</td>
</tr>
<tr>
<td>43.5 in</td>
<td>61.2 in</td>
</tr>
<tr>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>833 mm</td>
<td>1325 mm</td>
</tr>
<tr>
<td>32.8 in</td>
<td>52.2 in</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work Capacity</th>
<th>Measuring Envelope</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (upper)</td>
<td>X</td>
</tr>
<tr>
<td>529 mm</td>
<td>355 mm</td>
</tr>
<tr>
<td>20.8 in</td>
<td>14 in</td>
</tr>
<tr>
<td>X (lower)</td>
<td>Y</td>
</tr>
<tr>
<td>608 mm</td>
<td>514 mm</td>
</tr>
<tr>
<td>24 in</td>
<td>20.2 in</td>
</tr>
<tr>
<td>Y</td>
<td>Z</td>
</tr>
<tr>
<td>1100 mm</td>
<td>353 mm</td>
</tr>
<tr>
<td>43.3 in</td>
<td>13.9 in</td>
</tr>
<tr>
<td>Z</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Configuration</td>
<td>Maximum Part</td>
</tr>
<tr>
<td>628 kg</td>
<td>160 kg</td>
</tr>
<tr>
<td>1366 lbs</td>
<td>350 lbs</td>
</tr>
</tbody>
</table>

PERFORMANCE SPECIFICATIONS

According to ISO 10360-2:2001:

\[ MPE_x = 3.1 + 0.05 \times \Delta T + (3.0 + 0.2 \times \Delta T) \times L / 1000 \]

MPE_y = 3.2

According to ASME B89.4.1b-2001:

R: 2.0
A_{L} = 6.4 + 0.3 \times \Delta T [300]

where,

- \Delta T is the departure of ambient room temperature from 20°C (68°F) in °C;
- MPE_x is size measurement error in µm, where L is variable length in mm;
- MPE_y is probing error in µm;
- R is repeatability in µm;
- A_{L} is volumetric accuracy in µm, where L is ball bar length in mm.

Accuracy performance specifications valid under the following thermal conditions:

- Ambient Temperature: 15-40°C (59-104°F);
- Maximum temporal variation: 2°C/h (3.6°F/h) and 10°C/d (18°F/d);
- Maximum spatial variation: 1°C/m (1.8°F/m) horizontal and vertical.

Probing configurations used for performance tests:

- TESASTAR, TESASTAR-i: 3 mm tip, 21 mm stylus length;
- TESASTAR-p: 4 mm tip diameter, 10 mm stylus length;
- TESASTAR-mp, TP20: standard force module, 4 mm tip diameter, 10 mm stylus length.

Installation site vibration must be less than 2µm maximum horizontal and vertical amplitude over 5-50Hz to ensure stated performance levels.

<table>
<thead>
<tr>
<th>Dynamic Specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum 3D Velocity</td>
<td>433 mm/s</td>
</tr>
<tr>
<td>Maximum 3D Acceleration</td>
<td>1732 mm/s²</td>
</tr>
</tbody>
</table>
V. INSTALLATION RESPONSIBILITIES

Unless explicitly stated otherwise, this summary identifies the key milestones in the 4.5.4 SF installation process and identifies the appropriate responsible party. It is provided here in order to explain in more detail the scope of this proposal in order to avoid any possible misunderstandings and to facilitate a smooth and timely installation process.

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>RESPONSIBILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transportation</strong></td>
<td></td>
</tr>
<tr>
<td>From Hexagon Metrology factory to the customer facility</td>
<td>Customer</td>
</tr>
</tbody>
</table>

**Handling at Destination**

<table>
<thead>
<tr>
<th>Description</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigging, forklift/crane and labor</td>
<td>Customer</td>
</tr>
<tr>
<td>Place machine in permanent location</td>
<td>Customer</td>
</tr>
<tr>
<td>Uncrate machine, prepare components for installation</td>
<td>Customer</td>
</tr>
</tbody>
</table>

**Utilities/Environmental/Site Requirements**

<table>
<thead>
<tr>
<th>Description</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conformance to environmental specifications</td>
<td>Customer</td>
</tr>
<tr>
<td>Compressed air supply per machine requirements</td>
<td>Customer</td>
</tr>
<tr>
<td>Electrical provision per machine requirements</td>
<td>Customer</td>
</tr>
<tr>
<td>Vibration evaluation of installation site</td>
<td>Customer</td>
</tr>
<tr>
<td>Completion and return of Site Preparation Checklist</td>
<td>Customer</td>
</tr>
</tbody>
</table>

**Installation**

<table>
<thead>
<tr>
<th>Description</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigging, forklift/crane and labor</td>
<td>Customer</td>
</tr>
<tr>
<td>Machine installation and startup</td>
<td>Hexagon Metrology</td>
</tr>
<tr>
<td>Calibration and verification</td>
<td>Hexagon Metrology</td>
</tr>
</tbody>
</table>

---

5 Customer should uncrate and move the CMM to the intended installation location at least 24 hours prior to arrival of the Hexagon Metrology service technician in order for the machine to reach ambient temperature. If the customer requires, Hexagon Metrology can provide this service for an additional fee (see quotation for details).

6 By completing the Site Preparation Checklist the customer is verifying that the site has been prepared per the Site Preparation Manual and ready for installation of the CMM. I understand that I will be billed for wait time associated with an unprepared site once the Technician has arrived.

7 A Hexagon Metrology service person will perform a certification either to ISO10360-2:2001 or ANSI B89.4.1 whichever is specified by the customer. If not specified, then ANSI B89 will be performed. If B89.4.1 certification is required, then the following procedure will be performed at the customer’s site.

- Perform a repeatability test in accordance to ANSI B89.4.1 1997 paragraph 5.3.
- Perform a volumetric test using a Ball bar in accordance to ANSI B89. 1997 paragraph 5.5.2

Linear Displacement verification can be purchased as an option. If ISO 10360-2:2001 certification is required, then the following procedure will be performed at the customer’s site.

- Perform $\text{MPE}_x$ Volumetric uncertainty according to ISO-10360-2:2001 section 5.
- Perform $\text{MPE}_p$ Probing uncertainty according to ISO-10360-2:2001 section 5.
APPENDIX A

Request for advance approval of unusual expenses

[*Categories of unusual expenses are listed in paragraph 2, Section III of the "Guidelines for Appropriate Expenditure of Income from the Student Technology Fee."*

Category of unusual expense (from guidelines): This would be a hardware purchase. The CNC mill is controlled by computers running software such as Mastercam and Camworks.

Projected Cost: $75,569.

Description: Replace broken Milltronics VM-15 CNC mill with a new Haas MV-2 mill, located in room 1260 Black Engineering.

Date(s) of proposed expense: May 2015

Justification*: The current Milltronics VM-15 mill located in the Boyd Fabrication Lab is broken and needs to be replaced. Boyd Fabrication Lab supports courses ME270, ME324, ME415, ME466 and many ME490 and ME590 projects. Boyd Fabrication Lab is also used by many student organizations for building specific elements for competition such as Team prISUm, Lunabotics, ISU Robotics, SAE Formula, SAE Baja, and FIRST Robotics. Approximately 1500 students per year are impacted by this piece of equipment. This mill is critical to instruction and is technology driven in application.

The requested Hass mill will be consistent with the Haas mini mills that were installed in the ME and IMSE manufacturing labs in the summer of 2013.

*(Please attach PIQ of employee if requesting greater than 50% of base salary support from CAC.)*

Requested by: Nate Jensen

College approval: [Signature] 4/16/15
April 15, 2015 Iowa  
State University  
Ames, IA 50011  

Haas VM-2 Vertical Machining Center  
$73,300  

Includes: Standard features and installation, lifetime training/support, programming, operation.  

Standard Features  
Vertical Mold Making Machine; 30" X 20" X 20", 40 taper, 30 hp vector drive, 12,000 rpm, inline direct-drive, 24+1 side-mount tool changer, 710 ipm rapid, automatic chip auger, remote jog handle, automatic air gun, high-speed machining, Ethernet interface, macros, coordinate rotation & scaling, programmable coolant nozzle, power failure detection module, 750 MB program memory, 16" color LCD monitor, USB port, memory lock keyswitch, rigid tapping and 55-gallon flood coolant system.  

Optional Accessories and Equipment  
- Haas CNC Control  
  $10,800  
- 4th Axis Drive and Wiring (4AXD)  
  $1,995  
- Wireless Intuitive Probing System (WIPS-R)  
  $5,495  
- Intuitive Programming System (IPS)  
  $1,995  
- High-Intensity Lighting (HIL)  
  $695  
- HRT-210 Rotary Table-2" Center Hole (HRT-210)  
  $9,495  
- Manual Tailstock for HRT-210 (HTS6)  
  $1,195  
- 4-Jaw Independent Chuck for HRT-210 (7-851-0816)  
  $1,095  

Investment  
$106,065  
Less School Discount (Inc: Control Simulator & 2 yr. Warranty)  
($15,909)  
Less Milltronics VM-15 Trade-In  
($16,000)  
Freight  
$1,413  

Total Haas VM-2 (30"x 20"x 20" X,Y,Z Travels) Investment  
$75,569  
Total Haas VM-3 (40"x 26"x 25" X,Y,Z Travels) Investment  
$89,769  

Warranty: Two Year Machine and Control  
Terms: 10% down payment with purchase, 80% Exit Factory, Net 30 Days  
Delivery: 3-4 Weeks From Receipt of PO and Down Payment; F.O.B. Oxnard, CA  
Note: Prices good 30 days Rigging not included
APPENDIX A

Request for advance approval of unusual expenses

[*Categories of unusual expenses are listed in paragraph 2, Section III of the “Guidelines for Appropriate Expenditure of Income from the Student Technology Fee.”]

Department: ECpE

Building/room location: Equipment will be in the basement of Durham

Description:
A remote VDI (virtual desktop infrastructure) solution is needed that has the capability of running software that requires up to 16GB of RAM per VDI session. The current VDI environment in ITS can be expanded to support this type of large scale VDI solution and handle 50-60 student sessions at this large capacity.

Total Projected Cost: $91,000

Category of unusual expense(s) within the project (see http://www.cio.iastate.edu/committees/cac/policies/expenditures_2011-2012.pdf):

Hardware

Costs associated with these unusual expenses: $91,000

Date(s) of proposed expense: June 2015

Justification*:

The current solution for classes that require the ability to remote into Windows computers that have up to 16GB of RAM available is to setup workstations for each class. The trouble with this setup is that a student must log into several computers in order to find one that is available. Since we usually don’t have computers to dedicate to only one class then this creates the need for scheduling time, or the students may have to wait for hours for a remote computer to be available.

Since VDI creates new sessions for each user, the students will no longer have to wait for a computer to be available. The COE and ECpE are already using VDI sessions for students to use teaching lab software remotely. However, these VDI sessions are limited in the amount of memory and cpu they allow each session. ECpE and COE IT would like to work together with ITS to expand their current VDI infrastructure to be able to accommodate VDI sessions with high cpu and memory needs. Once in place, this type of centralized service would be of great benefit, not only to the ECpE Department, but to any other professor in the College that may need this kind of remote solution for their courses.
*(Please attach PIQ of employee if requesting greater than 50% of base salary support from CAC.)*

Requested by: __Jason Boyd__________________________

College approval: ________________________________