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An Industrial Engineering Perspective
From the ISEEM Chair – Jim “Scoop” Swain
A Passion for the Profession: What is our Profession?

Who are we, and what is it that industrial engineers do? This is a frequently occurring question, and one that does not admit an easy answer. Early pioneers such as Frederick W. Taylor and Frank and Lillian Gilbreth are not well known by the public; our work is more about relations between people, processes, and systems than about some instantly recognizable device or product. Some of the traditional symbols associated with the field, such as the stopwatch, are out of date and don’t foster a positive image of our field.

We lack the iconic figure or the easy image that many other fields enjoy. Physics is surely over endowed with such figures as Newton, Einstein, Feynman, and Hawking, and everyone knows that physics is associated with atomic particles such as the neutrino and results such as nuclear fission. Likewise, whether we would count Archimedes or DaVinci as famous examples of civil engineers, we are surely surrounded by their works, infrastructure so ubiquitous that we hardly notice the individual elements such as bridges and dams until they surprise us by inadvertently failing. The connection between the circuits course that all engineers take and the iPod is not especially clear, though everyone knows that it is a product of electrical engineering. Yet who or what can we point to that says industrial engineering to the world?

Classical industrial engineering arose in the early twentieth century out of the needs of a newly mechanized industrial setting, where men and machines interacted to manufacture a product. While the individual machine might be designed and built by mechanical engineers according to the principles of stress and strain, the overall concern operated in the realm of profit and cost. Early questions of management in this novel setting included technical aspects, such as the maintenance of the drive belts used to power the individual machines: essentially a problem of engineering economy, in which an optimal cost policy for replacing the belts was formulated. Other management activities were more traditional activities such as planning and scheduling, and issues about pay and production incentives.

In this realm, efficiency was defined in terms of money or throughput, not thermodynamics. Frederick W. Taylor is best known for time studies and scientific management, which have evolved into entirely new areas such as human factors and industrial psychology. Taylor’s shovel experiments suggested the need for tools that were appropriate for the job at hand; he also advocated planning for rest periods when work was demanding. Motion studies, developed by Frank and Lillian Gilbreth, further emphasized designing the work and workplace to reduce the number of steps needed to perform an activity, to reduce fatigue, and to prevent injuries. It was Frank Gilbreth who suggested that nurses provide surgeons with their tools, as needed, as a caddy assists a golfer. These activities are still necessary and important. Today those same ideals are being promoted in lean manufacturing activities such as 5S and poke yoke.
Industrial engineering departments have traditionally emphasized the need for statistical tools to describe and model the uncertainty in the workplace. Variation is encountered in work design, quality, reliability, transportation, inventory, scheduling, and in the human factors of products themselves. The workplace must be designed to accommodate variety in the work force such as size, strength, or reach, while the manufacturing process must be able to monitor and control variations in the components so that the final product will function as designed, consistently and robustly. The quality control tools of Shewhart and the philosophy of Deming involve statistical methods and management principles. Many of these items and process improvement methods such as design of experiments have been incorporated in modern Six Sigma techniques.

To cope with the implications of statistical variation, industrial engineers have employed a variety of analytical and modeling tools including operations research models of queues and simulation that are applied to plant layout, scheduling of manufacturing operations, and supply chains. Where possible, optimization is used to design systems to reduce or eliminate the effects of variation on the finished product.

In the last three decades, the Toyota Production System has provided a fresh view of traditional industrial engineering thinking. As such, it provides a foundation for unifying the many apparently disparate techniques and to establish the critical element in the analysis. The Toyota Production System is, according to its developer Taiichi Ohno, Toyota Style Industrial Engineering. The focus in the Toyota Production Systems is on customer value and the elimination of anything ("waste") which does not provide value, through strategies such as reducing setup, mistake proofing of processes, continuous improvement, and one piece flow. Because of the complex nature of most organizations, these improvements can only be achieved with the combined efforts of teams that involve everyone within the process, assisted by specialists such as industrial engineers but no longer dictated by them. It is also noted that individual processes do not occur in isolation from other portions of the system, and that corporations likewise are only a portion of the larger process of converting raw materials to products. As many firms are linked by logistical supply chains, problem solving frequently requires systems thinking to insure that the overall system is improving and not simply isolated components.

Using these major elements, the ISEEM department has identified the key elements in our vision of industrial engineering. The key elements are systems thinking and respect for people with an overriding focus on customer value. In addition, key skills for success in making this vision take place are waste minimization, variability reduction, and system optimization. Recent changes in the undergraduate program to introduce these concepts throughout the curriculum are under way, and the faculty is continuing to study the curriculum to more fully reflect this unifying paradigm.
The following students have passed their Ph.D. qualifying exams:

- **Gregg Hanold** of Charleston, SC.
- **Richard Russell** of Madison, AL.
- **Herbert Tuttle** of Overland Park, KS.

The following student has passed the Ph.D. written and oral comprehensive exams:

- **Mark Antonison** of Huntsville, AL.

The following students have met the requirements for the M.S.E.:

- **Hansel Gill** of Huntsville, AL. Capstone title: “A Correlation Between the Team Success Questionnaire and the Larson and LaFasto Team Evaluation Survey.”
- **Sandeep Jeereddy** of Huntsville, AL. Capstone title: “Relevant Factors for Disaggregating National Freight Flow Data at the County Level.”
- **David McCarty** of Madison, AL. Capstone title: “Evaluation of Integrated Product Team Development Using the Tuckman Four-Stage Group Development Model.”
- **Kristin Walker** of Harvest, AL. Capstone title: “MBNQA vs. ISO Standards.”

The following students have met the requirements for the M.S.O.R.:

- **Melanie Selman** of Harvest, AL. Capstone title: “Measuring Progress and Performance from EWIRDB to NGES.”

Congratulations

www.engdl.uah.edu
EM 667 Labor Relations for Engineers to be offered Summer 08

The EM labor relations course will be offered this summer for the first time in several years. The course will examine labor relations and collective bargaining with emphasis on the negotiation and administration of labor agreements. Included will be a survey of the historical, legal, and structural environments that influence the collective bargaining process. The final examination, required of all students, will consist of a 1/2-day collective bargaining simulation held in Huntsville on a Saturday morning. It will feature student labor and management negotiating teams meeting to hammer out labor agreements.

EM/ISE 767 – Contemporary Applications in EM/ISE Beginning in Fall 08

Now Open to Advanced Master’s Students.

Heretofore open only to doctoral students, is being opened to second-year master’s students beginning in the fall 08 semester. In this course, doctoral and advanced master’s students will be given the opportunity to apply the key qualitative and quantitative principles of technical management learned in earlier engineering management and ISE course work to realistic case problems. Students work as teams to solve multidimensional management/organizational problems that require a cross-functional point of view to reach a totally satisfactory conclusion or solution. While each case may focus on some specific problem/situation that existed in the organization studied, students are challenged to look beyond the obvious immediate problem to seek out subtle or latent problems that must be considered in the modern manager’s complex world. In-class time will be spent presenting and discussing alternative solutions. The idea is to distinguish between workable and unworkable solutions, and attempt to identify, where possible, a consensus solution. In approaching each case problem, students will be encouraged to take a freewheeling, broad-based, no-holds-barred approach that emphasizes resourcefulness, creativity, and thoroughness. Considerable emphasis will also be placed upon development of each student’s presentation skills.

Special Topics Courses, Summer 2008

Instructor Dr. Mikel Petty, UAH CMSA

ISE 639 (a) Modeling and Simulation Environments

Architectures and attributes of modeling and simulation environments (live, virtual, and constructive), relative advantages and disadvantages of each, and determining the most appropriate environment for different applications. Significant models and simulations used and testing and validation approaches suitable in each environment. Simulation interoperability approaches (standalone, interoperable) and current interoperability protocol standards and their advantages and disadvantages in the different environments. Case studies of successful M&S applications in each of the different environments, with emphasis on test and evaluation and acquisition applications.

ISE 639 (b) Modeling and Simulation Data Strategies

Categories of data sets required (such as service time distributions, terrain databases, or sensor performance parameters) for typical modeling and simulation (M&S) applications. Data requirements for M&S in terms of data sets, data volume, data availability, data accuracy, data classification, data storage media, and data archival. Existing M&S data resources available for reuse. Commonly used formats for documenting data (e.g., meta-data) and for structuring and encoding data (e.g., XML). Concepts of data models and commonly used data models. Data set format conversions. Data acquisition and creation effort estimation. Case studies of successful M&S applications in each of the different environments, with emphasis on test and evaluation and acquisition applications.

New Elective Offering!

PY426/520 History & Systems in Psychology

Provides a brief survey of the history of science before focusing on the development of Psychology as a scientific study. You’ll learn about the life and times of famous psychologists and how they influenced current thoughts on behavior. This is a great course for anyone preparing for the Psychology specialty GRE. It is also a good course to review foundations in Psychology for graduate students.
Industrial & Systems Engineering

ISE 439 (a) Engineering Economy (Grad)
3 Hrs.– Componation - Tuesday & Thursday,
10:15-12:15, TH N 140

ISE 439 (b) Probability & Engineering Statistics (Grad)
3 Hrs.– Gholston – Monday & Wednesday,
5:00-7:00, TH N 140

ISE 526 Design/Analysis of Experiments
3 Hrs.– Farrington – Monday & Wednesday,
5:00-7:00, TH N 140

ISE 537 Electronics Manufacturing Processes
3 Hrs.– Messimer – Tuesday & Thursday,
12:30-2:30, TH S105

ISE 638 Engineering Reliability
3 Hrs.- Wessels – Tuesday & Thursday,
2:45-4:45, TH N153

ISE 639 (a) Modeling and Simulation Environments
3 Hrs-Petty-Tuesday & Thursday, 12:30-2:30, TH N140
Text: No Text Required

ISE 639 (b) Modeling and Simulation Data Strategies
3 Hrs-Petty -Tuesday & Thursday, 2:45-4:45, TH N140
ISBN 0321240995

ISE 734 Decision Analysis
3 Hrs.– Componation – Tuesday & Thursday,
5:00-7:00, TH N155

ISE 697 Industrial & Systems Engineering Project I
3, 6 or 9 Hrs

ISE 698 Industrial & Systems Engineering Project II
3, 6, or 9 Hrs

ISE 699 Master’s Thesis
1, 3, 6, or 9 Hrs

ISE 799 Doctoral Dissertation
3, 6, or 9 Hrs

Engineering Management

EM 661 Strategic Engineering Management
3 Hrs.– Henriksen – Tuesday & Thursday,
5:00-7:00, TH N142
Text: Competitive Strategy, Porter,
ISBN 9780029253601

EM 667 Labor Relations
3 Hrs.– Tippett – Monday & Wednesday,
5:00-7:00, TH N142
Text: Labor Relations, 12th edition, Sloane & Witney,
ISBN 013196223X

EM 799 Doctoral Dissertation
3, 6, or 9 Hrs

Mechanical and Aerospace Engineering

MAE 540 Rocket Propulsion I
3 Hrs.– Staff – Monday & Wednesday,
2:45-4:45, TH N155
Text: Rocket Propulsion, Sutton, ISBN 9780471326427

MAE 541 Airbreathing Propulsion
3 Hrs.– Staff – Monday & Wednesday,
10:15-12:15, TH N153
Text: Gas Turbine Theory, Saravanamutto, ISBN 9780130158475

MAE 568 Elements of Space Craft Design
3 Hrs.– Benfield – Tuesday & Thursday,
12:30-2:30, TH N153

MAE 695 03 ST: Advanced Propellant Injectors
3 Hrs - Landrum/Bazarov - Tuesday & Thursday,
10:15-12:15, TH N153
Text: No Text Required

Other Courses

PY 520 ST: History and Systems
3 Hrs.- Torres - 2nd Summer Session,
Monday-Thursday, 5:00-7:00, TH N153
Text: Connections in the History & Systems of Psychology, 3rd edition, Thorne & Henley,
Forty Studies that Changed Psychology, 5th edition,
Hock, ISBN 978-0131147294

CS 617 Design & Analysis of Algorithms
3 Hrs.– Zhang – Tuesday & Thursday,
2:45-4:45, TH N155
UAH EMAIL SYSTEM

We appreciate the smoothness with which the students have migrated to using the official UAH email account for all information pertaining to courses. We appreciate your adaptability. For new students: you can redirect the email sent to your UAH account to an address you check regularly.

Fall 2008

ISE 439-(a) Engineering Economy (Grad)
ISE 439-(b) Probability & Eng. Statistics I (Grad)
ISE 530 Manufacturing Sys. & Facilities Design
ISE 547 Intro to Systems Simulation
ISE 626 Intro to Operations Research
ISE 627 Systems Engineering
ISE 641 Advanced Quality Control
ISE 670 Integrated Product & Proc. Design
ISE 690 Statistical Methods for Engineers
ISE 767 Contemporary Applications of ISE

EM 660 Engineering Management Theory
EM 666 Eng. Project Management
EM 711 Research Methods
EM 767 Contemporary Applications of EM

CPE 631 Advanced Computer Sys. Architecture

CS 650 Software Engineering

MAE 530 Fundamentals of Aerodynamics
MAE 540 Rocket Propulsion I
MAE 541 Airbreathing Propulsion
MAE 754 Hypersonic Flow
MAE 580 Aircraft Stability & Control

MKT 600 Survey of Marketing Management

MSC 600 Operations Management

Technology Update

Course Management: UAHuntsville is moving to a new course management system, Angel, to replace WebCT/Blackboard. The new system will be in place for summer 2008 classes.

Instructional Technology: Instructors now have the opportunity to teach from the Sympodiums in each classroom.

Course Delivery Options: We are investigating downloadable files of our courses as an option to CD distribution. In the future we hope to eliminate the need for CD distribution.

As always, if you have suggestions or are experiencing problems, please let us know so we can respond to your needs.

Dottie Luke, Distance Learning Administrative Secretary
Technology Hall N138.....(256) 824-6976 luke@ise.uah.edu.....Fax (256) 824-6608

Please call the Distance Learning Administrative Office with administrative questions or to have an exam proctored (256) 824-6976.
You may contact the professor directly for specific information pertaining to current course work.

Please pay attention to the instructions for registering, dropping or withdrawing from a course and/or applying for degree. If you do not follow procedure there could be un-necessary consequences!
!!!Registration Procedures!!!

- **Complete registration form IN FULL each time!**
- Use your A– Number rather than your Social Security Number.
- Signature at bottom is required.
- Late charges will be in effect for all late registrations or late payments.
- Call the Bursar at (256) 824-6223/6226 to make a payment; MasterCard, Visa, Discover, or American Express are accepted.
- If company covers tuition, all information concerning billing must be included with registration.
- Student is responsible for obtaining required textbooks. All books can be purchased through the UAH Bookstore. If using the UAH Bookstore, complete the form and fax to (256) 824-6754. For more information visit www.uah.bkstr.com or www.efollett.com.

### Faculty Advising Schedule (Tentative)

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEDC Tullahoma, TN, EAF Lobby</td>
<td>April 30</td>
<td>10:00 am – 12:00 pm</td>
</tr>
<tr>
<td>SPAWAR, Charleston, SC.</td>
<td>May 5</td>
<td>9:30 am – 12:30 pm</td>
</tr>
<tr>
<td>Savannah River, Aiken, SC.</td>
<td>May 6</td>
<td>9:30 am – 12:30 pm</td>
</tr>
<tr>
<td>Huntsville, Arsenal Bldg 4488</td>
<td>May 8</td>
<td>11:30 am – 1:30 pm</td>
</tr>
<tr>
<td>Huntsville, Arsenal Bldg 5400, SELA</td>
<td>May 9</td>
<td>9:00 am – 11:00 am</td>
</tr>
</tbody>
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### Summer Tuition Payments

<table>
<thead>
<tr>
<th>Zone</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1– Huntsville Area</td>
<td>$1071</td>
</tr>
<tr>
<td>2– Alabama, Tennessee, Mississippi</td>
<td>$1101</td>
</tr>
<tr>
<td>3– East of the Mississippi River</td>
<td>$1158</td>
</tr>
<tr>
<td>4– West of the Mississippi River</td>
<td>$1182</td>
</tr>
<tr>
<td>5– Pacific Coast</td>
<td>$1375</td>
</tr>
<tr>
<td>6– International</td>
<td>$1819</td>
</tr>
</tbody>
</table>

### Academic Calendar

- **May 11** - Spring Commencement.
- **May 21** - Registration forms for summer due.
- **May 26** - Memorial Day - Holiday.
  UAH CLOSED
- **May 27** - Classes begin.
- **June 1** - MSE & PhD application deadline for students planning to graduate in summer. See Dottie.
- **June 2** - Last day to add a class.
- **June 9** - Tuition due. Last day to drop with a refund. **NO REFUNDS AFTER THIS DATE.** Non payment of tuition does not constitute withdrawal from classes.
- **June 15** - Last day for oral defense of thesis or dissertation. See advisor.
- **June 16** - Last day to change from credit to audit.
- **June 30** - Theses & dissertations to Graduate Studies.
- **July 4** - Independence Day - Holiday.
  UAH CLOSED
- **July 15** - Last day to withdraw. **NO REFUND.** Last day for non-thesis final oral exam. See advisor.
- **July 30-August 1** - Final exams.
- **August 18** - Classes for fall semester begin.

Distance Learning Students must register and drop/add courses through Distance Learning Administrative Office.
Technology Hall, N138
(256) 824-6976
Dr. James J. Swain
Professor
Department Chair
Technology Hall N143A
jswain@ise.uah.edu (256) 824-6749

Dr. Phillip A. Farrington
Professor
Director of Distance Learning
Technology Hall N137
paf@ise.uah.edu (256) 824-6568

Dr. Dawn R. Utley
Associate Professor
Associate Director of Distance Learning
Technology Hall N134
utley@ise.uah.edu (256) 824-6075

Dr. Paul J. Componation
Associate Professor
Technology Hall N134
pjc@ise.uah.edu (256) 824-6738

Dr. Sampson E. Gholston
Associate Professor
Technology Hall N133
gholston@ise.uah.edu (256) 824-7310

Dr. Sherri L. Messimer
Associate Professor
Associate Dean for Engineering Student Affairs
Technology Hall N148
messimer@ise.uah.edu (256) 824-6211

Dr. Donald D. Tippett
Associate Professor
Technology Hall N135
tippet@ise.uah.edu (256) 824-6895

Dr. Michael P.J. Benfield
Assistant Research Professor
VBRH A4
Benfield@uah.edu (256) 824-2976

Dr. Aurora Torres
Assistant Professor Psychobiology
Morton Hall 108K
Torresa@email.uah.edu (256) 824-2320

Dr. Huaming Zhang
Assistant Professor
Technology Hall N300I
hzhang@cs.uah.edu (256) 824-5084

Dr. Brian Landrum
Associate Professor
Technology Hall S234
landrum@mae.uah.edu (256) 824-7207

Charity O’Neil
Distance Learning Operations Manager
Technology Hall N141 (256) 824-6563
oneil@ise.uah.edu Fax (256) 824-6608

Please contact the Production Office (256) 824-6563 for assistance with the distribution of course work and material, or if you will be on travel and need to make special arrangements

Dottie Luke
Distance Learning Administrative Secretary
Technology Hall N138 (256) 824-6976
luke@ise.uah.edu Fax (256) 824-6608

Please call the Distance Learning Administrative Office with administrative questions or to have an exam proctored (256) 824-6976. You may contact the professor directly for specific information pertaining to current course work.
Course No. & Title                                                    Credit Hours*                      Credit or Audit                      For Office Use Only
____________________________________________________________________________________ ___________ ___________ ___________ ___________
____________________________________________________________________________________ ___________ ___________ ___________ ___________
____________________________________________________________________________________ ___________ ___________ ___________ ___________
*EMI / ISE 799: 3, 6, or 9 & ISE 699: 3, 6, or 9

Please check method of delivery:  ☐ CD  ☐ Internet Delivery Only (must have high-speed connection)

Student Advisor: ____________________________  A Number ______________________________

Personal Information: Check here if this is a new address:

Full Legal Name: ______________________________________________________________________________________

Cell Phone (____) ___________________ Home Phone: (____) ___________________ Work Phone: (____) ___________________

Home Address: ______________________________________________________________________________________

Employer: ______________________________________________________________________________________

Work Address: ______________________________________________________________________________________

Proctor’s Name: ______________________________________________________________________________________

Proctor’s Address: ____________________________________________________________________________________

Proctor’s Phone: (____) ___________________ Proctor’s Fax: (____) ___________________

Tuition due June 9, 2008. Late payment will result in a $50 late fee.

Bill Student: ☐ Bill Organization: ☐

Purchase order #

Billing Address: ______________________________________________________________________________________

Validation
I certify that the information given in this application is true and complete, and falsifying may result in dismissal from UAH. I understand that I am responsible for payment.

Signature: ____________________________  Date: ___________________
Student’s Name (Please Print Clearly) ________________________________________________________

Address (No P.O. Boxes) ____________________________________________________________________

City __________________________ State ________________ Zip ______________

TEXTBOOKS NEEDED: COURSE # (Example: ISE 690)

_________________________________________________   __________________________

__________________________________________________   —————————————

__________________________________________________   __________________________

☐ Check here if you would like used textbooks (if available).

☐ Check here if you would like to be notified of your total.

Payment Information:

☐ Visa ☐ MasterCard ☐ Discover ☐ American Express

Government Credit Card (Must provide tax exempt #) ____________________________

Card # _____________________________ Exp. ___________________

Signature of Cardholder _____________________________________________

If your employer will be paying for your books, you MUST provide the following information. Otherwise, payment will be YOUR RESPONSIBILITY.

Name of Employer: _______________________________________________________________________

Address: _____________________________________________________________________________

City/State/Zip: _______________________________________________________________________

Contact Person: ________________________________________________________________

Returns/Exchange

You must have your receipt to receive a refund or exchange. All books in plastic wrap must be unopened. Shipping will be UPS Ground at no charge to you. Express or overnight shipping will be additional. Questions? Call 256-824-6754. We will be glad to help you. Ask for more the Book Information Desk. www.uah.bkstr.com