

# **TEACHING INDUSTRIAL ENGINEERING COURSES USING BLACKBOARD**

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## **ABSTRACT**

This paper presents information about the undergraduate program in industrial engineering at UW - Platteville and the Web pages created for five industrial and general engineering courses by the author. This paper summarizes the contents of these pages that are accessible to students and guests from any location. The paper discusses how course documents, assignments, solutions, and external links to other Web pages are made available to the target student group. Blackboard facilitates submission of individual or group student work in electronic form for grading and allows student groups to share common files for industrial projects. It also improves communication among students or student groups and the instructor. This paper presents the features that are attractive to students. Students' comments are also summarized.

## **INTRODUCTION**

The Industrial Engineering (IE) program at UW – Platteville requires a total of 128 credits for graduation and requires the following IE courses: Human Factors Engineering, Operations Research, Work Measurement and Design, Production and Operations Analysis, Simulation, Facilities Design, Materials Handling and Warehousing, Total Quality Management, Manufacturing Systems Design, Engineering Management, Cost and Value Analysis, and Industrial Systems Design. The above courses include a laboratory session (except for three courses) to provide hands-on practical experience to students. Three fully equipped and periodically upgraded laboratories are used to provide practical experience to students in the IE courses. State-of-the art computers and software are made available to students in these laboratories.

The IE program at UW-Platteville is unique in incorporating industrial design projects into many of the courses in the curriculum. These industry-sponsored projects prepare the students to undertake capstone design project of significant scope and also do well in their job after graduation. The excellent laboratories, dedicated faculty, and outstanding graduates have been recognized by the people in the region and the program has received much publicity due to its very high ranking in the review published in the US News and World Report last year.

The author established the IE laboratories and was responsible for the first ABET (Accreditation Board for Engineering and Technology) accreditation of the program in 1987. He has taught most of the courses in the IE curriculum. During the past few years he used the Blackboard Course Info system to enable students to submit their work electronically, access course materials, review grades, communicate with group members, and download files. This paper summarizes his experiences with the Blackboard course management system.

# BLACKBOARD

Blackboard 5 is a comprehensive and flexible e-Learning software platform that delivers a course management system with a customizable institution-wide portal. The Blackboard 5 is implemented at UW – Platteville as follows. The header frame has images that are hotlinks to the institution’s homepage, three buttons (Blackboard Login Page or Home, Help, and Exit) and three tabs (UWP BB Home, Courses, and Academic Web Resources) that navigate to different areas within Blackboard 5. Clicking on either a button or a tab opens that website or area in the content frame. A course Website consists of a navigation path (top left side), a button bar (left side), and a content frame. The navigation path allows users to return to any page accessed between the main course page and the current page. The button bar links users to the available content areas and tools. The content frame displays Web pages accessed through the buttons or tabs or navigation path or button bars and the display in the content frame changes depending on the option exercised by the user. The course website is the most commonly used area and most of the interactive use of course materials occurs here. The Figure 1 below shows the header frame and the course website. The significant features of both these parts of the Blackboard are also identified in this figure.

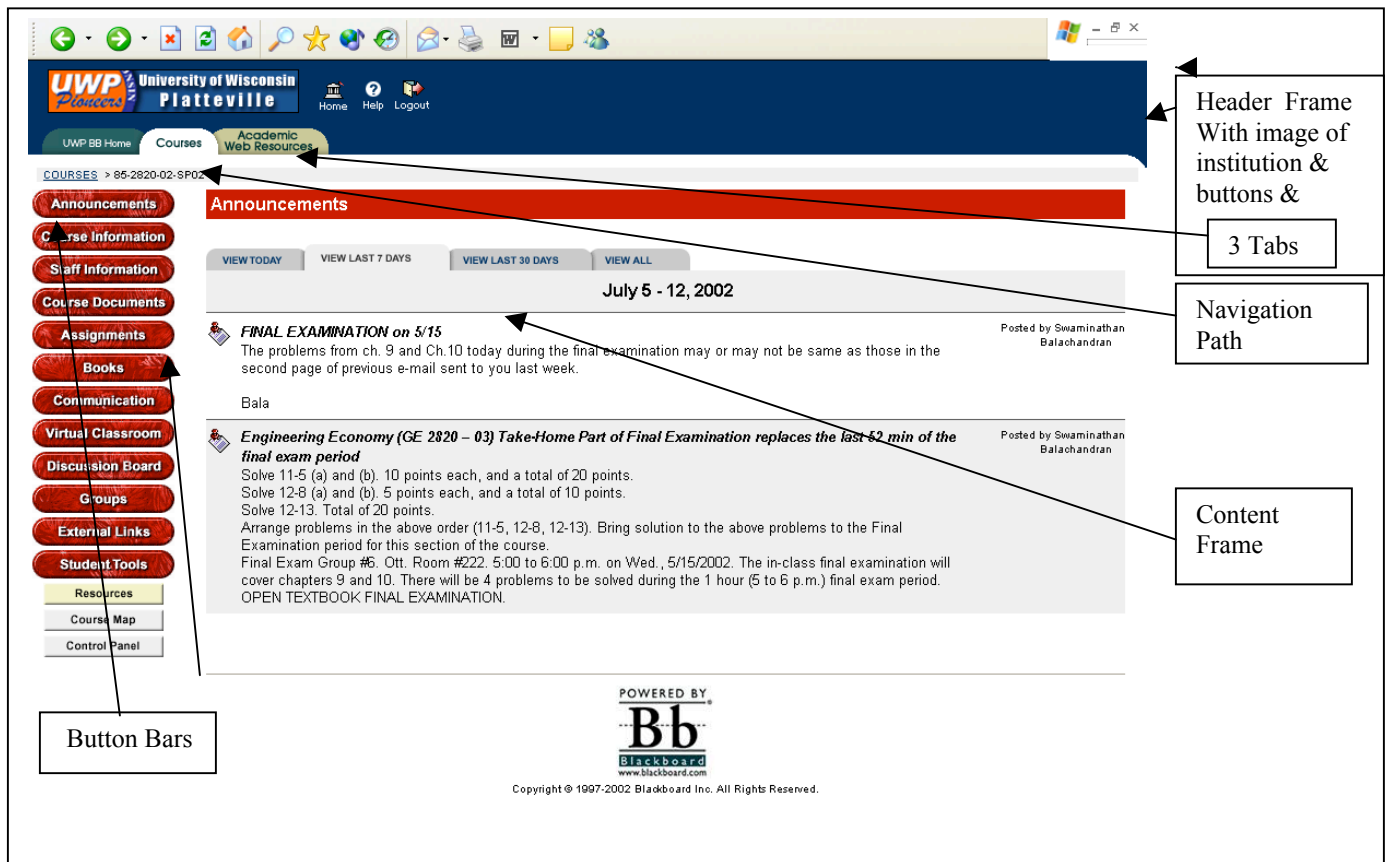


Figure 1 – Blackboard Header Frame (Image, Buttons, Tabs) & Course Website (Navigation Path, Button Bars, Content Frame)

The components of a course Web site are customizable by the instructor or the system administrator and are summarized below:

**Announcements:** Post timely information critical to course success. Announcements occupy the Main Content Frame upon entry to a course Web site and can also appear on the My Institution and Courses area depending on system configuration. Click

**Announcements** from the course Web site tool bar to view course announcements.

**Course Information:** Course Information displays descriptive materials about the course. Materials usually posted here include syllabus and course objectives.

**Staff Information:** Provides background and contact information on course instructors and teaching assistants.

**Course Documents:** Contains learning materials and lesson aids, such as lecture notes.

**Assignments:** Assignments lists the due date and description for class work. The instructor posts assignments and can modify the task and due date.

**Communication:** Course users communicate through the Communication Center. The Communication Center allow users to send and receive email, read and post messages to discussion boards, enter Virtual Classroom, view student roster, and view group pages.

**External Links:** Connects course users to outside learning materials. Instructors may select outside materials and post a hyperlink and brief description for each external source.

**Tools:** Tools that can be used in the course Web site include Digital Dropbox, Edit Home Page, Personal Information, Course Calendar, Check Grade, Manual, Tasks, and Electric Blackboard.

**Resources:** Provides access to the Blackboard 5 Resource Center. The Resource Center is a customizable Web site of educational resources.

**Course Map:** Allows easier course Web site navigation. The Course Map connects to an expandable and collapsible bookmark.

**Control Panel:** Provides accesses to the Instructor Control Panel. The Instructor Control Panel is used to set up a course Web site and add course materials to be accessed by students through the button bars.

All course administration is done through the Instructor Control Panel. The Control Panel is comprised of six function areas. Content Areas in this panel provides the tools necessary to add text, files, and information into the course, Course Tools area contains the communication tools for instructors to send email, create tasks, and work with groups, Course Options area contains Security and customization options for advanced management of course components, User Management area provides tools for the instructor to manage users and enrollments, Assessment area provides tools for building assessments, recording grades, and tracking user activity and Assistance area offers support contacts and online documentation.

### **LESSONS LEARNED IN USING BLACKBOARD**

The author used Blackboard in the following courses during the past few years. Some of these courses twice each year and Blackboard was used more than once in each course: GE 2820 – Engineering Economy, IE 3430 – Human Factors Engineering, IE 4130 – Simulation, IE 4230 – Facilities Design, IE 4430 – Total Quality Management, IE 4930 – Industrial System Design, MOE 7980 – Independent Study (Taguchi Methods). The lessons learned by the author are listed below:

In each course, the announcements area contains file formats and software versions used by the instructor, weekly schedule of activities, reminder of due dates, and instructions for accessing new items posted on Blackboard. The staff information area is more useful in web-based off campus courses to display personal information, office information, picture, and bio-data. In the course documents area, separate folders are used to organize lecture slides, journal papers, relevant standards, example problems solved using Excel, solution to tests, case studies, useful forms, and presentations on related topics. In the assignment area, separate folders are used to hold files for assignments, and instructions for each laboratory project. The external links area contains folders organizing useful websites. The following information about Blackboard may be useful to instructors planning to Blackboard to deliver course materials online.

1. The Resources button bar is almost a worthless feature in Blackboard. Instructors will be more productive in locating useful resources (journal papers, books, etc.) using campus libraries online and listing those resources under Course Documents.
2. Instructors are advised to locate useful reference websites using efficient search engines and organize these URLs under External links. In one course the author had several hundred useful websites. The best organization of these URLs involved classifying them and placing them into different folders under External Links.
3. Course materials placed online using Blackboard under Course Documents were appreciated by students when these were organized into folders. For example, lecture slides for textbook #1 were placed into the folder with title "Textbook1 Lecture Slides", and problems solved using Excel spreadsheet were placed in the folder with title "Excel Examples".
4. Folders are also recommended to organize materials placed under Assignments.
5. Student in a course must be given specific instructions for submitting files to the instructor via the digital drop box. To prevent the possibility of files in the course drop box being overwritten, students must be instructed to use file names that contain their initials, a letter denoting the type of work (A for assignment, P for project, L for laboratory work), a sequential number, and a few descriptive words.
6. Instructors must also list in the Announcement area the versions of all software they use on their computer so that students will submit files that may be retrieved by the instructor. For example, if the spreadsheet software is not specified, a student may submit a file that cannot be opened by the instructor.
7. Students must be cautioned that they must first upload a file to their digital drop box and then open that file to make sure that the file was uploaded correctly. Finally, the Send File button the digital drop box must be used to send the file to the instructor.
8. Under "Staff Information", Blackboard allows folders to be created, but these folders cannot be used to hold resume or other documents. Blackboard allows information about additional staff in the folders.
9. The e-mail facility does not have a spelling checking option. Users usually keep MS Word open to copy and spell-check messages.

## **STUDENT FEEDBACK**

Blackboard allows the instructor to organize students into groups. Blackboard facilitates sharing of common files for an industrial project or other coursework. In addition, Blackboard makes it convenient to communicate with group members. The digital drop box and communication tools in Blackboard are very attractive to students. Blackboard eliminates most of the handouts in a course and allows students to have the lecture notes beforehand. Students

usually bring a copy of the lecture slides to the class and this permits the instructor to cover more topics in a course. Blackboard tracks the date and time files are sent to the instructor and students appreciate this feature. Students are able to review their grades in each coursework quickly and easily. Most of the assistance sought by students in a course is easily handled through the communication tools and students do not have to wait outside the faculty office to get answers to simple questions. In effect, Blackboard forces students to use faculty office hours more efficiently.

Blackboard makes the playing field level for all the students in a course. When the instructor provides assistance to one student for a difficult assignment, he /she can post on Blackboard details about that assistance. As students become familiar with the Blackboard, they seem to like it and use it more. In fact, their expectations increase and most students contact the instructor if solutions or lecture notes are not posted in a timely manner on the Blackboard. The Blackboard is not integrated with the software used by the Registrar's Office and when students drop a course, they are not removed from the class roster on Blackboard. Instructors must manually delete students who dropped a course. Otherwise, the test average computed by Blackboard will differ from that computed by the instructor using a spreadsheet. The "Gradebook" in Release 5.5 of Blackboard has improved, but it does not have the flexibility and features available in a spreadsheet.

### **ACKNOWLEDGEMENTS**

The information about Blackboard Release 5.5 is derived from the online Instructor Manual available at the Blackboard website for the courses taught by the author.

### **REFERENCES**

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### **BIOGRAPHICAL SKETCH OF AUTHOR**

Dr. S. Balachandran is a Prof. of Ind. Eng., UW-Platteville. He serves as consultant and his areas of interest are ergonomics, continuous process and quality improvement, facilities design, and manufacturing simulation. He received B.E. Degree with Honors in Mech. Eng. from the University of Madras, India in 1968, and received M.E. degree with Distinction in Aeronautical Eng. with specialization in rockets and missiles from the Indian Institute of Science, India in 1970. He worked as Project Engineer at the Indian Space Research Organization, India from 1970 to 1974 and worked at Va. Tech. as Research Assistant, Instructor and Asst. Prof. from 1975 to 1985. He received a Ph.D. degree in I.E. & O.R. from Va. Tech. in 1984. He worked as Assoc. Prof., Professor and Chairman of Industrial Engineering at UW - Platteville from 1985 to 1994 and has over 170 presentations and publications. He continues to serve as a technical reviewer for the IJPR, IJPPC, JMPT and IJSM. He is an IIE/ABET evaluator for industrial technology programs. He is a member of IIE, ASEE, INFORMS, SME, ASQC, APICS and HF&ES. He is listed in several Who's Who publications.