Transfer of Transportation Management and Safety Technologies

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Four continuing education courses for transportation professionals were developed. Each course was one day long and was initially offered at the University of Alabama at Birmingham through its School of Engineering's Engineering Professional Development (EPD) program. The courses were geared toward engineers and managers and emphasized design, performance, specifications, quality control, and economic considerations. Course development and recruiting focused on state department of transportation personnel, city and county engineers, designers, construction company personnel, estimators, testing company personnel, researchers, and students. Courses offered were “Concrete Technology for Transportation Professionals,” “Uses of Aggregates in Transportation,” “Concrete Pavement Restoration,” and “Intelligent Transportation Systems.” Total course enrollment was approximately 63 students. The 2000 University Transportation Center for Alabama (UTCA) Technology Transfer Program is provided in this report as an appendix. Lessons learned from the development and delivery of the 2000 program are discussed. A UTCA technology transfer strategic plan and course catalog were developed. The course catalog is provided in this report as an appendix.
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Executive Summary

Four continuing education courses for transportation professionals were developed. Each course was one day long and was initially offered at the University of Alabama at Birmingham (UAB) through its School of Engineering’s Engineering Professional Development (EPD) program. The courses were geared toward engineers and managers and emphasized design, performance, specifications, quality control, and economic considerations. Course development and recruiting focused on state department of transportation personnel, city and county engineers, designers, construction company personnel, estimators, testing company personnel, researchers, and students. Courses offered were “Concrete Technology for Transportation Professionals,” “Uses of Aggregates in Transportation,” “Concrete Pavement Restoration,” and “Intelligent Transportation Systems.”

Course descriptions:

1. Concrete Technology for Transportation Professionals. This course was developed from the courses in concrete technology currently offered at UAB and UAH (the University of Alabama in Huntsville). Dr. Houssam Toutanji was the course instructor. Course topics included materials selection (cements, aggregates, admixtures), use of supplementary cementitious materials such as fly ash, slag, and silica fume, mix design procedures and considerations, fresh concrete properties, hardened concrete properties, wear, durability, curing, construction procedures, high performance and other engineered concretes, and nondestructive testing of concrete.

2. Use of Aggregates in Transportation. This course was developed in coordination with the Vulcan Materials Company. Dr. Norbert Delatte was the course instructor. Course topics included sources and manufacture of aggregates, basic properties of aggregates, aggregate sampling and test methods and procedures, structural behavior and performance of aggregate layers, aggregate selection and use in Portland cement and asphalt concretes, aggregate requirements of Superpave, and uses of aggregates for drainage, filtration, and erosion control.

3. Intelligent Transportation Systems (ITS). This course reviewed the history of IVHS-ISTEA-TEA21 and the future of research and technology related to these policies. The short course also evaluated Alabama's ITS initiative. Other topics included current projects underway in Alabama, the technology being used and status of the projects. Dr. John McFadden developed the course and was the course instructor.

4. Concrete Pavement Restoration. This course was developed in cooperation with the American Concrete Pavement Association (ACPA). It also made use of the results of UTCA Project Number 99247. Dr. Delatte developed this course in cooperation with the ACPA, and shared instruction with Mr. James Mack of the ACPA.
A team approach encompassing all three campuses (UAB, UA, and UAH) was used. Total enrollment for the four courses was approximately 63. Participants were surveyed to determine interest in future UTCA course offerings.

A thorough catalog of one- and two-day courses that could be offered by UA system faculty was developed. The research team also developed a strategic plan for delivery of the annual UTCA technology transfer program. Both are included in this report.

Based on the experiences of the research team in developing, publicizing, and delivering the 2000 UTCA technology program, the following recommendations are made:

- The course brochure must be mailed approximately four months before the first course in the program is offered.
- The mid-October to mid-December time frame is an excellent time to offer courses because engineers with Alabama PE licenses are looking for continuing education hours, and will often take two one-day courses to gain the required 15 hours. It is also a time of the year when transportation professionals are less busy with construction.
- A fee of $100 to $150 for a one-day course ($100 plus the cost of course materials) is reasonable and will be paid by industry.
- Industry participation can provide outstanding support to a technology transfer program in several important aspects. Industry can help develop course materials, provide books and other materials free or at reduced cost, and provide guest speakers for course delivery.
- Targeted mailing lists developed by the course instructor can be very efficient in building enrollments.
- Targeted personal contacts through visits and telephone calls are the most effective way to build course enrollments.
- Although it is possible to teach a one-day course with a single instructor, and three of the four courses used that format, it is much easier on instructors and participants to have two. A two-person team format, such as that used for the “Concrete Pavement Restoration” course, provides a better alternative.
- The 2000 technology transfer program’s effectiveness was significantly enhanced by delivery through UAB Engineering Professional Development. UAB EPD has extensive, centrally located facilities available for course delivery. Future UTCA technology transfer programs should take advantage of UAB EPD’s considerable infrastructure and experience, as well as its convenient location for engineers and other transportation professionals.

This report has documented a pilot program to develop a technology transfer program for UTCA. The work was accomplished by researchers from all three UA system campuses, in cooperation with UAB Engineering Professional Development (EPD).
Section 1
Introduction

Transferring the latest technology in Intelligent Transportation Systems (ITS), construction materials, and other topics to transportation professionals in Alabama will substantially enhance the management of transportation systems both during construction and in service. This project will also provide a solid foundation for future UTCA technology transfer efforts. This project was extremely important to UTCA because it supported high priority topic three (technology transfer) of the 2000 Annual Research Program.

Project Objectives

The objectives of this project were:
• To develop a pilot program for technology transfer of UTCA research results,
• To develop a strategic plan for UTCA technology transfer short courses, and
• To launch the UTCA technology transfer program with an initial offering of four strong courses.

The objectives of this project will improve management, economy, and performance of constructed transportation facilities through transfer of construction materials technology.

Course Summaries

Four continuing education courses for transportation professionals were developed. Each course was one day long and was initially offered at the University of Alabama at Birmingham (UAB) through its School of Engineering’s Engineering Professional Development (EPD) program. The courses were geared toward engineers and managers and emphasized design, performance, specifications, quality control, and economic considerations. Course development and recruiting focused on state department of transportation personnel, city and county engineers, designers, construction company personnel, estimators, testing company personnel, researchers, and students. Courses offered were “Concrete Technology for Transportation Professionals,” “Uses of Aggregates in Transportation,” “Concrete Pavement Restoration,” and “Intelligent Transportation Systems.” Course descriptions are provided in Appendix A. Courses offered and project tasks included:

1. Concrete Technology for Transportation Professionals. This course was developed from the courses in concrete technology currently offered at UAB and UAH (the University of Alabama in Huntsville). Dr. Houssam Toutanji was the course instructor. Course topics included materials selection (cements, aggregates, admixtures), use of supplementary cementitious materials such as fly ash, slag, and silica fume, mix design procedures and considerations, fresh concrete properties, hardened concrete properties, wear, durability, curing, construction procedures, high performance and other engineered concretes, and nondestructive testing of concrete.
2. **Use of Aggregates in Transportation.** This course was developed in coordination with the Vulcan Materials Company. Dr. Norbert Delatte was the course instructor. Course topics included sources and manufacture of aggregates, basic properties of aggregates, aggregate sampling and test methods and procedures, structural behavior and performance of aggregate layers, aggregate selection and use in Portland cement and asphalt concretes, aggregate requirements of Superpave, and uses of aggregates for drainage, filtration, and erosion control.

3. **Intelligent Transportation Systems (ITS).** This course reviewed the history of IVHS-ISTEA-TEA21 and the future of research and technology related to these policies. The short course also evaluated Alabama's ITS initiative. Other topics included current projects underway in Alabama, the technology being used and status of the projects. Dr. John McFadden developed the course and was the course instructor.

4. **Concrete Pavement Restoration.** This course was developed in cooperation with the American Concrete Pavement Association (ACPA). It also made use of the results of UTCA Project Number 99247. Dr. Delatte developed this course in cooperation with the ACPA, and shared instruction with Mr. James Mack of the ACPA.

**Approach and Work Plan**

A team approach encompassing all three campuses (UAB, UA, and UAH) was used. The work plan included the following tasks:

1. The principal investigators at all three campuses developed the course syllabi and scheduled the courses in consultation with the Alabama Department of Transportation and industry associations.

2. A one-day workshop was held by project personnel at UAB to develop final course descriptions, the schedule, and the brochure.

3. The research team developed the brochure and mailing list and contacted Alabama Department of Transportation personnel, city and county transportation personnel, contractor personnel, and consultants. The brochure included the new courses developed, as well as existing EPD courses that can be brought into this program. As an example, EPD’s existing AutoCAD courses were listed.

4. Course materials were prepared and reproduced.

5. The courses were presented.

6. The courses were evaluated.

7. A questionnaire was sent to all Civil and Environmental Engineering faculty at all three campuses to develop future course topics, and a plan for subsequent course offerings to benefit Alabama transportation professionals was developed.
8. Based on the questionnaire results, a draft strategic plan for UTCA technology transfer was developed to complement to research and education efforts of UA system faculty. This final report documents the effort, and presents the strategic plan and course catalog. Section 2 of this report discusses the development of the 2000 UTCA technology transfer program. Section 3 documents the evaluation and results of the program. Based on this information, Section 4 provides recommendations for future offerings, and Section 5 presents the summary and conclusions. The 2000 program flyer and web site information are provided as Appendix A and the UTCA course catalog is presented as Appendix B.
Section 2  
Course Program 2000

In this section, the development and delivery of the 2000 UTCA technology transfer program is discussed. First, the development of the program is addressed, and then the publicity and recruiting effort.

Program Development
The 2000 program was based on the four courses discussed in the research team’s proposal to UTCA. Each principal investigator individually developed one or two courses. The research team held a workshop at UAB on July 19, 2000, to develop the final plan and brochure. This was attended by all research team members as well as Ms. Sheila Springer, UTCA Administrative Assistant. At this workshop, the research team proposed setting course fees at $100 plus the course of the materials purchased separately. This was sufficient to cover room rental, parking, breaks, lunch, and other associated costs.

Each principal investigator developed a detailed package of course notes to supplement the course texts. Sample course note cover pages are shown in Figures 2-1 and 2-2. The course texts were also purchased and stored for the courses (American Concrete Pavement Association, 2000, Barksdale, 1991, Barksdale, 1998, Kosmatka and Panarese, 1988).

The Southeast Chapter of the American Concrete Pavement Association (ACPA) provided course materials without charge. In addition, personnel from Vulcan Materials helped develop the Aggregates course PowerPoint presentation and notes (Figure 2-1), and Mr. James Mack of ACPA helped develop the Concrete Pavement Restoration course PowerPoint presentation and notes (Figure 2-2).

Publicity and Recruiting
The draft brochure (Appendix A) was used for initial publicity and posted on the UTCA web site. Next, two versions of a full color brochure were printed, with identical text and improved graphics. UAB EPD mailed the brochures, using standard mailing lists as well as a special list developed using UTCA information.

In addition to mailing the brochure and posting the web site descriptions, the research team made the following additional efforts to publicize the courses:

- Telephone calls and faxes were made to Alabama Department of Transportation (ALDOT) personnel and other potentially interested parties.
- Robert Taylor of the Southeast Chapter ACPA personally contacted a large number of ALDOT personnel concerning the November 2 Concrete Pavement Restoration course. As a result, this single course accounted for more than half of the overall enrollment.
• Presentations were made at a number of meetings of the American Society of Civil Engineers (ASCE) and other organizations such as the local American Concrete Institute (ACI) education committee, and brochures were distributed.

![Use of Aggregates in Transportation](Figure 2-1. Use of Aggregates in Transportation Course Notes Cover)

![Concrete Pavement Restoration](Figure 2-2. Concrete Pavement Restoration Course Notes Cover)
Section 3  
Evaluation of Courses and Survey of Needed Courses

This section documents the results of surveys conducted with course participants at the end of each course. It should be noted that approximately 90% of course participants were in the areas of pavements and materials, and therefore these results reflect their interests, rather than those of the general transportation community. Future technology transfer courses in other areas of transportation should incorporate surveys to gauge interest and needs within those specializations (e.g. optimization and planning).

Discussions with course participants indicated a high degree of satisfaction with course materials and quality of instruction overall. Course evaluations were filled out by the course participants, collected and summarized by EPD, and provided to the course instructors. This section of the report discusses the course enrollments, and the results of a survey provided to participants to evaluate their interest in other potential UTCA course offerings.

The number of participants enrolled in each of the courses in the 2000 program is shown in Table 3-1. Because there was considerable interest in gearing this program toward meeting the needs of ALDOT, their participation is shown separately. The “Student” category comprises UAB students attending the first experimental course offering who were not charged. In addition to the participation in the courses shown in Table 3-1, ALDOT sent six students to the 1999 National Electric Code course offered by UAB EPD.

Table 3-1. Course Enrollments

<table>
<thead>
<tr>
<th>Course</th>
<th>Date</th>
<th>Participants Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ALDOT</td>
</tr>
<tr>
<td>Use of Aggregates in Transportation</td>
<td>28 Sep.</td>
<td>5</td>
</tr>
<tr>
<td>Concrete Pavement Restoration</td>
<td>2 Nov.</td>
<td>17</td>
</tr>
<tr>
<td>Concrete Technology for Transportation Professionals</td>
<td>9 Nov.</td>
<td>16</td>
</tr>
<tr>
<td>Intelligent Transportation Systems</td>
<td>7 Dec.</td>
<td>1</td>
</tr>
</tbody>
</table>

At the end of each of the last three courses offered, participants were surveyed to determine their level of interest in other potential course offerings. Each was provided with a list, and asked to rate the courses from 1 (Not Interested) to 5 (Would Definitely Attend). Results are shown in Table 3-2.

For each survey date, the table indicates the average score of the course (1 to 5) and the number of participants that indicated they were interested in the course. The “Number Interested” is the number of participants that rated their interest at 2 (Somewhat Interested) or higher.

The courses offered on November 2 and 9 addressed materials and pavements, and thus there was considerable overlap in interest. The Intelligent Transportation Systems course on December 7 focused on operations and planning, and was therefore somewhat different from the previous two groups.
The course catalog (Appendix B) was developed after the courses were offered and the participants were surveyed. Therefore, Table 3-2 does not include all of the potential courses discussed in Appendix B.

Courses that were highly rated (average 3.00 or above) that were not offered in 2000 include Construction of Portland Cement Concrete Pavements, Concrete Repair, Nondestructive Testing, Design and Construction of Concrete Overlays, Highway Pavement Design, Concrete Engineering of Streets and Local Roads, and Concrete Pavements for Parking Lots and Industrial and Multimodal Facilities. November 2 participants rated Concrete Repair highest, followed by Highway Pavement Design. November 9 participants rated Highway Pavement Design, followed by Concrete Pavements for Parking Lots and Industrial and Multimodal Facilities.
Section 4
Recommendations

Based on the experiences of the Research Team in developing, publicizing, and delivering the 2000 UTCA technology program, the following recommendations may be made. These have been supplemented by the extensive UAB EPD experience with course development and delivery.

- The course brochure must be mailed approximately four months before the first course in the program is offered.
- The mid-October to mid-December time frame is an excellent time to offer courses because engineers with Alabama PE licenses are looking for continuing education hours, and will often take two one-day courses to gain the 15 hours. It is also a time of the year when transportation professionals are less busy with construction.
- A fee of $100 to $150 for a one-day course ($100 plus the cost of course materials) is reasonable and will be paid by industry.
- Industry participation can provide outstanding support to a technology transfer program in several important aspects. Industry can help develop course materials, provide books and other materials free or at reduced cost, and provide guest speakers for course delivery.
- Targeted mailing lists developed by the course instructor can be very efficient in building enrollments.
- Targeted personal contacts through visits and telephone calls are the most effective way to build course enrollments.
- Although it is possible to teach a one-day course with a single instructor, and three of the four courses used that format, it is much easier on instructors and participants to have two. A two-person team format, such as that used for the “Concrete Pavement Restoration” course, provides a better alternative.
- The 2000 technology transfer program’s effectiveness was significantly enhanced by delivery through UAB Engineering Professional Development. UAB EPD has extensive, centrally located facilities available for course delivery. Future UTCA technology transfer programs should take advantage of UAB EPD’s considerable infrastructure and experience, as well as its convenient location for engineers and other transportation professionals.

Based on these observations, a proposed procedure for conducting a technology transfer program is outlined in Table 4-1. The experience and facilities of UAB EPD have been shown to be very successful. This organization can serve as a role model for additional technology transfer efforts. Table 4-1 provides an example of a possible strategic plan for future UTCA technology transfer efforts.
Table 4-1. Proposed UTCA Annual Technology Transfer Program

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>January – February</td>
<td>UTCA faculty propose courses for annual plan</td>
</tr>
<tr>
<td>March</td>
<td>Annual technology transfer workshop to develop program, brochure, and mailing lists</td>
</tr>
<tr>
<td>June</td>
<td>Mail brochures</td>
</tr>
<tr>
<td>October 15 – December 15</td>
<td>Deliver courses</td>
</tr>
</tbody>
</table>

The research team surveyed faculty at all three UA system campuses to determine what courses they had offered in the past that could be incorporated into an annual technology transfer program, as well as new courses they could develop. The courses are listed in Table 4-2, and described in detail in the course catalog in Appendix B. So far the courses proposed have been primarily in the field of civil engineering. In the future, it is important to incorporate courses from other disciplines in the annual program. Investigators from other disciplines involved in UTCA research projects can develop short courses based on their work for incorporation in the annual program. Management technology transfer courses currently offered by UA are listed in Table 4-3.

Table 4-2. Courses Proposed by UA System Faculty

<table>
<thead>
<tr>
<th>Course</th>
<th>Instructor(s)</th>
<th>Length (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Pavement Restoration</td>
<td>Delatte</td>
<td>1</td>
</tr>
<tr>
<td>Concrete Technology for Transportation Professionals</td>
<td>Toutanji</td>
<td>1</td>
</tr>
<tr>
<td>Intelligent Transportation Systems</td>
<td>McFadden</td>
<td>1</td>
</tr>
<tr>
<td>Use of Aggregates in Transportation</td>
<td>Delatte</td>
<td>1</td>
</tr>
<tr>
<td>Structural Reliability for Transportation Designs</td>
<td>Chen</td>
<td>1</td>
</tr>
<tr>
<td>Traffic Impact Analysis</td>
<td>Jones</td>
<td>1</td>
</tr>
<tr>
<td>Principles of Traffic Control</td>
<td>Jones</td>
<td>1</td>
</tr>
<tr>
<td>County Bridge Evaluation and Replacement Workshop</td>
<td>Davidson/ Delatte/ Chen</td>
<td>1</td>
</tr>
<tr>
<td>Stormwater Management</td>
<td>Pitt</td>
<td>1</td>
</tr>
<tr>
<td>Biofiltration Control Practices</td>
<td>Pitt</td>
<td>1</td>
</tr>
<tr>
<td>Construction Site Erosion Control</td>
<td>Pitt</td>
<td>1</td>
</tr>
<tr>
<td>Detention Pond Design</td>
<td>Pitt</td>
<td>1</td>
</tr>
<tr>
<td>Concrete Repair</td>
<td>Toutanji/ Delatte</td>
<td>1</td>
</tr>
<tr>
<td>Nondestructive Testing</td>
<td>Delatte/ Chen</td>
<td>1</td>
</tr>
<tr>
<td>Design and Construction of Concrete Overlays</td>
<td>Delatte</td>
<td>1</td>
</tr>
<tr>
<td>Concrete Pavements and Overlays for Airfields</td>
<td>Delatte</td>
<td>1</td>
</tr>
<tr>
<td>Highway Pavement Design</td>
<td>Delatte</td>
<td>1</td>
</tr>
<tr>
<td>Concrete Engineering of Streets and Local Roads</td>
<td>Delatte</td>
<td>1</td>
</tr>
<tr>
<td>Concrete Pavements for Parking Lots and Industrial and Multimodal Facilities</td>
<td>Delatte</td>
<td>1</td>
</tr>
<tr>
<td>Workshop on Effective Watershed Management Assisted by the Source Loading and Management Model (SLAMM)</td>
<td>Pitt</td>
<td>2</td>
</tr>
<tr>
<td>Construction of Portland Cement Concrete Pavements</td>
<td>Delatte</td>
<td>2</td>
</tr>
</tbody>
</table>

In order to develop and deliver an annual program, UTCA should provide a consistent annual level of funding for continuing costs and infrastructure. Establishing a technology transfer planning team composed of investigators at all three UA system campuses, plus UAB EPD, would ensure a consistent, high quality annual program. This funding should also provide the small subsidy necessary to allow courses to be offered on an experimental basis if they do not attract a high initial enrollment.

A suggested overall annual funding level of $15,000 per campus, plus $5,000 for administration and publicity to UAB EPD or a similar organization (total $50,000), is sufficient to fund annual program delivery plus the development of one new course by each campus. Faculty may apply
directly to UTCA for additional funds to develop new courses. UAB EPD made a significant investment of $50,000 in matching funds for the 2000 UTCA technology transfer program, which allowed all three UTCA campuses to develop their courses without providing additional matching funds.

Table 4-3. Current UA Management Technology Transfer Courses

<table>
<thead>
<tr>
<th>Number</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Project Management Overview: Principles and Techniques</td>
</tr>
<tr>
<td>2</td>
<td>Project Management and Team Work</td>
</tr>
<tr>
<td>3</td>
<td>Project Procurement and Contract Management</td>
</tr>
<tr>
<td>4</td>
<td>Project Time and Scheduling management</td>
</tr>
<tr>
<td>5</td>
<td>Project Tracking and Cost Management</td>
</tr>
<tr>
<td>6</td>
<td>Project Risk Management</td>
</tr>
<tr>
<td>7</td>
<td>Project Management and the PC</td>
</tr>
<tr>
<td>8</td>
<td>Quality Audits</td>
</tr>
<tr>
<td>9</td>
<td>Statistical Methods for Quality Improvement</td>
</tr>
<tr>
<td>10</td>
<td>Identifying and Developing the Individual Competencies that Matter to High Performance</td>
</tr>
<tr>
<td>11</td>
<td>Learning to Design, Implement and Manage a World-Class Performance Management System</td>
</tr>
<tr>
<td>12</td>
<td>Master Management Certificate program</td>
</tr>
<tr>
<td>13</td>
<td>Contract Writing and Legal Principals for Purchasing Professionals</td>
</tr>
<tr>
<td>14</td>
<td>Management Certificate Program for Supervisors</td>
</tr>
<tr>
<td>15</td>
<td>Maintenance Management Certificate program</td>
</tr>
<tr>
<td>16</td>
<td>Certified Purchasing Manager Review Course</td>
</tr>
<tr>
<td>17</td>
<td>Safety Engineering: Principles and Practices</td>
</tr>
<tr>
<td>18</td>
<td>Identifying and Developing the Critical Components of Successful Business Communication</td>
</tr>
<tr>
<td>19</td>
<td>Using Business Communication Knowledge to Improve Performance</td>
</tr>
<tr>
<td>20</td>
<td>Implementing Specific Business Communication Tools</td>
</tr>
<tr>
<td>21</td>
<td>An Overview of Organization Development and Change Management</td>
</tr>
<tr>
<td>22</td>
<td>Building and Facilitation and Process Consultation Skills</td>
</tr>
<tr>
<td>23</td>
<td>Implementing OD Interventions</td>
</tr>
<tr>
<td>24</td>
<td>Implementing the Action Research Model</td>
</tr>
</tbody>
</table>
Section 5
Summary and Conclusions

This report has documented a pilot program to develop a technology transfer program for UTCA. The work was accomplished by researchers from all three UA system campuses, in cooperation with UAB Engineering Professional Development (EPD).

The objectives of this project were:
- To develop a pilot program for technology transfer of UTCA research results,
- To develop a strategic plan for UTCA technology transfer short courses, and
- To launch the UTCA technology transfer program with an initial offering of three strong courses.

Overall, the 2000 UTCA technology transfer program was highly successful and well received by the intended audience. Approximately 62 participants enrolled in the four courses offered. Considerable information was obtained on the best way to develop, schedule, publicize, and deliver courses.

Two important and useful products of this project are the UTCA course catalog and technology transfer strategic plan.

Course Catalog
A course catalog was developed through a survey of faculty in the Departments of Civil and Environmental Engineering on the three UA system campuses. The catalog is based on the courses offered in the 2000 program, short courses that have previously been developed and offered by UA system faculty, and new courses proposed by faculty. The catalog is provided as Appendix B of this report. So far, the offerings in this catalog have been proposed only within the area of civil engineering, but other disciplines should be incorporated in the future. In particular, investigators on UTCA projects should consider providing courses based on their UTCA-funded research.

The course catalog will be useful in developing the annual UTCA technology transfer program. In addition, organizations (such as ALDOT) that wish to arrange a short course or other training may consult this catalog and contact UTCA to make suitable arrangements.

This course catalog also complements UTCA’s educational mission. One- and two-day short courses may be used as a basis to develop elective and graduate level transportation courses. Similarly, new and existing transportation courses on the three UA system campuses may be used to develop short courses.
Plan
The results of the 2000 program were carefully reviewed by the research team to develop a draft plan for future technology transfer offerings. The recommendations are outlined in detail in Section 4. Key recommendations include:

- An annual program, involving all three UA system campuses as well as an administrative and coordinating organization such as UAB EPD.
- An annual level of UTCA funding of $50,000 ($15,000 to each campus plus $5,000 to an administrative and coordinating organization such as UAB EPD) is recommended to develop one new course per campus, plus delivery of the annual plan.
- Additional UTCA funding for course development can be obtained through proposals prepared by individual investigators.
- The schedule outlined in Table 4-1 can lead to a good annual technology transfer program. A consistent, predictable schedule will ensure that transportation professionals and stakeholders become familiar with the UTCA program over time, and become accustomed to looking for it.

Implementation of the draft plan will ensure a successful annual UTCA technology transfer program.
Section 6
References


Section 7
Acknowledgements

Considerable support was provided by industry partners for this year’s program. Personnel from Vulcan Materials provided considerable assistance in the development of “Use of Aggregates in Transportation,” particularly Don Powell, Charles Marek, Eric Ownby, Robin Graves, and Colin Arrand. The American Concrete Pavement Association, and the Southeast Chapter in particular, provided considerable support for “Concrete Pavement Restoration,” including supplying course materials worth $3,885 free of charge and providing Mr. James Mack as a course instructor.
Appendix A
Course Descriptions for 2000 Offering

Attached below is the text of the flyer that was used to promote the 2000 program. A similar version was placed on the UTCA web site. The flyer was prepared in two versions. A two-part version was sent to the UTCA list. The three-part version, including the courses indicated as being on the third section below, was sent to a wider audience.

Engineering Professional Development
Fall 2000
Transfer of Transportation Management and Safety Technology

Sponsored By:
UAB Engineering Professional Development
The University Transportation Center for Alabama
UAB Civil and Environmental Engineering Department

The University Transportation Center for Alabama (UTCA) encompasses the University of Alabama, the University of Alabama at Birmingham, and the University of Alabama in Huntsville. UTCA seeks to transfer the latest technologies in transportation safety, management, and related topics. Courses to meet this objective are taught by faculty from the three UTCA campuses and by outside speakers.

Use of Aggregates in Transportation
Aggregates have many important uses for highway construction and other transportation applications. This course is intended to help transportation professionals make the best use of local materials and ensure economical and durable construction. Course topics include sources and manufacture of aggregates, basic properties of aggregates, aggregate sampling and test methods and procedures, structural behavior and performance of aggregate layers, aggregate selection and use in Portland cement and asphalt concretes, aggregate requirements of Superpave, and uses of aggregates for drainage, filtration, and erosion control. Fee includes course notes and course texts from the National Stone Association, The Aggregate Handbook and The Aggregate Handbook Supplement.

N. Delatte EGR1409A00 Two Days
Birmingham AL –, September 28, 2000, Thursday , 8:30-4:40 pm, Continuing Education Center
$150.00 .75 CEUs
*All course materials, breaks, lunch and parking included in course fee.

Intelligent Transportation Systems
Intelligent Transportation Systems (ITS) are emerging technologies applications, which involve the use of integrated communication and electronic technologies in improving safety and mitigating surface transportation problems. ITS programs usually involve joint public-private
ventures and partnerships, which are requiring a switch in paradigm regarding contracting services, maintaining/operating systems and training personnel to operate these systems. This seminar will provide public, private, and academic sectors with a state of the art review of ITS. This will include definition of ITS user groups and services and their potential benefits. This will be followed by identifying how these ITS technologies work including electronic technology descriptions for each technology. A systematic approach for evaluating what ITS can do for potential users (public and private sector) will be identified along with plans for financing and launching ITS programs. Finally, case studies will be analyzed regarding state of the art ITS programs throughout the world. The seminar will be a state of the art review of relevant references related to ITS.

J. McFadden EGR1410A00 Two Days
Birmingham AL –, October 12, 2000, Thursday, 8:30-4:40 pm, Continuing Education Center
$100.00 .75 CEUs
*All course materials, breaks, lunch and parking included in course fee.

Concrete Pavement Restoration
Many new techniques have been developed to restore functional and structural capacity of concrete pavements, including full and partial depth repairs, diamond grinding, joint resealing, and dowel retrofit. This course addresses the management decisions associated with strategy selection CPR as well as the techniques. Timely implementation of CPR is critical; therefore, the windows of opportunity for implementing the strategies will be discussed. Fee includes course notes and appropriate American Concrete Pavement Association documents.

N. Delatte EGR1411A00 Two Days
Birmingham AL –, November 2, 2000, Thursday, 8:30-4:40 pm, Continuing Education Center
$100.00 .75 CEUs
*All course materials, breaks, lunch and parking included in course fee.

Concrete Technology for Transportation Professionals
Course topics include materials selection (cements, aggregates, admixtures), use of supplementary cementitious materials such as fly ash, slag, and silica fume, mix design procedures and considerations, fresh concrete properties, hardened concrete properties, wear, durability, curing, construction procedures, high performance and other engineered concretes, and nondestructive testing of concrete. Fee includes course notes and Portland Cement Association Design and Control of Concrete Mixtures.

H. Toutanji EGR1412A00 Two Days
Birmingham AL –, November 9, 2000, Thursday, 8:30-4:40 pm, Continuing Education Center
$125.00 .75 CEUs
*All course materials, breaks, lunch and parking included in course fee.

AutoCAD Level 1
Master the latest release of AutoCAD 2000. Topics include menus, drawing editor, drawing commands, operating system, editing and display commands, basic dimensioning, crosshatching and text commands. Prerequisite: Basic understanding of drafting, computers and Microsoft Windows.

B. Chambless EGR1003A00
November 20 - 21, Monday & Tuesday, 8:30-4:30 pm, Hoehn Bldg. CPD Computer Lab, 1st floor  Two Days
$495.00  1.5 CEUs
*All course materials, breaks and parking included in course fee. Lunch on your own.

**AutoCAD Level II**
Advanced topics for AutoCAD 2000. Topics include filters, blocks and symbols, attributes for blocks, dimensioning, file management techniques, plotting techniques, multiple drawings, use of macros and script files and external references. Prerequisite: AutoCAD Level I or equivalent experience.
B. Chambless EGR1004A00
December 7 - 8, Thursday & Friday, 8:30-4:30 pm, Hoehn Bldg. CPD Computer Lab, 1st floor  Two Days
$495.00  1.5 CEUs
*All course materials, breaks, and parking included in course fee. Lunch on your own.

**Project Management**
Objectives: Adapt strategies from the field of project management for use at all levels of leadership. Develop specialized knowledge and analysis skills for guiding group productivity. Recognize the different approaches taken for group and individual projects. Manage multiple projects. Generate maximum staff performance and quality at minimum cost by using special motivational tools taught in this class. Maximize staff resources and time for optimum efficiency.
Who should attend: This workshop is designed for those who are responsible for delivering projects of all sizes on time and within a budget. Anyone who manages or supports projects in service, manufacturing, engineering, construction, software development or R&D industries will benefit from attending.

**Course Outline**
What is group productivity
- The difference between group and personal productivity
Writing successful project objectives
- Project vs. process, time and task management
- The division of labor principle: strategy vs. tactics
- The special problems of R&D projects
- Avoiding the "never-ending" project
- Dealing with multiple projects
Mastering the art of task definition
- The right (and wrong) way to define a task
- Efficient activity vs. maximum productivity
- Analyzing complex task relationships: successors, predecessors, leads and lags
- Understanding critical path
- Why predecessor task does not always come first
Effective use of project planning and tracking tools
- Gantt, pert, work breakdown structure, milestones and project baselines
- How to systematically integrate resource and cost factors into your plan
- Software tools for project management
Understand how to keep the staff pointed in the right direction for maximum productivity

R. Parker EGR1901A00 Two Days
Birmingham AL – December 11-12, Monday & Tuesday, 8:30-5 pm, Continuing Education Center
$595.00 1.5 CEUs
*All course materials, breaks, lunch and parking included in course fee.

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The University Transportation Center for Alabama (UTCA)
The University of Alabama at Birmingham Engineering Professional Development (EPD)
Southeast Chapter American Concrete Pavement Association

Other EDP courses offered in early 2001 (dates to be determined):
Fundamentals of Engineering Review (EIT), 11 classes, $595.00, 4.4 CEUs
Civil Engineering Review, ten classes, $595.00, 3.0 CEUs
AutoCAD , two days, $495.00, 3.0 CEUs
Reinforced Concrete Design, 2 days, $895.00, January 24-25, 2001, Las Vegas NV

The following courses were on the removable panel. These were not included in the two-part UTCA special brochure.

Reinforced Concrete Design
Objectives: This basic design course, using the latest codes, is intended for those with a civil or architectural engineering degree (or its equivalent) who are currently involved in reinforced concrete engineering work. The seminar will incorporate illustrated lectures and classroom discussions with computer demonstrations. The lectures are presented by two of the foremost experts in the field. After you complete the program, you will be able to produce design results for concrete beams, slabs, columns, footing, and retaining walls using the latest codes. Specific background knowledge of structural engineering is required. Lecture notes, example solutions and code information will be furnished to each participant.
Who should attend: If you need an introduction to concrete design, or if you are a designer who wants to update your skills or if you need a review of the new code, this course will prove to be invaluable.

The course will also include a demonstration of the computer package “RCPCDH,” which is composed of a large variety of computer programs for enhancing the design productivity of the engineer. Programs include: beam sizing, joist design, development length, rectangular and circular columns, deflections, torsion design, footings, pile caps, retaining walls and more.

Course Outline
1) Introduction
   a) Materials
   b) Review of new Codes and Specifications
   c) Load and Strength Reduction Factors
d) Strength Design Relations

2) Flexure
   a) Singly Reinforced Rectangular Sections
   b) Compression Reinforcement
   c) Flanged Sections
   d) One-Way Slabs
   e) Crack Control

3) Shear
   a) Shear Stress and Diagonal Tension
   b) Shear Strength of Beams
   c) Design of Beams for Shear
   d) Proportioning of Web Reinforcement
   e) Torsion

4) Development of Reinforcement
   a) Embedment Length
   b) Bond Failure Mechanisms
   c) Bar Cutoffs
   d) Hooks
   e) Splices
   f) Compression Bars

5) Continuous Beams
   a) ACI Code Coefficients
   b) Analysis and Design of Continuous Beams and One-Way Slabs
   c) Details of Reinforcement

6) Deflections
   a) Deflection Limits
   b) Effective Moment of Inertia
   c) Time Effects

7) Columns
   a) Strength of Axially Loaded Members
   b) Design of Short columns
   c) Combined Bending and Axial Load
   d) Interaction Diagrams
   e) Length Effects
   f) Moment Magnification Factors
   g) Design of Long Columns

8) Footings
   a) Shear and Flexural Behavior
   b) Design of Square, Rectangular and Combined Footings

9) Computer Aided Design/Programs

R. Furlong & F. Fouad EGR1402A00
January 24 –25, 2001, Wednesday & Thursday, 8:30-4:30 pm, Tropicana Hotel, Las Vegas
Nevada Two Days
$795.00 1.5 CEUs
*All course materials, breaks, lunch and parking included in course fee
**Industrial Ventilation Conference**  
The Industrial Ventilation Conference is designed to combine lectures with problem sessions on how to design ventilation systems that will provide the desired control over the in-plant environment as well as meet the constraints of air pollution control and energy limits. The purpose of this conference is to help you provide ventilation that is effective and economical through proper application of established principles.  
Two dates:  
R. Hunter & Staff  EGR1900A00  
October 2- 6, 2000, Monday-Friday, 8-5 pm, UAB Continuing Education Center, Birmingham AL, Five Days,  
$545.00 3.2 CEUs  
June 25- 28, 2001, Monday -Thursday, 8:00-5:00 pm, Tropicana Hotel, Las Vegas Nevada, Four Days  
$595.00 3.2 CEUs  
*All course materials, breaks and three lunches included in course fee*

**Lightning Protection of Buildings**  
This nonmathematical course is designed for individuals who have limited background related to lightning protection and will provide information related to the phenomena of lightning, with a significant portion of the course devoted to the methods of protecting buildings and equipment from lightning damage. Incorporated into this class are the NFPA Standard 780 Lightning Protection Code, Lightning Protection Institute Standard 175, NFPA Standard 70 – National Electric Code 1999. A 25-question quiz and set of plan drawings are used for “hands-on” design practice.  
S. Owen  EGR1354A00  
Birmingham AL – December 11-12, Monday & Tuesday, 8:30-4:30 pm, Continuing Education Center, Two Days  
$495.00 1.5 CEUs  
*All course materials, breaks, lunch and parking included in course fee.*

**National Electrical Code® 1999**  
This program outlines the requirements of the National Electrical Code®, and provides basic instructions on the 1999 Code. We will discuss rules to minimize the risk of electricity as a source of electric shock and as an ignition source of fires and explosions. What the purpose and scope of the NEC® is and what are the implications for you and your company. How to select and size conductors for different applications, physical environments and layouts. When and where ground fault protection of equipment is required by the NEC®. The most significant changes made to the 1999 NEC®. Grounding requirements for building services. What the NEC® terms “class”, “divisions” and “group” mean, and what their implication is in the design, installation and maintenance of electrical systems in hazardous classified locations.  
S. Owen  EGR1352A00  
Birmingham AL – December 13-14-15, Monday, Tuesday & Wednesday, 8:30-4:40 pm, Continuing Education Center, Three Days  
$795.00 2.1 CEUs  
*All course materials, breaks, lunch and parking included in course fee.*
**Plumbing Code Exam Review**
This is a two-day intensive review to help you prepare for the Journeyman or Masters exam. The course is designed for those working toward their state certification, SBCCI certification, persons who install and estimate jobs or supervisors of this work.
R. Glaze  EGR1150B00
Gulf Shores AL - October 14 - 15, 2000, Saturday & Sunday, 8-4:30 pm, Two Days
$245.00  2.4 CEUs

**Standard Gas Code Exam Review**
This is a two-day intensive review to help you prepare for the Journeyman or Masters Gasfitters exam. The course is designed for those working toward their state certification, SBCCI certification, persons who install and estimate jobs or supervisors of this work.
R. Glaze  EGR1151A00
Birmingham AL - October 7 - 8, 2000, Saturday & Sunday, 8-4:30 pm, Two Days
$245.00  2.4 CEUs

**How to Register:**
By Phone:  (205) 934-8994
By Fax:  (205) 934-8437
Web Site:  [http://www.eng.uab.edu/epd/](http://www.eng.uab.edu/epd/)

By Mail:  UAB School of Engineering, Professional Development, Hoehn 100, 1530 3rd Ave. S.,
Birmingham, AL 35294-4440

**Fees**
All fees are due by program start date. Daytime program fee includes program materials, parking, and breaks. Lunch is included for the four courses listed. If you have six or more, call David Eckhoff for corporate training pricing, at (205) 934-8268. Full-time registered UA, UAB, and UA students receive a 40% discount.

**Cancellation Policy**
Cancellations can be made up to five working days prior to course start date to receive a refund. Failure to attend without notification requires us to charge to full fee. Substitutions may be made at any time. Please call if you need assistance.

**Special needs**
If you have special needs due to a disability, please call David Eckhoff at (205) 934-8268.

**Registration Form:**
Name:  
Employer:  
Work Phone:  
Home Phone:  
Mailing Address:
Course/Seminar Title:
Course #:
Fee:
Payment method: Check ___ Cash ___ P.O. ___ Third Party ___
       Visa ___ Mastercard ___ Discover ___

ATTN:
Credit Card #:
Expiration Date:
Signature:
Appendix B
UTCA Technology Transfer Course Catalog

One-day and Two-day courses for the UTCA technology transfer are listed below. These include courses previously developed and offered by UA system faculty, as well as those proposed for future development. Courses are classified as safety, management, or other. Some marketing information is also included.

One-day Courses
For descriptions of “Use of Aggregates in Transportation,” “Concrete Pavement Restoration,” “Concrete Technology for Transportation Professionals,” and “Intelligent Transportation Systems”, see Appendix A.

Title: Structural Reliability for Transportation Designs
Instructor: Shen-en Chen
Course description: Reliability is a probabilistic approach to quantify the potential success of a structure to provide the design needs throughout the intended service period. By considering the randomness of the system factors, reliability can be used as a quantitative measure of the design philosophies, such as the Load Resistance Factor Design (LRFD). Hence, it is important for engineers to understand the fundamentals of system reliability. This short course is intended to help structural engineers who are involved in the designs of the transportation systems to incorporate reliability concept into their design with the latest advancements in system reliability concepts and steel member connections. The course content includes system reliability and component reliability, review of probability, LRFD design philosophy for steel structures, recent advancements in steel component connections.
Category: Safety.
Target Audience: Structural Engineers

Title: Traffic Impact Analysis
Instructor: Steven L. Jones, Jr.
Course description: The course will cover the "what, why, and how" of traffic impact studies for private development. The course will address data collection procedures and technologies, sources of existing traffic data, and guidelines to determine how much and what types of data are needed. Analytical techniques will be covered including: trip generation, trip distribution, trip assignment, projection of traffic growth, and capacity analyses of existing and projected future scenarios. The course will also address the reporting of results. The course will serve two primary goals in that it will present an overview of how to conduct a traffic impact study as well as what to expect from one as a reviewer.
Category: Management
Target Audience: Engineers and land developers from private industry that are interested in conducting traffic impact analyses or are required to provide them as part of their submission to planning and zoning commissions. Individuals from public organizations such as municipal, county, and state engineering departments, planning and zoning representatives, and interested political officials.
Title: Principles of Traffic Control
Instructor: Steven L. Jones, Jr.
Course description: The course will cover aspects of traffic control including residential traffic calming, roadway signing, and intersection control (unsignalized & signalized). The concept of residential traffic calming will be addressed along with specific techniques and examples of successful installations. A brief summary of the Alabama Manual on Uniform Traffic Control Devices (MUTCD) will be presented. The use of engineering judgment in interpreting the MUTCD and designing signing applications for special situations not explicitly addressed in the MUTCD will be covered. The MUTCD warrants for installation of stop or signalized control at intersection will be presented. Additional considerations to intersection control such as advanced warning degree of control (two-way vs. four-way stop, protective vs. permissive left turns, etc.) will be addressed. The concept of metering freeway entrances (ramp metering), its pros and cons, and current status around the country will be presented.
Category: Management
Target Audience: Public and private sector engineers involved in the design and evaluation of traffic control installations. Interested public safety and political officials.

Title: County Bridge Evaluation and Replacement Workshop
Instructors: James Davidson, Norbert Delatte, Shen-en Chen
Course description: Addresses available solutions for evaluating, upgrading, and replacing county bridges.

Title: Stormwater Management
Instructor: Robert Pitt
Course description: Fundamentals of stormwater management, including receiving water effects, sources of pollutants, and suitable controls (and their performance) for typical situations.

Title: Biofiltration Control Practices
Instructor: Robert Pitt
Course description: This workshop will build on the introductory stormwater management workshop. Biofiltration controls for stormwater are becoming increasingly popular and common due to their low cost and suitability for many conditions. This workshop will address locating and sizing of biofiltration controls, including grass swales, rain gardens, and other upland infiltration devices.

Title: Construction Site Erosion Control
Instructor: Robert Pitt
Course description: Review the fundamentals of erosion and sediment control, especially minimizing areas being disturbed, upslope diversion, on-site mulching and other site protection tools, and downslope controls including filter fences and sediment ponds.

Title: Detention Pond Design
Instructor: Robert Pitt
Course description: The design of detention ponds for water quality and quantity objectives for different performance goals and site conditions.

Title: Concrete Repair
Instructors: Houssam Toutanji, Norbert Delatte
Course description: Addresses evaluation and repair of concrete structures and infrastructure.

Title: Nondestructive Testing
Instructors: Norbert Delatte, Shen-en Chen
Course description: Using the latest NDT techniques to evaluate structures and infrastructure.

Title: Design and Construction of Concrete Overlays
Instructor: Norbert Delatte
Course description: Design and construction of bonded and unbonded concrete overlays for existing concrete and asphalt pavements.

Title: Concrete Pavements and Overlays for Airfields
Instructor: Norbert Delatte
Course description: Thickness design procedures for concrete runways, taxiways, and aprons. Includes small (general aviation) airfields.

Title: Highway Pavement Design
Instructor: Norbert Delatte
Course description: Thickness design procedures for highway pavements by 1993 AASHTO, Asphalt Institute, and PCA procedures.

Title: Concrete Engineering of Streets and Local Roads
Instructor: Norbert Delatte
Course description: Design and construction of concrete pavements for the urban environment.

Title: Concrete Pavements for Parking Lots and Industrial and Multimodal Facilities
Instructor: Norbert Delatte
Course description: Pavement design and construction for light- and heavy-duty applications, including Roller Compacted Concrete (RCC).

Two-day Courses
Title: Workshop on Effective Watershed Management Assisted by the Source Loading and Management Model (SLAMM)
Instructor: Robert Pitt
Course description: The purpose of this low-cost workshop is to introduce local watershed planners and stormwater engineers, and other interested individuals, to new management tools and techniques. Historical watershed and stormwater management approaches will be reviewed, with an emphasis on what has been successful and what has not worked as well as expected. Emerging and encouraging technologies will also be described. Special emphasis will be placed on local issues, especially local receiving water problems associated with wet weather flows, and the role that stormwater plays in TMDL evaluations. Past and current UAB stormwater research,
and how it integrates with watershed evaluations, will be described, especially as to how the results are being used in stormwater management practice around the country. Several computer sessions during the workshop will use the Source Loading and Management Model (SLAMM) as a tool to enable quantification of stormwater discharges for different development and control scenarios for small sites to large areas in a watershed.

Day One:
1. Introduction and objectives of workshop
2. Watersheds and major source categories of pollutants
3. Trends and local sources of pollutants
4. Effects of stormwater on surface and subsurface waters
5. The integration of water quality and drainage design objectives

Computer workshop sessions on watershed approaches to stormwater management and quantifying general alternatives

Day Two:
6. Land development characteristics and source area controls
7. Retrofit stormwater control practices
8. Stormwater controls at the time of development
9. Evaluating and selecting controls

Computer workshop sessions on the evaluation of multiple practices for urban runoff control for small-scale sites and critical source areas

Title: Construction of Portland Cement Concrete Pavements
Instructor: Norbert Delatte
Course description: This course is based on materials developed by NHI/FHWA/ACPA on PCC pavement construction. This is part of the course listed as NHI 013133.