# CEE 561
## ENVIRONMENTAL ANALYSIS OF TRANSPORTATION SYSTEMS I

### Spring, 2002, TR 11:00 am - 12:15 pm, WS Speed Hall 106

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**Catalog Course Description:**

*CEE 561 Environmental Analysis of Transportation Systems (3). Prerequisite: CEE 360
An examination of the various impacts that transportation systems and projects may have
on the natural and human environment. Areas of study include noise, air quality, and water
resources. Relevant laws and regulations, as well as quantitative prediction models are
thoroughly considered.*

Text:   *The NEPA Book,* 2nd Ed., Bass et al, Solano Press

**Course Objectives:**

$   To develop understanding by the student that transportation systems and projects
    will have unintentional and normally negative impacts on the environment.

$   To assist the student in recognizing that these impacts must be considered as part
    of the project development process.

$   To provide the student with the legislative and regulative background needed to
    assess impacts.

$   To provide the student with the knowledge and tools to quantitatively analyze noise
    and air quality impacts.

$   To provide the student the opportunity to design a noise barrier system that will
    effectively reduce or eliminate noise impacts from an urban freeway.

**Course Schedule:**

Week  Day          Topic

1:    1/08         **Laws/Regs:** Introduction to Environmental Laws and Regulations in
                   Transportation; the US Code and Code of Federal Regulations
                   National Environmental Policy Act (NEPA) of 1969 and its effect on the
                   Transportation Project Development Process **(read pp. 1-23)**

2:    1/15         Council on Environmental Quality (CEQ) Guidelines **(read pp. 25-59)**
                   Modal Agency Implementation of the CEQ Guidelines **(read pp. 61-85)**

3:    1/22         Pollutant-specific Laws and Regs Affecting the Project Development
                   Process  **(read pp. 87-153)**
                   Take Home Exam 1 (Laws and Regulations)

**Air Quality:** Introduction to Air Quality; the National Ambient Air Quality Standards (NAAQS); Transportation's Impacts on Air Quality; Types of Emissions from Vehicles

4:    1/29    Air Quality Introduction – (cont.)

**Noise:** Introduction to Transportation Noise Analysis; Fundamentals of Acoustics

5:    2/05    Fundamentals (i.e., the *Physics)* of Transportation Noise;
Sources of Transportation Noise Modeling Highway Noise with TNM and STAMINA

6:    2/12    Noise Impact and Abatement Analysis; Noise Barrier Design
23CFR772 and Highway Noise Study Reporting Requirements

7:    2/19    Aircraft Noise Requirements of FAR Parts 36 and 150; Aircraft Noise and Land Use Compatibility Studies; Modeling Aircraft Noise with INM
Take Home Exam 2 (Noise)

8:    2/26    **Air Quality:** Introduction to CALINE3 and CAL3QHC
Pollution Dispersion Models; Gaussian Modeling

9:    3/05    Mobile emissions and Introduction to MOBILE5a
MOBILE5a

10:    3/12    Spring Break

11:    3/19    In-use Emissions and Field Investigations
MOBILE6

12:    3/26    Air Quality Legislation - Clean Air Act Amendments (CAAA); Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA); Transportation Equity Act for the 21st Century (TEA-21)

Transportation Conformity; Interaction of Transportation Demand Model with Air Quality Models; Specifics on Jefferson County; Interactions with other agencies

13:    4/02    **Water/Ecology:** Rivers and Harbors Act of 1899, Sections 9 and10; Coast Guard Permits

14:    4/09    Clean Water Act Amendments; Section 404 (Dredge and Fill) Corps of Engineers Permits; Review
Take Home Exam 3 (Air and Water/Ecology)

15:    4/16    Noise Barrier Project Presentations

Final Exam Period:    Presentations if needed

Grading will be on a strict 90 - 100 = A; 80 - 89 = B; 70 - 79 = C; and 60 - 69 = D.

There will be three take home exams, and, at my discretion, there will be a quiz each class. In addition, there will be occasional homework assignments that will count as part of the quiz portion of the grade. The quizzes will be designed to assure that the required reading is done, and that adequate notes are taken from the lectures. The take home exams will be comprehensive on each of the subject areas.

For air quality, there will be a MOBILE5a (or MOBILE6) and CAL3QHC project.

For noise, there will be a computer modeling team project using TNM or STAMINA, in which a noise study will be performed as per 23CFR772. The noise study project location will be a section of I-264 or other freeway in the Louisville urban area. A barrier design is required, as is a field measurement component to determine existing noise levels. The deliverable will include a report summarizing the study, with appropriate graphics. There will also be PowerPoint presentations during the final class period. All team members must significantly participate in all phases of the project. Teams will include two or three persons. Team membership and freeway section to be analyzed must be submitted by 2/21.

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| Quizzes & HW | 20% |
| Take Home Exams | 30% |
| MOBILE5a (or MOBILE6) & CAL3QHC project | 20% |
| Noise project | 30% |
| **Total** | **100%** |

**Contribution of Course to Meeting the Professional Component:** This course is an elective engineering course in the civil engineering proficiency area of transportation. The course involves engineering science and engineering design activity.

**Relationship of Course to Program Objectives:** This course seeks to meet the following CEE program objectives -

$       Provide an educational experience that prepares students for the challenges of the CEE profession that they will encounter during their professional careers.

X       Promote scholarship and hone problem-solving skills through an excellent curriculum.

X       Provide opportunities for students to exhibit leadership, display initiative, and develop team building skills.

$       Incorporate meaningful exercises using interdisciplinary concepts and pragmatic approaches to realistic problems into the educational matrix.

X       Provide exposure to proven current CEE technologies and to emerging techniques likely to be important in the future.

ABET Assessment

| | Outcome Assessment | How the outcomes were achieved |
|---|---|---|
| ABET category | Outcome specified in this ABET category | Course assignment or requirement as given in the course syllabus |
| 3a | ability to apply knowledge of math, science and engineering | Lectures on noise and air and Exams 2 and 3. Also, the noise analysis requirements of the final project. |
| 3b | ability to design and conduct experi-ments, as well as to analyze and interpret data | The noise measurement component of the final project. |
| 3c | ability to design a system, component, or process to meet desired needs | The submission of the final project in the form of a Noise Study Report as per 23CFR772. |
| 3d | ability to function on multidisciplinary teams | Does not apply to this course |
| 3e | ability to identify, formulate and solve engineering problems | Noise impact identification and barrier design components of the final project. |
| 3f | understanding of professional and ethical responsibility | Does not apply to this course |
| 3g | ability to communicate effectively | Presentation of the final project during the final exam period. |
| 3h | broad education necessary to understand impact of engineering solutions in a global and societal context | Does not apply to this course |
| 3i | recognition of the need for, and ability to engage in life-long learning | Guest lectures on air quality |
| 3j | knowledge of contemporary issues | Does not apply to this course |
| 3k | ability to use techniques, skills and modern engineering tools necessary for engineering practice | Use of calculators and personal computers for homework and the air and noise projects. |

| ASCE Outcome | How Achieved |
|---|---|
| Proficiency in: mathematics through differential equations, probability and statistics; calculus-based physics; and general chemistry | Lectures on noise and air and Exams 2 and 3. Also, the noise analysis requirements of the final project. |
| Proficiency in a minimum of four (4) recognized major civil engineering areas. The generally recognized majors areas of civil engineering have been identified by CC&A as the following: Structural, Geotechnical, Environmental, Transportation, Hydraulics/Hydrology/Water Resources, Survey/Measurement, Construction/Management | This course develops proficiency in the area of Transportation, and to a lesser extent, Environmental Engineering. |
| Ability to conduct laboratory experiments and to critically analyze and interpret data in more than one of the major recognized civil engineering areas | The noise measurement component of the final project requires data collection and interpretation in the Transportation and Environmental Engineering areas. |
| Ability to perform civil engineering design by means of design experiences integrated throughout the professional component of the curriculum | This course utilizes knowledge gained by the students in previous courses, including CEE 260, 360 and 460, as well as the math and science sequences. |
| An understanding of professional practice issues such as: procurement of work; bidding versus quality based selection process; how the design and construction professionals interact to construct a project; the importance of professional licensure and continuing | Does not apply to this course. |

| education; and/or other professional practice issues | |
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