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15. Supplementary Notes

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This is the third update to the FHWA University Course. Authors for the previous versions include: Jennifer L. Toole, Martin T. Pietrucha, Jeff Davis, Shawn Turner, Laura Sandt, Robert Benz, and Robert Patten. The first two versions were published as Report No. FHWA-RD-99-198 and FHWA-HRT-05-133, respectively.

16. Abstract

Universities play a critical role in preparing future professionals to address transportation challenges and build the knowledge and skills needed on their first day of employment. The FHWA Bicycle and Pedestrian Transportation University Course provides foundational knowledge and skills to prepare future transportation professionals to understand and address bicycle and pedestrian needs. The course materials may be used "as is" or customized to fit the needs of instructors teaching transportation topics to students studying engineering, planning, public health, public policy, or landscape architecture. These materials may also be used by practitioners interested in learning about the latest resources, best practices, and tools related to bicycle and pedestrian travel. The course materials include: 1 instructor guide, 21 lessons with speakers notes, 20 assignments/activity prompts, 1 menu of readings, and 1 menu of videos. The course spans a wide range of topics including an introduction to bicycling and walking issues, planning and designing for bicycle and pedestrian facilities, and supporting elements and programs. Through this course, students will:
1.) Understand historical influences, key processes, practices and contexts for decisionmaking in bicycle and pedestrian transportation.
2.) Develop a systems/holistic perspective for supporting safe, active, multimodal transportation.
3.) Explain the transportation needs and behavioral/user/vehicle profiles of different roadway users.
4.) Describe the underlying factors that influence transportation mode choice.
5.) Understand the core principles and processes for designing for people walking and bicycling.
6.) Apply critical thinking skills to evaluate alternatives for multimodal planning and design.
7.) Build skills in acquiring pedestrian/bicycle related data, applying analysis methods, and interpreting results.
8.) Acknowledge tradeoffs when applying various decisionmaking tools.
9.) Recognize the role of partnerships and cultivate leadership skills.
The course materials are available online through the FHWA Office of Safety and the Pedestrian and Bicycle Information Center.

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2019 FHWA Pedestrian and Bicycle Transportation University Course

Instructor Guide

Course Overview

The FHWA Bicycle and Pedestrian Transportation University Course is designed to help educators inspire the next generation of practitioners to support safe, vibrant, and multimodal transportation systems. Through this course, students will recognize the legitimacy of the bicycle and pedestrian modes; understand how policy, planning, and engineering practices can be improved to create a more balanced transportation system; and become familiar with basic policies, practices, tools, and design principles that can be used to create bicycle and pedestrian-friendly communities.

The enclosed materials represent a comprehensive update to course materials that were last updated in 2006. The course contains 21 PowerPoint slideshows with speaker notes and complementary materials including assignments, readings, and videos. The course materials are intended for use in graduate or undergraduate courses in civil engineering and/or urban/regional planning programs, but materials can also be incorporated into classes in public health, public policy and administration, and landscape architecture. The course spans a wide range of topics including an introduction to bicycling and walking issues, planning and designing for bicycle and pedestrian facilities, and supporting elements and programs.

Each PowerPoint slideshow is available individually along with any corresponding assignments. The 21 PowerPoint slideshows and 20 assignments (and supplementary materials) all also available as separate, complete sets. The assignments are numbered for the module they most closely align with.

Learning Objectives

If the course content is taught in full, students should meet each of the nine learning objectives listed below. These learning objectives can be used by course instructors in describing the overarching course goals in the syllabus or marketing materials for the course. Every course module is mapped to one or more learning objectives (Table 1).

1. Understand historical influences, key processes, practices, and contexts for decisionmaking in bicycle and pedestrian transportation.
2. Develop a systems/holistic perspective for supporting safe, active, multimodal transportation.
3. Explain the transportation needs and behavioral/user/vehicle profiles of different roadway users.
4. Describe underlying factors that influence transportation mode choice.
5. Understand the core principles and process for designing for people walking and bicycling.
6. Apply critical thinking skills to evaluate alternatives for multimodal planning and design.
7. Build skills in acquiring pedestrian- and bicycle-related data, applying analysis methods, and interpreting results.
8. Acknowledge tradeoffs when applying various decisionmaking tools.
9. Recognize the role of partnerships and cultivate leadership skills.

Table 1. Learning Objectives by Module

	Learning Objective								
Module	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Introduction to Pedestrian and Bicycle Transportation	X	—	—	—	—	—	—	—	—
The Benefits of Designing Streets for Walking and Bicycling	—	X	—	—	—	—	—	—	—
User and Mode Characteristics	—	—	X	—	—	—	—	—	—
Factors Influencing Mode Choice	—	—	—	X	—	—	—	—	—
Planning for Walking and Bicycling	X	—	—	—	—	X	—	—	X
Policies that Support Pedestrian and Bicycle Planning	—	X	—	X	—	—	—	—	X
Bicycle and Pedestrian Data for Planning	—	—	—	—	—	X	X	X	—
Designing for Walking and Bicycling	—	—	—	—	X	X	—	—	—
Strategies for Safer Speeds	—	X	—	—	X	—	—	—	—
Intersections	—	X	—	—	X	X	—	—	—
Safety Analysis	—	—	—	—	—	X	X	X	—
Facility and Network Analysis	—	—	—	—	—	X	X	X	—
Trails	—	X	X	—	X	X	—	—	—
Accessibility and ADA	—	—	X	—	X	—	—	—	—
Inclusive Public Engagement	X	—	—	X	—	—	—	—	X
Connections to Transit and Shared Mobility	—	X	X	—	—	X	—	—	—
School Travel	—	—	X	X	—	X	—	—	X
Temporary Facilities and Maintenance	—	—	—	—	X	—	—	—	—
Systems Perspectives	—	X	—	—	—	—	—	—	—
Leadership in Implementation	X	X	—	—	—	—	—	—	X
Equity in Pedestrian and Bicycle Transportation	X	X	X	X	—	—	—	—	—

X = key learning objective of module; — = learning objective not targeted by module

Course Modules and Assignments

The course material is spread across 21 modules. The modules are listed in a logical order, but instructors are encouraged to re-order the modules at their discretion and select the most relevant modules for their classes. Most modules include specific case study examples relevant to the module topic, including international examples and rural examples where possible. Some topics have key connections to concepts covered in other modules, and instructors are highly encouraged to help students understand these relationships by teaching the connected modules together. Such connections are highlighted in the speaker notes of the module presentations.

Each module is designed to stand on its own, but modules vary in length. The modules with the most material may require multiple class periods to cover in full. These larger modules are 6, 8, 9, 10, 11, 12, 13, and 14. Other modules may require less than a full class period to cover the material.

The assignments are designed to complement and enhance students' understanding of the module topics. There are two types of assignment descriptions provided: ***Full Assignments*** include detailed instructions for students, although instructors should still tailor the timelines, specific study locations, and other details. ***Assignment Prompts*** allow the instructor more flexibility to adjust the assignment parameters and scope to suit their class goals. Instructors should select as few or as many assignments as they feel their class can complete.

The following symbols show whether an assignment is recommended for completion in groups or individually and indicate whether the assignment involves a written deliverable, a presentation, and/or fieldwork outside the classroom:

- Group Assignment
- Individual Assignment
- Writing
- Presentation
- Fieldwork

1. **Introduction to Pedestrian and Bicycle Transportation: Past, Present, and Future**

   History of walking and bicycling in the United States from the 1800s to present, including events and policies that shaped the current state of transportation, mode share and safety trends, and emerging issues such as micromobility and automated vehicles.

   Assignment Prompt: Transportation Autobiography

2. **The Benefits of Designing Streets for Walking and Bicycling**

   Summary of research on how designing streets for walking and bicycling can help communities achieve common goals related to safety, equity, health, environmental stewardship, community vitality, and transportation efficiency.

   Assignment Prompt: Policy Brief

3. User and Mode Characteristics

Explores what makes active travel distinct from motorized transportation: the unique characteristics of pedestrians and bicyclists (their capabilities, vulnerabilities, needs, and behaviors) and differences in trip purposes. Includes special considerations for the bicycle (and e-bike) as a design vehicle and for historically underserved/underrepresented populations (seniors, women, children, people with disabilities, low English proficiency, lower income, etc.).

Assignment Prompt: Waypoint Tour

4. Factors Influencing Mode Choice

Describes the theory of mode choice decisions and factors that influence mode choice such as land use, access, and connectivity, and policies and regulatory systems that can affect behavior. Introduces some strategies like improved wayfinding and bicycle parking that support walking and bicycling by appealing to peoples' convenience, awareness of mode options, and enjoyment. Elements of the transportation system and infrastructure, which also influence travel behavior, are covered in more detail in subsequent modules.

Assignment Prompt: Community Mode Share Comparison

5. Planning for Walking and Bicycling

Fundamental module covering the planning process, common elements of bicycle and pedestrian master plans, and the purpose and rationale for creating plans. Special attention is given to the context in which planning takes place and the relationships between plans, engineering practice, and the policy environment. Planning activities like facility analysis, performance measurement, and public engagement are covered in subsequent modules.

Assignment Prompt: Local Ped/Bike Plan Evaluation

6. Policies that Support Pedestrian and Bicycle Planning

Emphasizes the need for performance measurement to support plan and policy evaluation and implementation, and measurement strategies and challenges. Provides examples of policies that can support pedestrian and bicycle transportation, including comprehensive policy initiatives like Vision Zero and Complete Streets, parking pricing, and international examples of supportive policies.

Assignment Prompt: Developing Policy to Support Local Planning Goals

7. Bicycle and Pedestrian Data for Planning

Introduces types and sources of environmental and behavioral data and their uses and limitations in pedestrian and bicycle planning (note: crash data is covered in more detail in the Safety Analysis module). In-depth discussion of bicycle and pedestrian counts and their collection and application, along with other relevant data such as mode share and data from emerging sources.

Full Assignment: Field Counting Exercise

8. Designing for Walking and Bicycling

Highlights where and why the traditional, car-centric engineering design approach falls short of creating safe, comfortable pedestrian and bicycle networks. Explores the relationship between vehicle throughput and nonmotorized travel and how tradeoffs affect the walking and bicycling environment. Context-sensitive design and safe systems principles for accommodating pedestrians and bicyclists with transportation infrastructure are covered. This is the main module for bikeway and walkway design.

Full Assignment: Corridor Observations

9. Strategies for Safer Speeds

Vehicle speed dramatically affects the chances of bicycle and pedestrian crashes and the seriousness of crash injuries for vulnerable road users. This module explores the traditional perceptions and rationale for speed limit setting (higher speeds thought to reduce congestion and delay) and presents new paradigms such as Vision Zero, which employs speed reduction as a key strategy to eliminate fatalities and serious injuries. Includes speed-reduction and traffic calming strategies through enforcement, education, and engineering.

10. Intersections

Geometric design, markings, and signalization strategies to improve bicycle and pedestrian safety and comfort at intersections, based on principles for designing for the needs of vulnerable users (slower vehicle speeds, separation from traffic, mutual visibility, predictable actions, minimized crossing distances, etc.).

Full Assignment: Observations and Design Recommendations

11. Safety Analysis

Introduces current methods of safety measurement and analysis for pedestrians and bicyclists and discusses their limitations. Covers crash data analysis and interpretation, crash modification factors (CMFs), and the road safety management process. Also explores challenges with balancing bicycle and pedestrian safety with other interests.

Assignment Prompt: Network Screening Exercise

Note: This assignment prompt takes an engineering-focused approach to safety analysis and is cued in the presentation slides. For instructors who choose to skip the more quantitative sections of this module, substitute ***Full Assignment: Pitching an Intervention (In-Class Competition)*** *from the Leadership in Implementation module for a simple activity that asks students to draw on their knowledge of safety analysis and design while employing presentation skills.*

12. Facility and Network Analysis

Builds on the content from the Bicycle and Pedestrian Data for Planning module to examine the strengths and weaknesses of metrics for network-level and facility-level analyses. Compares traditional level of service to bike/ped specific measures like bike/ped level of service and level of traffic stress. The role of network analysis is described in the context of project prioritization and the planning process. Includes multiple example of agency analyses.

Full Assignment: Bicycle Level of Service and Level of Traffic Stress Analyses

13. Trails

Review of literature showing the economic, environmental, and social benefits of trails, plus design principles for safe and accessible trails, effective trail crossings at roadways, and unique funding opportunities for trail projects.

14. Accessibility and the Americans with Disabilities Act (ADA)

Overview of the legal context and requirements for accessibility in the United States, including the Americans with Disabilities Act (ADA) of 1990 and the 2011 Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG). Includes considerations for how different types of disabilities affect travel and best practices for accessible sidewalks, crossings, intersections, and shared streets.

Full Assignment: Walkability Assessment/Audit

15. Inclusive Public Engagement

Public engagement is a key component of the planning process, but it can be challenging to create a meaningful, ongoing relationship that allows the public to be involved in plan and project decisions. Planners need to understand the expected levels of engagement and proactively address inequity when identifying stakeholders. This module introduces considerations and best practices to make public engagement processes more inclusive than traditional outreach processes, including examples of inclusive and creative outreach for bicycle and pedestrian projects.

Assignment Prompt: Reflection and Critique of Public Engagement Process

16. Connections to Transit and Shared Mobility

Planning for transit is linked to planning for bicycle and pedestrian travel. This module discusses the relationship between transit and active travel and introduces common transit design and planning challenges that affect access, equity, and safety including: first and last mile accommodations, bus stop siting and design, and curbside management. This module also considers ways that shared mobility (i.e., carsharing, ridesourcing, and micromobility) is shifting active travel behaviors.

17. School Travel

Discusses changes in school travel patterns and mode share over the last decades. Introduces Safe Routes to School and how school site selection and school zone design influence school travel. Presents strategies for encouraging active travel to school through environmental design, policy, and programming.

Assignment Prompt: School Arrival and Departure Field Observations

Assignment Prompt: School Policy Briefs

18. Temporary Facilities and Maintenance

The maintenance of bicycle and pedestrian facilities is critical to ensuring the full potential of these investments, just like any transportation investment. This module describes common bike/ped facility maintenance issues and practices to address snow removal, routine maintenance, and work zones/construction detours. Also discusses the use of temporary and interim projects, which are increasingly used by cities as a low-cost method to pilot new facilities or as incremental steps towards complete networks.

Assignment Prompt: Comparison of Policies

Assignment Prompt: Pedestrian Access During Construction

Full Assignment: Tactical Urbanism Project

*Note: The **Full Assignment: Tactical Urbanism Project** requires a significant time investment and will need to be started early in the semester or quarter.*

19. **Systems Perspectives in Ped/Bike Planning and Design**

    Introduction to systems terminology and theory applied to pedestrian and bicycle planning, policy analysis, and stakeholder engagement. Makes the case for systems thinking as a tool to understand complex relationships, identify new relationships and data sources, and support interdisciplinary collaboration.

    Assignment: The presentation for this module includes an in-class activity (approximately 30 minutes).

20. **Leadership in Implementation**

    Focuses on the importance of partnerships and relationship-building in bicycle and pedestrian project implementation, from framing to funding. Cultural sensitivity, transformative leadership, and communications framing are discussed as keys to collaboration across groups.

    Assignment Prompt: Media Portrayal and Perception of Pedestrian and Bicycle Crashes

    Full Assignment: Pitching an Intervention (In-Class Competition)

21. **Equity in Pedestrian and Bicycle Transportation**

    This module compiles relevant content from other modules to highlight the importance of equity considerations throughout all aspects of pedestrian and bicycle planning and design.

Menu of Readings

The menu of readings provides instructors with suggested readings for their class. Each module includes strongly recommended readings and optional, supplementary readings that provide additional information about subjects in the module.

Menu of Videos

The menu of videos includes resources that instructors may wish to show in class or provide to students to help illustrate concepts in the course. Videos include educational resources and case study examples of national and international projects. Most videos are between 1 and 10 minutes in length and can be easily incorporated into a lecture or assigned for individual viewing before or after a lecture.