



Human Factors Engineering Career Pathway Documentation

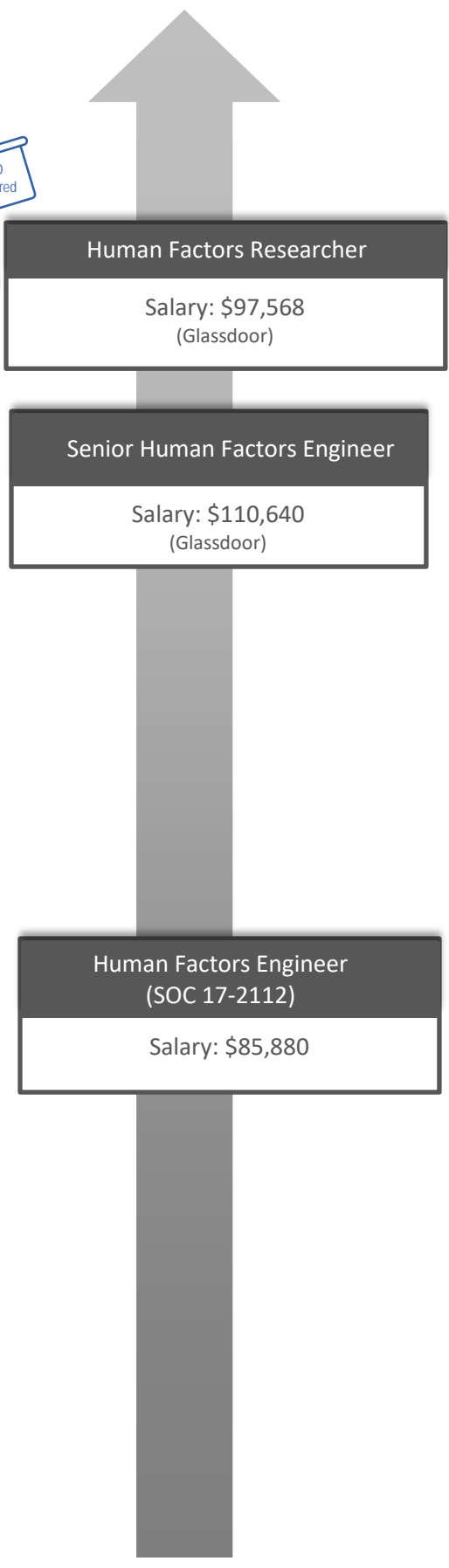

**Graduate Degree
Master's or PhD
Engineering**

With specialized research and/or coursework focused on human factors in transportation systems safety; vehicle safety design; safety data analysis and systems performance


Bachelor's Degree

With coursework in Human Factors/Systems/Industrial Engineering, Computer Science, Cognitive Psychology, Human-Centered Design, Research & Statistical Methods and specialized coursework, research, or other experience on transportation safety-related topics

PROGRAM OF STUDY



CAREER LADDER

Alternative Job Titles

Human Factors Researcher

Job Description

A Human Factors Engineer focused on transportation safety utilizes human factors principles to evaluate the interaction between the human element and transportation system elements to identify systemic risk and to design safety solutions. Human Factors Engineers must be able to recognize the capabilities and limitations of road users in terms of behavior choices and reactions to system elements, as well as how demographics influence safety outcomes. Based on knowledge of human factors principles, they investigate, design, and implement transportation system safety solutions; and utilize multiple strategies to integrate road safety and human factors data and analysis into transportation planning and design. Other duties include:

- Utilize psychological and other scientific research methods based on principles related to human behavior and performance to assess safety impacts of behavioral decision-making as well as appropriate mitigation measures.
- Analyze and integrate human performance or human factors related data and knowledge into transportation system design activities.
- Diagnose design deficiencies based on real-world driver behavior.
- Apply knowledge of environmental, cultural and other factors that influence behavior to the design and implementation of behavior change and safety culture enhancement strategies.
- Apply modeling and simulation skills as well as appropriate qualitative, quantitative, user-centered design, and predictive analytics methodologies to identify safety issues and to design solutions, including safety-enhancement devices and technologies.

Knowledge Requirements

- Psychology, Ergonomics, Systems Engineering
- Human Factors Engineering Requirements/Standards
- Road Safety Principles
- Experimental Design
- User Interface Design, Human-Computer Interaction, Interaction Design
- Analysis/Research/Report Methods
- Modeling and Simulation Techniques
- Statistical Theory/Methods
- Usability Analysis

Required Skills & Abilities

- Analyze Data
- Prepare Reports
- Written and Oral Communication
- Product Design, Usability Testing
- Project Management/Supervision
- Mathematical Analysis
- Complex Problem Solving
- Leadership

Technical Skills Requirements

- SPSS or other statistical software
- Adobe; Microsoft Office Applications;

Education & Work Experience

- Bachelor's degree accepted for some positions, but most prefer an advanced graduate degree.
- Professional Engineer licensure is required for many mid-level to senior positions. Engineer-in-Training (EIT) status is required for many entry-level positions.



Certifications

Beyond attaining Professional Engineering licensure, Human Factors Engineers can apply for a variety of additional professional certifications, which attest to the attainment of a body of knowledge and capability specific to the discipline. In the field of behavioral transportation safety, the Transportation Professional Certification Board (TPCB) has developed the Road Safety Professional Certification to recognize the attainment of a given level of practice and knowledge in road safety science.



Master's or Doctoral Degree in Industrial or Human Factors Engineering

Year 5-8

Years 6-8: Students complete electives and required research thesis or dissertation requirements for the degree.

Year 5: Students complete core and elective courses within their concentration while selecting specialized independent research activities.

Core Human Factors Courses

Human Factors Systems Design
Human Factors Research Design
Cognitive Psychology
Usability Engineering
Human Machine Interactions

Interdisciplinary Research Methods

Statistics: Experimental Design & Analysis; Regression Analysis
Psychology: Cognitive Psychology, Research Methods, Behavior Management
Human Factors: Research Methods

Core Transportation Courses

Transportation Safety
Transportation Systems Planning
Traffic Flow Modeling

Experiential learning includes research/lab work, design work, fieldwork



Bachelor's Degree in Industrial or Human Factors Engineering

Year 3-4

Year 4: Students may select electives in specific areas of interest and will fulfill internship, fieldwork, or senior capstone requirements. Core courses may include human factors design labs, human machine/human computer interactions, and systems or product design.

Year 3: Students take courses in different areas of Human Factors Engineering, to include experimental design, engineering statistics, mechanics, engineering psychology, and user-centered design.

GE Courses

Science, Social Sciences, Humanities, Arts & Foundational Core Courses

Human Factors Courses

Human-Centered Systems Design
Systems Modeling & Simulation
Design & Analysis of Information Systems
Engineering Psychology
Computational Methods

Transportation Safety-Related Courses

Transportation Safety
Risk Assessment

Experiential learning includes design courses, labs, internships & research



Bachelor's Degree in Progress or Associate's Transfer Degree in Pre-Engineering

Year 1-2

Year 1 and 2: Course requirements vary by institution. Students wishing to transfer into a 4-year degree program from a two-year Associate's degree should work with an advisor early on to ensure they take all pre-requisite courses for their intended major.

General Education Courses

Students will develop writing, communication, math, and critical thinking skills.

Transfer Program Prerequisites

Calculus & Differential Equations
Probability and Statistics
Chemistry
Applied Mechanics & Dynamics
Computer Programming

HF-Related Courses

Mechanics
Statistics
Psychology
Computer Technology/Programming

Experiential learning includes design labs/courses, internships, co-ops



High School Diploma or G.E.D.

Engineering or Computer Science CTE coursework if available.



Year 0

Experiential Learning & Professional Development Opportunities

Student professional associations provide professional development and networking opportunities to students, bridging coursework to practice. Many associations provide experiential learning opportunities like design/build or other student competitions; professional conferences and other networking opportunities, as well as student scholarships and other support. In addition, many institutions either require or strongly encourage work-based learning experiences for their students through internships and/or co-ops. Industry and education institutions can work together to ensure that safety-focused experiences and application of safety skills are an important component of these student development experiences. Examples of relevant human factors engineering experiential learning and professional development sources are provided below:

[Highway Safety Data Fellows Program](#)

The Federal Highway Administration and USDOT Secretary's Safety Data Initiative provide a fellowship program to examine safety among the most vulnerable road users including bicyclists and pedestrians.

[Strategic Highway Research Program \(SHRP\)](#)

The Transportation Research Board provides targeted student opportunities to implement and disseminate transportation safety research, such as through its SHRP student paper competition.

[National Association of Women Highway Safety Leaders, Inc. \(NAWHSL\)](#)

NAWHSL provides full-time female college students, interns, or employees with scholarships opportunities to attend the Annual Traffic Safety Leadership Conference.

[Traffic Safety Scholars Program](#)

The Traffic Safety Scholars (TSS) Program provides awards of up to \$1,000 to undergraduate and graduate students to help defray the cost of attending the Lifesavers Conference on Highway Safety Priorities. This conference provides opportunities to learn about highway safety issues from leading experts and network with the largest gathering of highway safety professionals anywhere in the country.

[National Highway Traffic Safety Administration \(NHTSA\)](#)

The mission of NHTSA is to save lives, prevent injuries, and reduce economic costs due to traffic crashes through education, research, and enforcement. NHTSA provides internship and career opportunities in safety data analysis, driving simulation research, and safety technology design.

[Human Factors and Ergonomics Society \(HFES\)](#)

HFES is the largest professional association for human factors/ergonomics professionals. Student chapters provide opportunities to encourage participation in the discipline and professional development.

[National Highway Institute \(NHI\)](#)

NHI provides trainings and education for highway professionals in order to improve the conditions and safety of roads.

[Intelligent Transportation Society of America \(ITSA\)](#)

The Intelligent Transportation Society of America advances the research and deployment of intelligent transportation technologies to save lives, improve mobility, promote sustainability, and increase efficiency and productivity. ITSA's Education & Advocacy resources include safety related information that may be useful to students. The annual conferences and ITS America Career Center also provide career-oriented resources for students. Students can become members of ITS America to tap into networking and other professional development opportunities through the organization.

[Summer Transportation Internship Program for Diverse Groups \(STIPDG\)](#)

The U.S. Department of Transportation (U.S. DOT), Federal Highway Administration's (FHWA) Office of Innovative Program Delivery offers internships to college students of various backgrounds. The objective of the STIPDG is to provide college/university students with hands-on experience and on-the-job training while working on current transportation-related topics and issues. The STIPDG is open to all qualified applicants but is designed to provide qualified women, persons with disabilities, and members of diverse groups with summer opportunities in transportation where these groups have been underrepresented.

[Dwight David Eisenhower Transportation Fellowship Program \(DDETFP\)](#)

The DDETFP awards fellowships to students pursuing master's or doctoral degrees in transportation-related disciplines. As a part of the fellowship program, each year fellows participate in the Transportation Research Board (TRB) Annual Meeting.

Innovative Strategies for Integrating Safety Competencies into Varied Programs of Study

A safety career pathway involves attaining specialized safety competencies within various traditional transportation programs of study. In addition to acquiring academic and technical preparedness within a broader field (e.g. Civil Engineering or Human Factors Engineering), students and incumbent workers on a safety career pathway will pursue research, experiential learning, on-the-job training and other work-based or real-world learning experiences focused on transportation safety. Examples of effective safety integration models are listed that provide curricular and co-curricular value to student safety career preparedness:

Co-Curricular

Transportation Agency/University Research Partnerships

Research partnerships between university faculty and state DOTs are proven sources for safety workforce development when they: 1) are implemented over the long-term; and 2) actively involve faculty and both undergraduate and graduate multi-disciplinary students in the implementation of safety research and project development.

On-Campus DOT Design Units

Many campuses partner with transportation agencies to provide on-campus internship experiences to undergraduate students in roadway design or traffic operations projects. These programs provide students with hands-on design experience and exposure to state DOT standards and practices while building a pipeline into transportation engineering careers.

Safety-Focused Work-Based Learning

Particularly in construction programs, many institutions either require or strongly encourage work-based learning experiences, which can be utilized to attain safety-focused experiences and to apply safety skills in the workplace.

Curricular

Engaged Scholarship

Most universities provide mechanisms to incorporate community projects into student coursework, either through senior design, capstone, or service learning courses. Engagement of transportation organizations with universities to provide safety-focused course-based projects can serve as a powerful student exposure and recruitment tool to safety career pathways. Some universities provide opportunities to scale up these types of engaged scholarship opportunities so that one agency partner can provide multiple projects over the course of an academic year.

Safety-Focused Course-Based Learning

Integration of safety topics and experiential learning into the classroom can be accomplished in various ways, including incorporation of safety-focused case studies and lab exercises into required coursework; and implementation of assignments that demonstrate understanding of safety principles and processes, through development of safety plans, safety data

analysis assignments, or implementation of accident investigations or safety audits. Job site visits and field trips have also been identified useful tools for promoting student interest in safety.

Students can design their own externship experience.

Competency-Based Curriculum

A curriculum that meets academic and quality standards, designed and organized by competencies required for jobs and cross-walked with industry skill standards and certifications, can be designed for safety. Job profiling and the use of "SMEs" should be considered to meet the competency needs of employers. The proliferation of industry-driven professional safety certifications can be used to facilitate this process. Programs of this kind may award credit for prior learning, allowing incumbent workers to achieve credentials by demonstrating knowledge and skills developed on-the-job.

Asynchronous Learning

Provide education and training for students and incumbent workers at times and locations convenient to students and employers, rather than instructors or institutions. This may include evenings or weekends, blended or "hybrid" delivery models, and delivery at off-campus locations.

Problem-Based Learning

Problem-based learning provides students with opportunities to solve real life problems, often in environments that replicate the workplace (e.g. design within constraints, working on multidisciplinary teams, etc.). Industry engagement with educators to provide real world problem examples and guidance on project constraints enhances student experience.

Work-Based and Experiential Learning

Incorporate opportunities for "learning-by-doing", including internships, co-op work experience, simulations, and team class projects that are assignments from local employers.



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