

Northwestern
CENTER FOR PUBLIC SAFETY

2024 / 25 COURSE CATALOG

Simply the Best.

Unsurpassed Public Safety
Education since 1936.

- ✓ LAW ENFORCEMENT
MANAGEMENT &
LEADERSHIP
- ✓ CRASH INVESTIGATION &
RECONSTRUCTION
- ✓ POLICE MOTORCYCLE
INSTRUCTOR TRAINING
- ✓ ONLINE, ON-GROUND



Find Your Next Class!

nucps.northwestern.edu

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NOTE: NUCPS tuition varies based on format and location. Please see specific course sections for tuition per student (registration.nucps.northwestern.edu).

Evolving with Technology *Nearly 90 Years of Unsurpassed Crash Investigation & Reconstruction Education*



Since our founding in 1936, Northwestern University Center for Public Safety has provided excellence in traffic crash investigation and reconstruction education — courses against which all others are measured.

Our internationally acclaimed courses evolve with advancements in vehicles, roadways, infrastructures, investigative technologies, and the corresponding educational needs of our students and their organizations. We continue to lead the education available for crash investigation and reconstruction professionals with an excellence only found at Northwestern University.



EARN ACTAR CEUs

Nearly 80% of NUCPS crash investigation and reconstruction classes are approved by the Accreditation Commission for Traffic Accident Reconstruction (ACTAR) for ACTAR CEUs.

THE CORE SEQUENCE

Our foundational series is the highest caliber program available for students who want to develop and master the essential skills and proficiencies that constitute the building blocks of crash investigation and reconstruction. Each course in this authoritative series builds on concepts and techniques acquired in the previous course(s) and is a prerequisite for the next class. Our sequence begins with an immersive introduction to essential crash investigation techniques, advances through key math and physics, and concludes with case study-driven reconstruction concepts and hands-on practice.

The Core Sequence

Crash Investigation & Reconstruction



COURSE FORMATS

- On-ground (80 hours / 2 weeks)
- Online (Asynchronous)

PREREQUISITES

None

CONTENT

- Comprehensive intro to crash investigation
- Collecting information from drivers & witnesses
- Vehicle inspection protocols and procedures
- Measuring & mapping the crash scene
- Creating sketches and post-crash diagrams
- Intro to Event Data Recorders

Follow the QR code to for Core Sequence course dates — or visit nucps.northwestern.edu/crashsequence.



1 CRASH INVESTIGATION 1

At-Scene Investigation

The moments immediately following a traffic collision are crucial, and only a well-trained crash investigator knows how to identify and collect the necessary information at the crash scene. That critical training begins with Crash Investigation 1.

Crash 1 is the authoritative NUCPS introductory course that sets students on the path to becoming proficient in the skills required to quickly, successfully, and confidently obtain critical physical evidence and driver and witness information. Our team of expert instructors teach students how to: properly obtain and document at-scene information and evidence; gather information from drivers, passengers, and witnesses; measure and map the crash scene; and, create sketches and after-crash diagrams. Crash 1 also introduces students to EDR technologies and how the data investigators collect are used in crash reconstructions.

Crash Investigation 1 is based on the most recent edition of our seminal text, *Traffic Crash Investigation*, which is included in the course tuition.

“[Crash Investigation 1] will make you think about crashes in a whole new way . . . Extremely informative and has good hands-on application. Once you finish with this course, you feel empowered to handle traffic crashes.” — Wayne R. Jakobitz, Jr., Bourbonnais (IL) Police Dept.

COURSE FORMATS

- On-ground (80 hours / 10 days)
- Online (Asynchronous)

PREREQUISITES

Crash Investigation 1

CONTENT

- Vehicle damage analysis (describing, reporting & determining direction of forces)
- Vehicle behavior in crashes
- Identifying and interpreting tire marks, road scars & other results of a crash on the road
- CDR Systems Operator course, including data downloading & preservation
- Technical report writing
- Lamp filament analysis
- Tire damage analysis & the role of tire failure
- Measurement methods, including perspective grid, photogrammetry, diagram drawing, aerial imagery & application to crash investigation
- Interpretation of data
- Specialized data gathering, measuring devices & other testing

2

CRASH INVESTIGATION 2

Technical Investigation

Traffic crash data is useful only if it is properly collected, interpreted, and analyzed. Participation in Crash Investigation 2 increases the at-scene investigator's professional skill set and enhances their credibility.

Students who successfully complete Crash Investigation 2 develop skills in technically preparing crash investigation data and collecting follow-up data required by reconstructionists, prosecutors, defense attorneys, claims adjusters, fleet supervisors, and highway safety engineers.

Crash Investigation 2 builds upon topics examined in Crash 1 and provides students with greater knowledge of the information available at the crash scene, how to properly collect that data, and how to initiate its interpretation. Like Crash 1, the course is rooted in the latest edition of our authoritative text *Traffic Crash Investigation* and emphasizes vehicle behavior in crashes, vehicle damage analysis, advanced mapping and evidence location skills, technical report writing, and proper preservation of digital evidence collected from collision investigations.

Instructors demonstrate use of such emerging technologies as mapping scenes and recording videos with drones and/or total stations. **Our CDR Systems Operator course is included within Crash 2**, and students who complete Crash 2 are certified to download and preserve data from EDRs.

ONE-TIME ONLINE!

CRASH INVESTIGATION 2 ONLINE ACCELERATED

DECEMBER 9 - JANUARY 17

Asynchronous and instructor led, this course covers the same curriculum as on-ground or online Crash Investigation 2 but in a condensed timeframe. Complete with assignment due dates and required contributions to course discussions, this course features an accelerated 4-week schedule as opposed to the standard 8 weeks for our online Crash 2. The course takes advantage of Northwestern University's Winter Recess, which occurs between weeks three and four, for students to continue homework and study. Instructors will be available for guidance during weeks one through four, although not during Winter Recess. Visit nucps.northwestern.edu/crashsequence to learn more.



COURSE FORMATS

- On-ground
- Remote Learning (Synchronous)

PREREQUISITES

Crash Investigation 1 & 2

CONTENT

- Order of operations
- Unit conversions
- Polynomial operations
- Solving algebraic equations
- Cartesian plane
- Slopes & intercepts
- Linear & quadratic functions
- Euclidean geometry
- Congruency & similarity
- Angle measurements
- Trigonometric definitions
- Pythagorean Theorem
- Vectors & their basic operations
- Basic & derived physics quantities
- Distance-velocity-acceleration relationships
- Intro to Newton's Laws of Motion

3

MATH & PHYSICS REVIEW FOR CRASH RECONSTRUCTION

(Optional, based on NUCPS approval)

Learn or review the basic and intermediate mathematics and physics required for success in Vehicle Dynamics and Traffic Crash Reconstruction 1 & 2.

This new course is designed for students who want to continue to Vehicle Dynamics, Traffic Crash Reconstruction 1 & 2, and other advanced reconstruction courses but need to learn — or refresh their knowledge of — the math and physics required for successfully participating in those courses, rather than struggling due to missing skill sets.

Lessons begin with the basics of high school-level math and physics and progress through intermediate concepts. Our course instructors review such fundamentals as perimeter and area, order of operations, angle measurements, and unit conversions before advancing to more complex topics, such as linear and quadratic functions, vectors, and more. Students learn the proper application of physics to equations in order to solve for velocity, acceleration, and distances of travel. Confidence and abilities are solidified with practice problems.

Scan to Register for a Core Course or Visit
nucps.northwestern.edu/crashsequence





COURSE FORMATS

- On-Ground (40 hours / 5 days)
- Remote Learning (Synchronous)

PREREQUISITES

Crash Investigation 1 & 2; Math & Physics Review for Crash Reconstruction

CONTENT

- Newton's Laws of Motion
- Friction and drag factor
- Basic equations of motion
- Solving for velocity, time, acceleration, and distance
- Momentum - collinear (in-line)
- Time-Distance Analysis
- More!

4 VEHICLE DYNAMICS

Vehicle Dynamics expands from the skills in Math & Physics Review for Crash Reconstruction to the advanced physics and math concepts as applied to traffic crash reconstruction. The course focuses on mechanics, the study of motion and forces, and the effects of such forces during a crash.

Vehicle Dynamics teaches the advanced math procedures and the applied physics necessary for Traffic Crash Reconstruction 1, Traffic Crash Reconstruction 2, and other advanced reconstruction courses.

Curriculum covers Newton's Laws of Motion and the proper use of physics principles for equations of motion to solve for velocity, time, acceleration, and distances of travel. Once these concepts are understood, instruction continues to vehicle braking, drag factors, and coefficients of friction and time-distance analysis.

Please note: Instructors assume that students possess working knowledge of the math and physics taught in Math & Physics Review for Crash Reconstruction.



COURSE FORMATS

- On-Ground (80 hours / 10 days)
- Remote Learning (Synchronous)

PREREQUISITES

Crash Investigation 1 & 2; Math & Physics Review for Crash Reconstruction; and, Vehicle Dynamics

CONTENT

- Engineering mechanics
- Equations of motion
- Vehicle behavior in collisions
- Principal direction of force
- Intro to human factors
- Time-distance analysis
- Conservation of momentum
- Oblique & collinear analysis
- Post-collision drag factors
- Newton's Laws of Motion
- Identifying & analyzing road marks
- Driver strategy & tactics
- Eight real-world case studies

5 TRAFFIC CRASH RECONSTRUCTION 1

Engineering Mechanics & Momentum

In Traffic Crash Reconstruction 1, students synthesize lessons from the previous four courses in order to learn to determine how a crash occurred.

Incorporating the latest edition of our seminal textbook ***Traffic Crash Reconstruction***, curriculum focuses on analyzing and interpreting information collected during previous stages of an investigation in order to describe — in as much detail as possible — the crash and the events leading to actual impact. Students apply the lessons from daily lecture material to real-world case study situations — an instruction format that provides students with the training necessary to reconstruct traffic collisions. After successfully completing this course, students will have the ability to reconstruct crash situations using momentum and mechanics.

A copy the latest edition of *Traffic Crash Reconstruction* is included in the course tuition.

ACTAR-Accredited
Professionals Earn
80 ACTAR CEUs



The Core Sequence

Crash Investigation & Reconstruction



6

TRAFFIC CRASH RECONSTRUCTION 2

Energy, Statistics & Data Event Recorders

COURSE FORMATS

- On-Ground (80 hours / 10 days)
- Remote Learning (Synchronous)

PREREQUISITES:

Traffic Crash Reconstruction 1

CONTENT

- Work & energy
- Damage energy
- Energy & momentum
- Force balance
- After-impact drag factors
- Occupant kinematics
- Heavy & light vehicle EDR usage in crash reconstruction
- Special velocity calculations, including sideslips, falls, vaults & flips
- Monte Carlo Statistical Analysis

Our series capstone course, Traffic Crash Reconstruction 2 (TCR2), is a continuation of the skills learned in Reconstruction 1. Drawing from the latest edition of *Traffic Crash Reconstruction*, this advanced course ties lecture material to hands-on analysis through daily, real-world case studies.

Students initially expand their understanding of crash reconstruction concepts and analyze collisions using conservation of energy. Instructors then move on to cover special velocity calculations for such situations as vehicle falls, flips, and rollovers. Students also learn basic skills for analyzing Event Data Recorder (EDR) information and how to apply such data to traditional reconstructions. Finally, students are introduced to the Monte Carlo Statistical Analysis and learn to solve momentum-based collision sequences using spreadsheet analysis.

Upon successful completion of this course, students will possess the ability to reconstruct crash situations using energy and statistical analysis of momentum-based collision reconstructions.



ACTAR-Accredited
Professionals Earn
80 ACTAR CEUs

Scan to Register for a Core Course or Visit
nucps.northwestern.edu/crashsequence



Crash Investigation & Reconstruction



COURSE FORMAT

- On-Ground (28 hours / 3.5 days)

PREREQUISITES:

Traffic Crash Reconstruction 1

CONTENT:

- Testing & demonstrations at a closed test facility
- Overview of current ADAS technologies
- The SAE Levels of Self-Driving Vehicles
- Identifying and examining ADAS and self-driving technologies
- Standards, protocols & performance parameters
- Liability & litigation
- Media & public perception
- Successes & challenges

ADVANCED DRIVER ASSISTANCE SYSTEMS FOR THE CRASH RECONSTRUCTIONIST

Major auto manufacturers are equipping their new vehicles with ADAS technology — and crash investigators, reconstructionists, attorneys, and other professionals need to “stay ahead of the curve” by learning how ADAS affects their investigations.

Exclusive to NUCPS, this dynamic new course offers a detailed look at the rapidly growing world of self-driving vehicles and ADAS and examines how these technologies impact your crash investigations and reconstructions.

Experience ADAS features on a closed test facility. Former Ford Motor Company auto design engineer, licensed professional engineer, and ACTAR-certified reconstructionist Alan Moore teaches participants how to determine if ADAS was installed, enabled, and functioned as designed in a vehicle associated with a crash. Moore demonstrates ADAS systems at work, and students obtain hands-on experience, even conducting tests and demonstrations at a closed test facility.

After 3-½ days, participants are able to:

- Use available electronic data specifically tailored for ADAS systems;
- Define performance parameters;
- Formulate a plan to approach accident reconstruction involving ADAS;
- Summarize ADAS technologies in current production and under development;
- Identify applicable state & federal regulations; and,
- Explain ADAS’ ethical and societal implications.



Learn More about Instructor Alan Moore



Crash Investigation & Reconstruction

ADVANCED CRASH RECONSTRUCTION UTILIZING HUMAN FACTORS RESEARCH

COURSE FORMAT

- On-Ground (40 hours / 5 days)

PREREQUISITES

Traffic Crash Reconstruction 1 & 2; Microsoft Excel proficiency is strongly encouraged

Obtain a better understanding of the human role in various crash scenarios and learn to compare and evaluate human actions. Curriculum includes: driver and pedestrian behavior; response and reaction times; delayed response; recognition and perception; nighttime recognition and impairment; and, more.

Participants are introduced to Driver Research Institute's Response cloud-based software. This research-based human factors tool helps analyze driver responses and is based on research by course instructor Dr. Jeff Muttart and other professionals. Students receive a 7-day trial of Response and learn how to incorporate it into their reconstructions.

CONTENT

- Perception-response time
- Interactive Driver Response Research (IDRR)
- Driver decision-making
- Nighttime recognition
- Gap acceptance for left & right turns
- Through movements for drivers, riders & pedestrians
- Pedestrian walking speeds
- Acceleration
- Lateral acceleration (swerving) for cars, motorcycles, and commercial vehicles
- Forward & backward accelerations
- Driver responses to traffic signals, deceleration choices, reaction time & probability of stopping
- More!

COURSE INSTRUCTOR

Jeff Muttart, M.S., Ph.D., is an internationally respected researcher in driver behavior and a recipient of the National Transportation Safety Board Award for Contributions to Safety and the Wallace Award for Excellence in Research. He is the author of more than 50 peer-reviewed articles on traffic safety and driver response in crash and near-crash events. A frequent conference speaker, he was the keynote speaker at WREX16.

INJURY BIOMECHANICS & TRAFFIC CRASH RECONSTRUCTION

COURSE FORMAT

- On-ground (24 hours / 3 days)

PREREQUISITES

None

Injury biomechanics explores the physical and physiologic responses to force. This captivating course offers an in-depth examination of injury biomechanics for investigators, reconstructionists, attorneys, and other professionals involved in vehicle crash investigation. Each topic discusses mechanism and method of injury, analysis, and tolerances. The thorough curriculum also covers vehicle-vs.-vehicle and vehicle-vs.-pedestrian collisions, the injury investigation, and advanced procedures for matching injuries to vehicle crashes. To further examine injury patterns, case studies are paired with lecture material specific to vehicle-vs.-vehicle crashes (front, side, and rear) and pedestrian-vs.-vehicle collisions.

CONTENT

- History of injury trauma & biomechanics
- Automotive safety systems, including seatbelts & airbags
- Mechanism of injury, methods, analyses & tolerances for head injury, neck injury & lumbar injury
- Upper & lower extremity biomechanics
- Vehicle-vs.-vehicle & vehicle-vs.-pedestrian impacts

COURSE INSTRUCTOR

Dr. Sean Shimada earned a Ph.D. from the School of Health and Rehabilitation Sciences, University of Pittsburgh, in 1998, and a second master's degree in Bioengineering from the university in 2000. Both degrees were in the field of biomechanics. Currently he is the President of Biomechanical Consultants, a forensic biomechanics and engineering firm. His primary area of consulting and research is focused on identifying, determining the likelihood, and preventing brain and spinal cord injuries. Dr. Shimada has authored over 70 peer-reviewed journal articles, conference proceedings, and abstracts in the field of biomechanics, medicine, and engineering. He has conducted several research studies and presented at such meetings and conferences as the Association for the Advancement of Automotive Medicine, International Society of Biomechanics, American Society of Biomechanics, and Biomedical Engineering Society.



ACTAR-Accredited
Professionals Earn
40 ACTAR CEUs



ACTAR-Accredited
Professionals Earn
40 ACTAR CEUs



Crashes involving heavy vehicles often encompass unique documentation and analysis. Their braking systems differ from those found in passenger vehicles, and semi-tractor/trailer combinations behave differently than single units. These specialized reconstruction courses exam the critical and unique elements of reconstructing collisions that involve these vehicles.

COURSE FORMAT

- On-ground (40 hours / 5 days)

PREREQUISITES

None

CONTENT

- Heavy vehicle nomenclature
- Braking systems
- Suspension systems
- Wheel systems
- Steering systems
- Proper forensic investigation methods



**ACTAR-Accredited
Professionals Earn
40 ACTAR CEUs for
either course**

COURSE FORMAT

- On-ground (40 hours / 5 days)

PREREQUISITES

Traffic Crash Reconstruction 1 & 2

CONTENT

- Field testing
- Braking & special components
- Off-tracking & rollovers
- Basic heavy vehicle EDRs
- Proper data collection
- Speed analysis
- Crash behavior, momentum & damage
- Computer analysis
- Heavy vehicle tire stamping

HEAVY VEHICLE FORENSIC MECHANICAL INSPECTION FOR COLLISION INVESTIGATORS

This lab-based, hands-on course features forensic investigation, proper documentation, and evidence preservation for crashes involving heavy commercial trucks. Curriculum includes lecture and hands-on experience with collision-damaged trucks. Forensic work is conducted on the braking, suspension, wheel, and steering systems. Instructors provide foundational information about each component, and students use that knowledge to mechanically examine and test damaged trucks. Additional hands-on training with undamaged trucks provides the opportunity to thoroughly understand components.

By course end, students can demonstrate the restoration of a damaged air-braking system on a heavy-duty truck back to its pre-collision condition for the purpose of collecting data for calculations that are used in evaluating braking efficiency. Students also master the identification of parts and pieces of steering and suspension systems and can clearly explain how the components may have factored into a crash.

HEAVY VEHICLE CRASH RECONSTRUCTION

Through lecture, field work, and case studies, this advanced course expands students' knowledge of heavy vehicle braking systems and behavior, including momentum and damage. The curriculum covers specific yet complex component issues that can be present in reconstructions involving these vehicles. Other course topics include rollovers, speed analysis techniques, and heavy vehicle EDRs. During multiple hours of field testing, students view demonstrations of various vehicle behaviors, examine braking and acceleration characteristics, and have the opportunity to practice analyzing and applying their collected data to reconstructions. Case studies show how various analytic techniques can be applied to real-world heavy vehicle crashes.

Crash Investigation & Reconstruction



COURSE FORMAT

- On-ground (32 hours / 4 days)

PREREQUISITES

Traffic Crash Reconstruction 1 & 2

CONTENT

- Labs with real motorcycles & sample evidence
- Rider performance & perception-response time
- Braking systems
- Acceleration behavior, calculations & gearing analysis
- Analysis of wheelbase reduction for determination of impact speed
- Sliding friction & angular momentum
- Rider & pillion vault analysis
- Event data recorders & dataloggers



**ACTAR-Accredited
Professionals Earn
32 ACTAR CEUs**

MOTORCYCLE TRAFFIC CRASH RECONSTRUCTION

In 2021, motorcycle operators accounted for 14% of all traffic fatalities, according to the NHTSA, which also reports that this is the highest number of motorcycle driver fatalities since 1975. This hands-on course teaches the skills required for advanced investigation of these often devastating crashes.

Course participants develop a firm understanding of motorcycle crash causation, inspection, and dynamics. Led by motorcycle reconstruction expert Louis Peck, students examine the unique characteristics and challenges that arise in collisions involving motorcycles and their operators. A dive into kinematics includes conversions and derivations of basic equations, and curriculum also covers simulation analyses for impact speed, Monte Carlo Analysis for speed ranges, and more.

Participants benefit from a combination of in-class lecture and practical lessons using real motorcycles and sample evidence.

COURSE INSTRUCTOR

As a forensic engineer and former Expert-level motorcycle road racer, **Louis Peck, M.S.**, offers a unique understanding of motorcycle dynamics. He is an ACTAR-certified motorcycle crash reconstruction expert, mechanical engineer, collision photogrammetrist, and published researcher. His “Glancing and Stopping Behavior of Motorcyclists and Car Drivers at Intersections” was published in the TRB Transportation Record in 2011; and, “Motorcycle Sliding Friction for Accident Reconstruction,” in 2014 (Proceedings of the 10th International Motorcycle Safety Conference, 2014: Cologne, Germany). At WREX16 his team conducted the first public crash test of Harley-Davidson motorcycles, which resulted in updated motorcycle impact-speed equations that were published by SAE in 2018. He earned his master’s degree in mechanical engineering from Worcester Polytechnic Institute and his bachelor’s degree in mechanical engineering from California State University, Fresno.

Crash Investigation & Reconstruction



COURSE FORMAT

- On-ground (40 hours / 5 days)

PREREQUISITES

Traffic Crash Reconstruction 1; Reconstruction 2 is encouraged

CONTENT

- Identifying & documenting information from the road, vehicle & body
- Investigating pedestrian & bicycle hit-and-run crashes
- Pedestrian motion as a result of a vehicle collision
- Pedestrian & bicycle crash reconstruction techniques
- Vehicle speed estimates
- Vehicle dynamics review
- Time-distance analysis
- Pedestrian / bicycle strategy & tactics
- Pedestrian visibility
- Lab / Field projects
- Case analysis / case studies

PEDESTRIAN & BICYCLE CRASH RECONSTRUCTION

Vehicle-vs.-pedestrian and vehicle-vs.-bicycle collisions often result in severe injuries to the pedestrian or bicyclist, escalating the importance of investigating and reconstructing these crashes. In this specialized course, students learn the mathematical equations for modelling such collisions and the appropriate formulas for varied crash scenarios.

Participants obtain the skills to determine first-contact positions of pedestrians, bicycles, and vehicles and to estimate the speed of a striking vehicle. Other course topics include human body motion as a result of an impact, empirical data for pedestrian walking and running, and bicycle collisions. Students also receive an introduction to injury biomechanics.

This course includes three valuable lab workshops. An outdoor, nighttime pedestrian visibility workshop exposes students to the different effects of illumination, luminance, and glare. Participants learn to discern the roles that visual acuity and contrast sensitivity play in the driving process. Other lab projects include developing data from pedestrian and bicycle velocities and studying drag factors of bodies on various surfaces.

After completing this course, students are able to:

- Determine first contact positions;
- Estimate the speed of a striking vehicle;
- Use appropriate equations to calculate vehicle speeds based on pedestrian, bicycle, and vehicle configurations;
- Understand human body motion as a result of an impact;
- Develop and use empirical data for pedestrian walking and running; and,
- Understand the bicycle collision.



**ACTAR-Accredited
Professionals Earn
40 ACTAR CEUs**

Crash Investigation & Reconstruction

TRAFFIC CRASH RECONSTRUCTION UPDATE & REFRESHER

COURSE FORMAT

- On-ground (40 hours / 5 days)

PREREQUISITES

Traffic Crash Reconstruction 1 & 2

Designed for those who completed Traffic Crash Reconstruction 1 & 2 more than three years ago, this course updates participants on industry advances and utilizes real-world case studies to refresh students' skills in the areas taught in Traffic Crash Reconstruction 1 and 2.

CONTENT

- Engineering mechanics
- Collinear momentum
- Oblique momentum
- After-impact drag factors
- Work & energy
- Damage energy
- Energy & momentum
- Force balance



ACTAR-Accredited

Professionals

EARN 40 ACTAR CEUs in

TCR Update & Refresher

or Using Excel in Collision Investigation

USING EXCEL IN COLLISION INVESTIGATION

COURSE FORMAT

- On-ground (40 hours / 5 days)

PREREQUISITES

Traffic Crash Reconstruction 1 & 2

Learn the valuable ability to use Microsoft Excel in crash investigation and reconstruction. Our course sets itself apart from general Excel courses with its focus on crash investigation and reconstruction rather than a general business environment.

In this hands-on class, students work in Excel the entire week, creating all of the spreadsheets they use in class. The week begins with basic Excel operations. By the end of the week, students will be able to complete such advanced Excel functions as writing macros, working complex "if" statements, creating form controls, and using goal seeker and solver.

CONTENT

- Basic & advanced spreadsheet operations
- Trigonometric functions
- Formatting cells & numbers
- Conditional formatting
- Naming cells & constants
- Working with names in functions
- Writing complex equations
- Using form controls
- Working with data validation
- Conditional / logical functions ("If" statements)
- Database operations
- Using goal seeker & solver

TRAFFIC RADAR / LIDAR INSTRUCTOR TRAINING

COURSE FORMAT

- On-ground (40 hours / 5 days)

PREREQUISITES

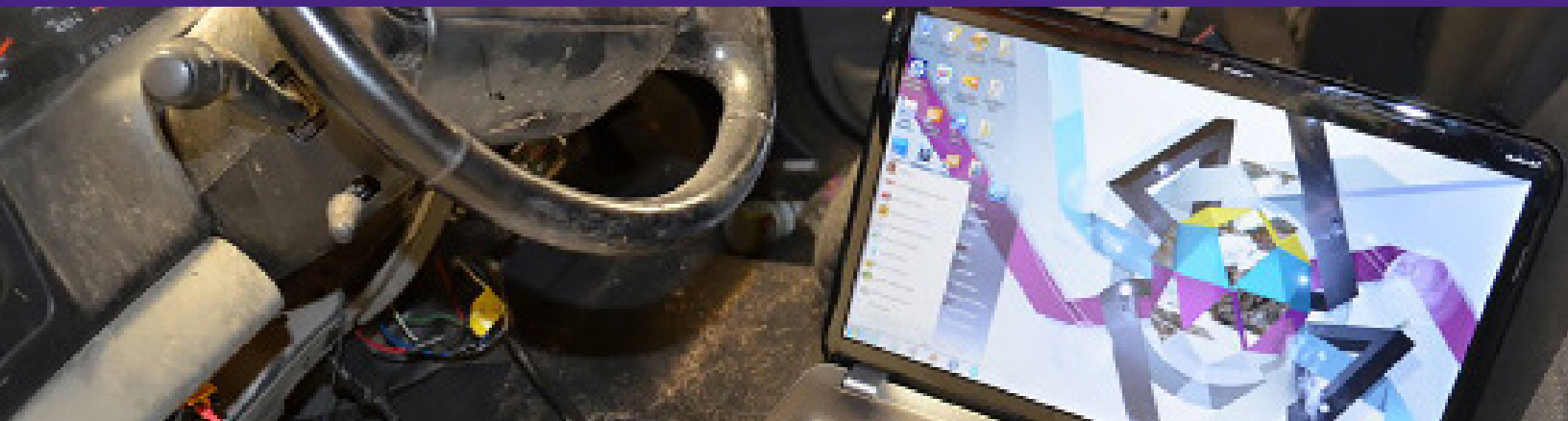
1 year RADAR / LIDAR experience

In this train-the-trainer course, students learn how to develop a RADAR / LIDAR operator course and how to instruct new operators in their agencies. In addition to instructional methodology and the technical and legal aspects of RADAR / LIDAR operation, this **NHTSA-approved course** also covers the latest information, content, and materials needed to successfully train new operators and features **practical field exercises** using the latest equipment. Material is provided in PowerPoint, including the course administrator manual, teaching outlines, and the student-operator manual.

CONTENT

- Instructional methodology
- LIDAR vs. RADAR technology
- Practical field demonstrations & exercises
- Field training & operator certification
- Speed & enforcement
- Stationary RADAR operation
- Moving RADAR / LIDAR operation
- Effects of RADAR & LIDAR
- Visual speed & range determination
- Legal aspects of speed measurement
- Administrative guides for speed enforcement

Crash Investigation & Reconstruction



CRASH DATA RETRIEVAL SYSTEMS OPERATOR

COURSE FORMAT

- On-ground (16 hours / 2 days)

PREREQUISITES

None



ACTAR-Accredited Professionals
Earn 16 ACTAR CEUs

This **hands-on, entry-level course** covers the Bosch CDR System and the Hyundai, Kia, and Tesla EDR systems. Instructors start with such basics as in-vehicle connections (DLC) and direct-to-module cables, add-on adapters, and software installation. Students then learn operation basics: determining if a vehicle is CDR supported; selecting the appropriate connection method to safely image data; using the CDR software app; saving imaged data for later use; and, creating reports.

Instructors emphasize in-vehicle connections wherever possible, plus potential impacts of direct-to-module access. The curriculum also includes back-powering methods and accessing vehicle owner's manuals. To develop operational fluency, students **practice using the Bosch CDR System and Hyundai and Kia EDR tools** to back power and image a variety of modules and vehicles.

CONTENT

- CDR / EDR system components & required tools
- Software installation / configuration
- Selecting the best method of access
- Software operation, step-by-step guides & nuances
- Common error messages & trouble-shooting steps
- Trouble-shooting connections
- Back powering
- Saving imaged data & generating reports
- Basic legal issues

ADVANCED COLLISION RECONSTRUCTION WITH CDR APPLICATION

COURSE FORMAT

- On-ground (40 hours / 5 days)

PREREQUISITES

Traffic Crash Reconstruction 1 & 2 and CDR Analysis & Applications

Explore advanced methods for analyzing CDR data in collision reconstructions. Drawing from the skills and lessons taught in Crash Data Retrieval Analysis & Applications, this class takes the data analysis further — with particular emphasis on how to properly use delta-v data to determine impact and post-impact velocities in various crash scenarios. Instructors incorporate a review of pre-crash and delta-v data from currently supported vehicles and may include additional updated CDR information.

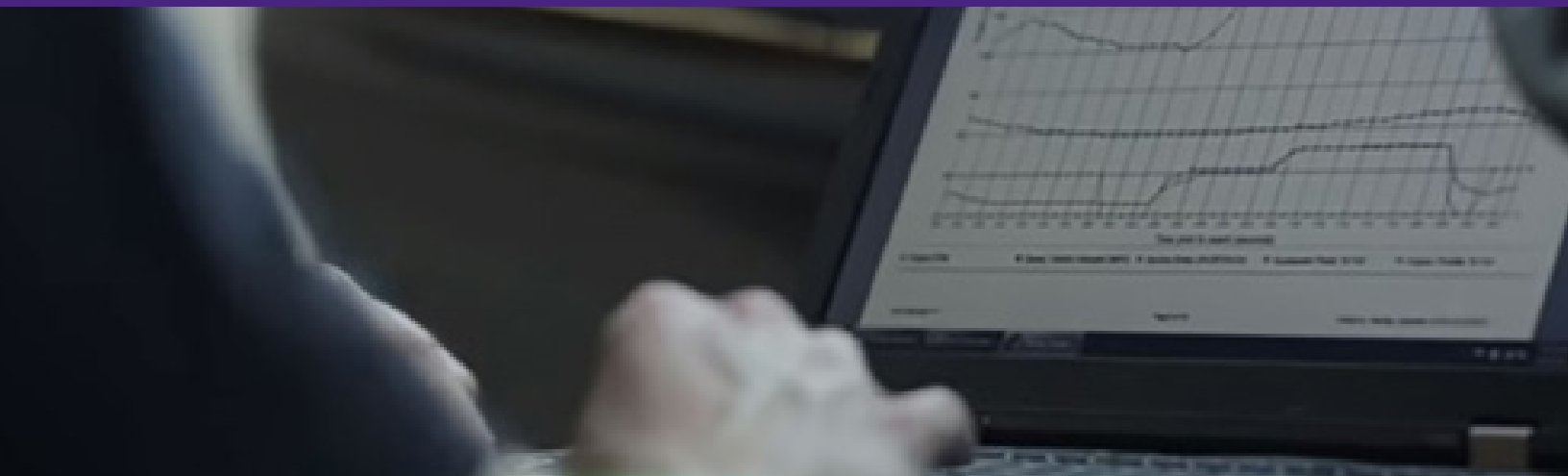
The techniques taught in this class can be applied to your reconstructions, and all of the presented projects are based on actual crashes, utilizing data downloads obtained from those collisions.

CONTENT

- Pre-crash data sources & recorded crash pulse data
- Calculating delta-v from acceleration data
- Finding impulse delta-v from x/y delta-v data
- PDOF from x/y delta-v data
- Adjusting x axis delta-v to represent impulse delta-v
- Single Equation Approach to 360° Momentum Analysis
- Finding impact & post-impact velocities from CDR data
- Reconciling pre-crash & post-crash CDR data
- Analyzing CDR data in context of a reconstruction



ACTAR-Accredited Professionals
Earn 40 ACTAR CEUs



COURSE FORMAT

- On-ground (40 hours / 5 days)

PREREQUISITES

Traffic Crash Reconstruction 1 & 2, CDR Operator

CONTENT

- Terms & conventions in the CDR / EDR field
- Airbag deployment decision-making basics
- Crash sensing & critical timelines
- Idealized timeline for decision making & other system inputs
- Crash Pulse recording methodologies
- Delta-V recording variations & time periods
- Calculating principle direction of force from CDR data
- NHTSA CFR 49 Part 563 Rule with examples
- Pre-crash data sources & impacts on accuracy
- More!

CRASH DATA RETRIEVAL ANALYSIS & APPLICATIONS

Students learn about the function of CDR / EDR data that is obtainable from electronic control modules present in most late-model vehicles. Instructors cover Crash Pulse recording methodologies, crash sensing and timelines, delta-v recording variations, airbag system deployment, and more.

Using case studies, CDR reports from actual crashes, and crash tests, instructors cover each generation of modules for all supported vehicle families, including line-by-line analysis of most parameters. Students receive copies of the CDR reports used in class for later reference.

Students learn to apply data to the crash at hand, including delta-v and closing-speed analyses, principle direction of force calculation and application, and comparison of such pre-crash parameters as vehicle speed, throttle position, engine speed, and brake application. Other topics include methods of comparing internally recorded data, data from external sources, and how they handshake.

All CDR-supported vehicle systems are discussed, including but not limited to:

- BMW vehicles & data from its Advanced Crash Sensing Module (ACSM)
- Chrysler reports & recorded data from its first CDR through most recent
- Ford reports, including ACM and Powertrain Control Modules data elements from its first CDR through the latest ACM, which contains pre-crash data
- Ford PCM data timing relating impact to “time 0” and restraint deployment signal
- GM CDR reports by generation, including Rollover Sensor data & Engineering Translation reports & variants
- Honda CDR reports, including examples from real-world crashes
- Mazda vehicles, including sample reports from real-world crashes
- Mercedes vehicles & their ACM data
- Nissan CDR reports, including a fuse panel guide to assist in back-powering
- Suzuki CDR reports, model-year ACM data, and sources for back powering
- Volvo CDR reports
- Toyota ACM data, from Generation 1 through the newest modules, with & without pre-crash
- Hyundai & Kia EDR Tool reports, content, and data integrity



**ACTAR-Accredited
Professionals Earn
40 ACTAR CEUs**

Crash Investigation & Reconstruction



CONTENT

- sUAS characteristics stipulated in Part 107
- Exclusions from Part 107
- Operational requirements & limitations
- Supporting crew roles, management & best practices
- The National Airspace System
- Characteristics of flight
- Aeronautical decision making
- Physiological factors for pilots
- Safe-loading restrictions & procedures
- Evaluating performance during operation
- Effects of weather

CONTENT

- sUAS setup & configuration
- sUAS maintenance
- Camera setup & configuration
- Camera controls
- Preflight checks
- Flight planning & patterns
- Day & nighttime image capturing
- Terrestrial photography techniques for photogrammetry
- Field measurements
- Obstacle navigation techniques



**ACTAR-Accredited
Professionals Earn
8 ACTAR CEUs**

sUAS FAA KNOWLEDGE TEST PREPARATION

COURSE FORMAT

- On-ground (8 hours / 1 day)

PREREQUISITES

None

Review the information you need for the FAA sUAS Knowledge Test. When paired with adequate studying, students who complete this course will be prepared to take and pass the FAA test and also will possess the knowledge required to begin safely operating drones within the U.S. National Airspace System. Curriculum includes: requirements for obtaining a remote pilot certificate with a small sUAS rating; required sUAS registration, markings, and condition; recommended maintenance; inspection criteria to verify a sUAS is in safe operating condition; and, reporting accidents resulting from sUAS operations. Instructors also cover abnormal and emergency situations that may rise during a sUAS operation.

sUAS CRASH INVESTIGATION REMOTE PILOT

COURSE FORMAT

- On-ground (8 hours / 1 day)

PREREQUISITES

sUAS FAA Knowledge Test Preparation; or, a current 14 CFR Part 107 Certification

Crash professionals and other beginning drone pilots employed at a public safety agency learn how to reliably capture photographic and video evidence at a crash scene. Our experienced instructors work with students using DJI Inspire/1 sUAS drones to teach critical basic skills that successful drone pilots need in their tool box.

In addition to flight planning and patterns, image capturing in day and nighttime lighting, and field measurements, our course also covers such issues as handling trees, powerlines, wind, snow, and other obstructive conditions and incorporates a demonstration of common capture errors. Students also participate in an overview of 3D-model construction and a mock crash scene.

Crash Investigation & Reconstruction



CRASH INVESTIGATION & RECONSTRUCTION AERIAL PHOTOGRAMMETRIST

COURSE FORMAT

- On-ground (16 hours / 2 days)

PREREQUISITES

Strong computer skills

Students utilize the Pix4DMapper photogrammetry modeling software to learn how to develop 3D models and orthomosaics from evidence captured with aerial and terrestrial photography. This exciting course covers such important skills as geographic projections and geo-referencing, generating sparse and dense-point clouds and textured meshes, selecting and using manual tie points, generating x-y-z point lists, correcting common problems, and more.

CONTENT

- Structure from Motion concepts
- EXIF data
- Geographic projections & geo-referencing
- Sparse & dense point clouds
- Creating textured meshes
- Manual tie points
- Converting to local coordinate systems
- Generating X,Y,Z point lists
- Common problems
- Exporting to CAD software

NEW! ADVANCED CRASH INVESTIGATION & RECONSTRUCTION AERIAL PHOTOGRAMMETRIST

COURSE FORMAT

- On-ground (8 hours / 1 day)

PREREQUISITES

1 year experience processing crashes with Pix4Mapper

This advanced photogrammetry course is a one-day program in which experienced photogrammetrists who utilize Pix4D Mapper can further their skills with advanced topic discussions addressing common pitfalls and issues. Students will learn advanced processing techniques and use new skills to complete challenging, real-world projects.

CONTENT

- Updated photogrammetry techniques
- Troubleshooting issues with scene captures
- Advanced use of Pix4D software
- Documenting vehicle damage with drone data
- Advanced diagramming procedures



Law Enforcement Management & Leadership Education

from a Top 10-Ranked University

Northwestern University Center for Public Safety offers the only certificate courses from a Top 10-ranked university for law enforcement professionals. Our authoritative Management & Leadership courses include the internationally respected School of Police Staff & Command.

We work with all types of public safety organizations to create safer communities. Our programs have helped tens of thousands of officers and executives develop the managerial skills and acumen that are essential to success at in any law enforcement leadership role, from first time front line supervisors to chiefs and senior command staff.

Our management courses are available for public safety professionals from local, state, county, and federal organizations, as well as universities, medical systems, and other public or private entities. Our course directors and instructors are all authorities in their fields.

School of Police Staff & Command

Management & Leadership Education

The School of Police Staff & Command (SPSC) offers an unparalleled education in public safety leadership and management, helping experienced law enforcement professionals succeed in senior command positions.

COURSE FORMATS

- 10 total weeks on-ground (40 hours per week)
- 5 months online (asynchronous)

PREREQUISITES

2+ years as a mid- or upper-level supervisor or manager

UNIVERSITY CREDIT

Successful online and on-ground earn 6 units of credit from Northwestern University.

CURRICULUM

- Budgeting
- Contemporary policing
- Decision making
- Employee relations
- Recruiting
- Evaluating products/services
- Executive image
- Human resources
- Leadership & management
- Communications
- Organizational behavior
- Strategic planning & policies
- Project management
- Resource allocation
- Statistics
- More!

COLLEGE-LEVEL COURSE WORK

- Significant out-of-class reading & writing assignments
- Mathematic operations, including algebraic notation
- Final staff study research paper
- In-class exams
- Required discussion participation

THE SPSC ADVANTAGE

Since 1983, SPSC has graduated more than 575 classes — over 21,000 students — and is **the most academically rigorous** leadership and management program available for public safety leaders. Agencies throughout the U.S. and around the globe recognize SPSC's important impact on their organizations. Through our dynamic mix of academic principles and practical applications, SPSC focuses on the topics that are crucial for managerial success. Time and again, **SPSC graduates have proven that they are better prepared to:**

- Think globally rather than remain task-oriented;
- Deliver services effectively and efficiently;
- Successfully accomplish team-oriented projects and tasks;
- Analyze the environment;
- Mitigate legal exposure; and,
- Develop systems of accountability.

SPSC goes beyond learning management concepts and strategies — it also encompasses how to effectively implement strategies, apply concepts, and lead in situations where the problems are real and agency outcomes are critical.



Every lieutenant, manager . . . assistant chief, and chief should attend this course. [SPSC] was academically challenging. . . . It's so much more applicable than going to FBI Academy. There are so many areas taught at SPSC that make us better. . . . the academics were vitally important to

know.

HUGH LOCKERBY, SPSC #570

LIEUTENANT, SCOTTSDALE (AZ)
POLICE DEPARTMENT

School of Police Staff & Command Management & Leadership Education

SPSC STUDENTS

Program participants are experienced public safety professionals. Our course activities are designed to allow class members to learn from one another's experiences and to build a network of relationships and resources that will last long after graduation. **To optimize the opportunities to learn from each other, we require students to have 2+ years of mid- or upper-level management experience.**

SPSC INSTRUCTORS

SPSC adjunct instructors are experienced professionals. The majority are SPSC graduates themselves who not only talk the talk but have walked the walk. As expected in a Northwestern University program, our adjunct instructors and guest lecturers are experts in their respective areas of instruction and bring an authority to their classes that is not found in other law enforcement certificate programs.

COURSE WORK REQUIREMENTS

Students are responsible for university-level course work that includes:

- Mathematic operations and algebraic notation;
- In-class exams;
- Completion of out-of-class reading and writing assignments. Reading, comprehending, and retaining assignments from texts, professional journals, trade magazines, and other sources is expected.
- Research is a key component of SPSC, and all students are required to write an objective, well-documented staff study addressing a problem or issue currently affecting the student's organization.

LEARN MORE!

Scan the QR code or visit **nucps.northwestern.edu/spsc**



SPSC Opens Doors to More

More career advancement and options! SPSC is a preferred qualifier on command staff resumés.



More networking opportunities! SPSC graduates number more than 21,000 — including nearly 800 currently active chiefs & sheriffs.



More professional resource and personal friendships from a one-of-a-kind learning experience.

Supervision of Police Personnel

Management & Leadership Education



COURSE FORMATS

- 2 weeks on-ground (80 hours / 10 days)
- Asynchronous online

PREREQUISITES

None

EARN COLLEGE CREDIT

On-ground graduates earn 1 unit of credit from Northwestern University.

CONTENT

- Accountability
- Communication
- Critical incidents
- Decision making
- DiSC® Personal Profile System
- Discipline
- Ethics & professionalism
- Elements of dynamic leadership
- Managing problem employees
- Motivational principles
- Officer wellness
- Performance management
- Planning
- Procedural justice
- Supervising diversity

Supervision of Police Personnel

Supervision of Police Personnel (SPP) prepares law enforcement officers for success in their new positions as first-line supervisors. The lessons learned in this class will benefit students throughout their careers.

SPP is designed for first-time police supervisors and officers with little or no formal managerial training. Our adjunct instructors — current or former police leaders — teach students the basic yet critical skills they need as front-line supervisors. Our authoritative curriculum focuses on understanding human behavior and day-to-day professional relationships with subordinates, superiors, and the public and encompasses the leadership challenges involved in managing in today's environment.

Students complete this integral program understanding that what action they take — how they implement those actions — can be the difference between success or failure on the street or in their department.



COURSE FORMATS

- 3 total weeks on-ground

ENROLLMENT REQUIREMENTS

Participation is limited to senior-level command or experienced mid-level public safety managers.

RECENT TOPICS

- Critical Incident Command
- Media Relations
- Leading in a Political Environment
- Information Technology
- Data Collection & Profiling
- Discipline & Accountability
- Ethics
- Executive Image
- Crime Prevention Strategies
- Human Resources
- Officer Selection, Assessment & Promotion
- Recruitment & Retention
- Risk Management

The Executive Management Program

Our capstone management and leadership course delves into the critical management issues, advanced topics, and current trends that senior leadership face — all presented in a seminar environment.

EMP features daily guest speakers who present on current topics in their fields of expertise. Each day dawns with a different speaker and a different topic from a continually revised slate of advanced managerial concepts. Among the issues that recent participants have examined are Ethics & Legal Updates, Officer Assessment & Promotion, Recruitment & Retention, Media Relations, Critical Incident Command, and Leading in Crisis, among many others.

To enhance the discussion and learning between students, enrollment is limited to chiefs, deputy chiefs, sheriffs, and other experienced senior and mid-level public safety managers.

Participants complete EMP with enhanced knowledge informed by our expert speakers, lively class discussions, and professional networking — and are ready to proactively respond to meet the most challenging of emerging demands.

Police Motorcycle Instructor Training



REQUIREMENTS

Our Police Motorcycle courses require a valid, unrestricted motorcycle endorsement from student's state of residence (temporary/provisional permits are not accepted).

CONTENT

- Principles of adult learning
- Methods of instruction
- Site selection & course layout
- Teaching field exercises
- Street-riding techniques
- Law enforcement tactical techniques
- Students bring their own bikes.

COURSE FORMATS

- On-Ground
- Remote (2 hours, synchronous)

CONTENT

- Students ride their own bikes
- Registrants receive a copy of the most recent *Northwestern Center for Public Safety Motorcycle Instructor Manual* to prepare for their exams
- Recertification involves a riding-skills exam and an instructing-skills exam.

POLICE MOTORCYCLE INSTRUCTOR TRAINING

By demonstrating an ability to conduct high-caliber training, NUCPS-certified instructors provide their agencies with reduced risk and improved safety. Our three-week course prepares participants to teach the 80-hour NUCPS Police Motorcycle Operator Training™ course to officers in their own agency. Upon successful completion, candidates will receive their Northwestern Police Motorcycle Instructor certification, which is valid for three years and permits them to teach our copyrighted curriculum.

Week One familiarizes students with course set up and basic exercises, reviews adult education methods, and provides opportunities for feedback on technique. To continue in the program, candidates must pass the Week One exam. Weeks Two and Three are integrated with an operator training course and give instructor candidates a supervised, hands-on teaching experience.

POLICE MOTORCYCLE INSTRUCTOR RECERTIFICATION

Recertification ensures all instructors maintain the superior knowledge, skills, and teaching methods expected of NUCPS-certified police motorcycle instructors. NUCPS-certified instructors can renew their expiring or recently expired three-year certificates at a **one-day, on-ground program or through a two-hour virtual program**. Both formats involve a test of riding and teaching abilities. Upon successful completion, participants receive a new three-year instructor certificate, which authorizes them to continue training police motorcycle operator students at their agencies using our copyrighted training curriculum.

Host a Course

Host at the location of your choice. Earn free seats.
Gain recognition as a leader in advancing law enforcement education.

Agencies throughout the US and abroad host Northwestern Center for Public Safety courses, creating opportunities for law enforcement professionals to attend our exceptional programs closer to home.

LEARN MORE

- **EMAIL**
nucps@northwestern.edu
- **CALL**
(800) 323-4011
- **VISIT**
nucps.northwestern.edu/hostacourse
- **FOLLOW OUR QR CODE**



HASSLE-FREE HOSTING EXPERIENCE

Course hosts incur no out-of-pocket costs due to Northwestern. With few exceptions, NUCPS manages student registration and tuition billing.

EARN FREE TUITION

The host agency can earn up to four free seats at the course it is hosting, depending on the number of paying students enrolled in the class. These seats can be used for the host's personnel or can be sold to other agencies.

NUCPS PROVIDES

- Outstanding instructors
- Required course materials and books
- Promotional PDF flyers
- Course listing on the NUCPS website and in e-blasts to prospective students
- Student registration and billing.

HOST AGENCY PROVIDES

- Course promotion to local law enforcement agencies.
- A suitable classroom with internet access that meets general course requirements.
- A contact person to assist instructors during the course.

LENGTH OF COURSES

The course length varies depending on the program. NUCPS can work with the host to determine the number of days and class hours.

HOTEL, MEALS & TRANSPORTATION

Hosts may provide students with options and recommendations but are not required to book hotels, schedule meals, or provide transportation.

PLANNING AHEAD

We recommend **planning at least nine months to one year in advance**. Lead time is critical in allowing:

- NUCPS and the host agency to effectively promote the course;
- Potential students to secure funding for tuition;
- Students & their agencies to make arrangements for the time needed to attend.

Celebrating Student Achievements & Milestones

Northwestern University Center for Public Safety recognizes our students' hard work and dedication of in pursuit of continued professional education through multiple achievement awards and milestone email logos.

NUCPS Executive Leadership Award

This prestigious honor is awarded annually to qualified applicants who have successfully completed all three of our core management courses: Supervision of Police Personnel, School of Police Staff & Command, and the Executive Management Program. Visit nucps.northwestern.edu/management for more information and to download an application.



Fricke Cooper Achievement Award

Qualified Crash Investigation & Reconstruction students who have successfully completed the required nine courses (the Crash Series, CDR Analysis & Applications, and three elective courses in Crash Investigation & Reconstruction) are invited to apply for this elite annual award. Visit nucps.northwestern.edu/crash for more information and to download an application.

Recipients of both the NUCPS Executive Leadership Award and the Fricke Cooper Achievement Award are honored at an luncheon each year. (Students are not required to attend the luncheon to receive their achievement awards.)

NUCPS E-mail Signature Logo Program

This program recognizes the achievements of graduates of the School of Police Staff & Command and of our Crash Investigation Core Sequence with custom email signature logos.

School of Police Staff & Command Logo

E-mail signature logos are available to those who have successfully completed the on-ground or online SPSC program. Each logo is customized with the graduate's class number. Visit nucps.northwestern.edu/management to download a request form.

Traffic Crash Reconstruction Professional Logo

To receive this email signature logo, students must have successfully completed **Crash Investigation 1, Crash Investigation 2, Vehicle Dynamics, Traffic Crash Reconstruction 1, and Traffic Crash Reconstruction 2**. Each e-mail signature logo is customized with the month and year applicants completed TCR2. Visit nucps.northwestern.edu/crash to download an application.

EXPERIENCE THE NORTHWESTERN ADVANTAGE

1. THE GOLD STANDARD FOR PUBLIC SAFETY PROFESSIONAL EDUCATION

Tens of thousands of NUCPS course graduates are serving in agencies and organizations throughout the US and around the world — creating the future of law enforcement and addressing the most challenging issues in public safety.

2. COMPREHENSIVE CURRICULUM

NUCPS offers comprehensive education for public safety professionals. We serve organizations of all sizes and professionals at every stage of their careers. The depth of our programs enables you to find the right course at the right time and in a convenient location.

3. NATIONALLY RECOGNIZED INSTRUCTORS

Our instructors define excellence in law enforcement education — combining academic proficiency with on-the-job experience to provide education with a professional's perspective.

4. DELIVERING IMPACT

NUCPS advances skills and techniques, builds analytical capacity, and improves agency performance. This enables agencies to reduce risk, avoid liability, drive efficiency, and advance strategic goals.

5. A PROFESSIONAL NETWORK & LEADERSHIP COMMUNITY

Northwestern students build relationships with instructors, fellow course participants, and leaders in the public safety community. These relationships translate into a lifetime of professional resources and opportunities.

Northwestern

CENTER FOR PUBLIC SAFETY

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Evanston, Illinois 60201-3193

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