



# Northwestern University Center for Public Safety Course Offerings 2023 / 24



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# Law Enforcement Management & Leadership Education

**The Northwestern University Center for Public Safety offers preeminent professional education through our internationally recognized Management & Leadership courses, including the 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 — and continue to build upon — the foundations for success at any level.

Led by experienced authorities in their fields, our courses are available for public safety professionals from local, state, county, and federal agencies, as well as those from university, medical, corporate, and other public or private entities.

# Management & Leadership Education

## SCHOOL OF POLICE STAFF & COMMAND

### *Celebrating 40 Years of Excellence*



#### COURSE CONTENT

- Budgeting
- Contemporary policing
- Decision making & problem solving
- Employee relations
- Evaluating products/services
- Executive image
- Grant writing
- Human resources
- Leadership & management
- Media relations
- Organizational behavior
- Planning & policies
- Project management
- Resource allocation
- Statistics
- More!

#### EARN COLLEGE CREDIT

Successful students earn 6 units of credit under Northwestern University's quarter system.

#### SPSC ONLINE

We offer SPSC as an asynchronous online course, which provides the benefits of a longer time frame, the ability to remain on the job while enrolled, and the convenience of studying and participating from home, office, or wherever life takes you. [Visit nucps.northwestern.edu/spsc](https://nucps.northwestern.edu/spsc) to learn more.

*10 Total Weeks On-Ground - OR - Asynchronous Online | Enrollment Requirements: 2+ years as a mid- or upper-level supervisor or manager; familiarity with basic algebra.*

**The School of Police Staff & Command (SPSC)** prepares experienced law enforcement professionals for success in senior command positions. For 40 years, SPSC has stood as the most academically rigorous leadership and management curriculum available for public safety leaders. **Law enforcement agencies throughout the U.S. and around the globe recognize the important impact SPSC makes on their organizations.**

Through an innovative combination of academic principles and practical applications, the SPSC curriculum focuses on critical areas in law enforcement management. Our program graduates 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.

The SPSC environment involves more than learning critical concepts and strategies — but also how to effectively implement the concepts, apply the strategies, and lead in situations where the problems are real and agency outcomes are critical.

**SPSC students are experienced public safety professionals.** Our course activities are designed to allow class members to learn from one another's experiences and to build relationships and networks that will last long after graduation.

*[Learn more about SPSC on page 5 →](#)*

# Management & Leadership Education

## SCHOOL OF POLICE STAFF & COMMAND

### SPSC Opens Doors to More . . .

More career advancement and job options! SPSC is a preferred resume



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



More personal & professional friendships that last a lifetime.



*SPSC graduates gathered in Evanston to celebrate our 40th anniversary. Pictured are members of SPSC Classes #415, #319, #84 & #75.*

### 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

### ON-GROUND WORK RELEASE

Students in our on-ground course should be released from their regular job responsibilities to ensure that they have sufficient time to attend class and complete homework assignments.

### SPSC INSTRUCTORS

Curriculum units are taught by adjunct instructors, all of whom are experienced law enforcement professionals and — and in most cases — SPSC graduates themselves. Our adjuncts and guest lecturers are experts in their respective areas of instructions.

### COURSE WORK REQUIREMENTS

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

- Performing mathematic operations and algebraic notation
- Reading, comprehending, and retaining assigned materials based on textbooks, professional journals, trade magazines, and other sources
- In-class exams
- Completing out-of-class reading and writing assignments

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. Because the student's research project originates from a timely and critical issue facing that student's agency, the new knowledge can be put to use immediately.



### LEARN MORE!

Scan the QR code or go to [nucps.northwestern.edu/spsc](https://nucps.northwestern.edu/spsc) to learn more about the School of Police Staff & Command.

# Management & Leadership Education

## EXECUTIVE MANAGEMENT PROGRAM



### COURSE CONTENT

- Critical incident command
- Crime prevention strategies
- Information technology
- Data collection & profiling
- Discipline & accountability
- Ethics
- Executive image
- Human resources
- Leadership
- Political environments
- Media relations
- Officer recruitment & selection
- Officer assessment & promotion
- Organizational policies
- Risk Management
- More

### EXECUTIVE MANAGEMENT PROGRAM

**3 Total Weeks | Enrollment Requirements: Participation is limited to senior-level command or experienced mid-level public safety managers**

Join chiefs, deputy chiefs, and other senior command officers and mid-level public safety managers from throughout the US and around the world for three weeks of intensive examination of law enforcement trends and to workshop the critical issues shaping law enforcement today.

Under the leadership of respected and experienced NUCPS instructors, participants gain tools and knowledge for proactively responding to dynamic public safety environments. Among the many current topics that participants study and discuss are Organizational Policies, Ethics & Legal Updates, Officer Assessment & Promotion, Discipline & Accountability, Recruitment & Retention, Media Relations, Critical Incident Command, Leading in Politically Charged Environments, and more.

**The Executive Management Program is the third & final course required for the NUCPS Executive Leadership Award (see p. 8)**

# Management & Leadership Education

## SUPERVISION OF POLICE PERSONNEL



Build a solid foundation  
for a successful  
management career.

### COURSE 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

*2 Weeks On-Ground - OR - Asynchronous Online*

Supervision of Police Personnel (SPP) teaches the critical skills that officers need for success in their new positions as first-line supervisors. The lessons learned in this class will benefit law enforcement professionals throughout their careers.

Taught by adjunct instructors who are current or former police leaders, SPP is designed for first-line supervisors and officers with little or no formal managerial training and instructs in basic supervisory skills and managing today's leadership challenges. Our authoritative SPP curriculum focuses on understanding human behavior and day-to-day work relationships with subordinates, superiors, and the public.

Students complete this important course with an understanding of that knowing what action to take — and how to implement that action — can be the difference between success or failure on the street or in their department.

# NUCPS STUDENT ACHIEVEMENT AWARDS & LOGOS

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

## NUCPS Executive Leadership Award

This prestigious honor is awarded annually to qualified applicants who have successfully completed all of our three core management courses: Supervision of Police Personnel, School of Police Staff & Command, and the Executive Management Program. Visit [nucps.northwestern.edu/management](https://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 5-course 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](https://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 a luncheon each year. (Students are not required to attend the luncheon to receive their achievement award.)*

## NUCPS E-mail Signature Logo Program

This program recognizes the achievements of graduates of the School of Police Staff & Command and of our 5-Course Crash Investigation Sequence. **Links to request forms for both signature logos are located on our home page, [nucps.northwestern.edu](https://nucps.northwestern.edu).**

### 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](https://nucps.northwestern.edu) for more details.

### Traffic Crash Reconstruction Professional Logo

To receive this logo, students must have successfully completed **each** of the 5-Course Crash Series classes through NUCPS. Each e-mail signature logo is customized with the month and year students completed TCR2. Visit [nucps.northwestern.edu/crash](https://nucps.northwestern.edu/crash) for more information.



# Traffic Crash Investigation & Reconstruction

Since our founding in 1936, Northwestern University Center for Public Safety has been a world leader in traffic crash investigation and reconstruction. Our programs excel in providing students with the skills and knowledge to meet the most challenging of current and emerging demands.

Countless crash investigation professionals have benefited from our instructors' expertise and our authoritative curricula.

# Traffic Crash Investigation & Reconstruction

## THE 5-COURSE CORE SEQUENCE

### COURSE CONTENT

- Preparation for traffic crash investigation
- Collecting information from involved persons & witnesses
- Obtaining information from vehicles
- Collecting information from roadways
- Measuring & mapping the crash scene
- Photographing the crash scene & damaged vehicles
- Vehicle examinations
- Introduction to Event Data Recorders



Learn more about our 5-Course Sequence at [nucps.northwestern.edu/crashsequence](https://nucps.northwestern.edu/crashsequence) or follow the QR code.

# 1 CRASH INVESTIGATION 1

*At-Scene Investigation | 80 Hours On-Ground - OR - Asynchronous Online*

In most jurisdictions, traffic crashes account for more deaths, more injuries, and more property damage than all criminal activity combined. To effectively implement crash prevention programs and improve community safety, law enforcement agencies need to know the who, what, where, when, and why of crashes. The moments immediately following a collision are crucial, and only a well-trained crash investigator knows how to identify and collect the necessary information at the scene and how to begin the interpretation of that evidence.

Crash investigators must work quickly and confidently to preserve significant physical results before the crash scene is altered or evidence disappears. They must anticipate what information will be needed for enforcing traffic laws, planning crash prevention programs, and possible case litigation. In addition, they must properly document the at-scene information and evidence because once the scene is cleared, the evidence might be impossible to recover.

“[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.*

Based on the most recent edition of our world-renowned text, *Traffic Crash Investigation*, Crash 1 is an in-depth study of the skills needed to systematically investigate a traffic crash. Students learn techniques for recognizing and properly recording roadway and vehicle crash evidence, measuring and photographing a crash scene, and creating sketches and after-crash diagrams. The course introduces students to the use of electronic devices to collect and record at-scene data and addresses how collected data are used to reconstruct crashes.

# Traffic Crash Investigation & Reconstruction

## THE 5-COURSE CORE SEQUENCE



# 2

## CRASH INVESTIGATION 2

*Technical Investigation | 80 Hours On-Ground - OR - Asynchronous Online | Prerequisite: Crash Investigation 1*

### COURSE 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
- Lamp filament analysis
- Tire damage analysis & role of tire failure
- Measurement methods & techniques, including perspective grid, photogrammetry, diagram drawing & aerial imagery
- Interpretation of data
- Specialized data gathering, measuring devices & other testing

### ***New Topics include:***

- CDR Operator instruction, including Event Data Recorder downloading and preservation
- Technical report writing

At-scene traffic crash data collection is useful only if all relevant data is properly collected, interpreted, and analyzed. Participation in Crash Investigation 2 expands the capabilities — and enhances the credibility — of on-scene investigators.

**Students in Crash Investigation 2 obtain expanded skills for technically preparing crash investigation data, report writing, and collecting follow-up data required for prosecutors, defense attorneys, reconstructionists, traffic safety engineers, and others.**

Crash Investigation 2 builds upon topics examined in Crash Investigation 1 and provides students with greater knowledge of the information available at the crash scene, how to properly collect it, and how to initiate its interpretation.

Like Crash Investigation 1, the course is rooted in the most recent edition of *Traffic Crash Investigation* and emphasizes vehicle behavior in crashes, vehicle damage analysis, advanced mapping and evidence location skills, and properly downloading and preserving digital evidence from collision investigations. Instructors demonstrate use of such emerging technologies as mapping scenes and recording videos with drones and/or total stations.

***Our CDR Operator course is now included within Crash Investigation 2, and all students will complete the course certified to download and preserve event data recorders from vehicles.***

# Traffic Crash Investigation & Reconstruction

## THE 5-COURSE CORE SEQUENCE

### COURSE CONTENT

- Newton's laws of motion
- Coefficient of friction and drag factor
- Introduction to basic motion equations: velocity, time, acceleration, and distance
- Momentum
- Time-Distance Analysis
- Physics & mathematics overviews
- More

### COURSE CONTENT

- Engineering mechanics
- Equations of motion calculations
- Vehicle behavior in collisions
- Principal direction of force analysis
- Introduction 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

## 3 VEHICLE DYNAMICS

*40 Hours On-Ground - OR - Remote Learning Online | Prerequisites: Crash Investigation 1 & 2*

Vehicle Dynamics focuses on mechanics, the study of motion and forces, and the effects of such forces during a crash.

**Vehicle Dynamics is an introduction to basic mathematical procedures and the basic laws of physics necessary for those who wish to attend Traffic Crash Reconstruction 1 and Traffic Crash Reconstruction 2.**

Instructors present Newton's Laws of Motion and proper application of physics principles to 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.

## 4 TRAFFIC CRASH RECONSTRUCTION 1

*Engineering Mechanics & Momentum | 80 Hours On-Ground - OR - Remote Learning Online | 80 ACTAR CEUs | Prerequisites: Crash Investigation 1 & 2, Vehicle Dynamics*

This course teaches the foundations of reconstruction to students who are new to the crash reconstruction profession. **Participants should possess an understanding of physics and math skills that include high-school level algebra, geometry, and trigonometry.**

Employing skills from Crash Investigation 1 & 2 and Vehicle Dynamics, students learn to understand the determination of how a crash occurred. Based on the most recent edition of our authoritative **Traffic Crash Reconstruction textbook**, instruction focuses on analyzing and interpreting data that were collected at lower levels of an investigation in order to describe the crash and the events leading to actual impact in as much detail as possible. Students apply the lessons from lecture material to real world case study situations — an instruction format that provides students with the training necessary to reconstruct traffic crashes. Upon successful completion, students are able to reconstruct crash situations using momentum and mechanics.

# Traffic Crash Investigation & Reconstruction

## THE 5-COURSE CORE SEQUENCE



### COURSE CONTENT

- Conservation of energy
- Work & energy
- Damage energy
- Energy & momentum
- Force balance
- After-impact drag factors
- Occupant kinematics
- Light & heavy vehicle event data recorder (EDR) usage in crash reconstruction
- Special velocity calculations, including sideslip, falls, vaults & flips
- Monte Carlo Statistical Analysis

**The NUCPS Traffic Crash Reconstruction Professional E-mail Signature Logo** is available to students who have completed all five classes in our 5-course core sequence. Visit **nucps.northwestern.edu/crash** for more information.

## 5 TRAFFIC CRASH RECONSTRUCTION 2

*Energy, Statistical & Data Event Recorders 80 Hours On-Ground - OR - Remote Learning Online | 80 ACTAR CEUs | Prerequisite: Crash Investigation 1 & 2, Vehicle Dynamics, Traffic Crash Reconstruction 1*

Designed for professional traffic crash reconstructionists, prospective students must fulfill the prerequisite courses or receive prior approval for equivalent courses from NUCPS staff in order to enroll. **Students should possess an understanding of physics and math skills that include high-school level algebra, geometry, and trigonometry.**

Traffic Crash Reconstruction 2 is a continuation of learning based on the skills obtained in Reconstruction 1. Students learn through lecture and daily real-world case studies to tie lecture material to hands-on analysis, expanding their understanding of crashes. In this capstone course, instructors also cover special velocity calculations for situations involving 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 core skills of traffic collision reconstruction and the ability to reconstruct crash situations using energy and statistical analysis of momentum-based collision reconstructions.

# Traffic Crash Investigation & Reconstruction

## ELECTIVE COURSES



### COURSE CONTENT

- Reaction time research history & foundations
- Driver response terms & definitions
- Perception response time
- IDRR tutorial
- Speed choice, weather, window tints, steering, acceleration, night recognition, headlights & gap acceptance
- Evaluating responses during night driving, headlight analysis & hazard recognition
- Evaluating path intrusion crashes
- Responses to slow moving vehicles
- Driver search patterns
- Driver response to lead vehicles, expectations, traffic signals & decision making

## ADVANCED CRASH RECONSTRUCTION UTILIZING HUMAN FACTORS RESEARCH

**40 Hours | 40 ACTAR CEUs | Prerequisites: Traffic Crash Reconstruction 1 & 2; Microsoft Excel proficiency is preferred**

Building upon skills and knowledge taught in Traffic Crash Reconstruction 1 & 2, this advanced course focuses on understanding and assessing the human role in the crash sequence in order to answer key questions in reconstruction cases that involve human behaviors, including reaction time, perception, visibility, impairment, and other human factors.

Upon successful completion of this course, each student receives a three-month, personal-use license from CSS, LLC, which allows the licensed user to access:

- Interactive Driver Response Research (IDRR): a human factors-based time/distance program, and
- V\*Star: a momentum calculator that calculates uncertainty in a Monte Carlo-type analysis.

IDRR and V\*Star will be available for purchase at a discounted class price following the three-month trial period. If a student already has a license for these programs, CSS, LLC will add three months to the licensure for IDRR and three months for V\*Star.

# Traffic Crash Investigation & Reconstruction ELECTIVE COURSES



## MOTORCYCLE TRAFFIC CRASH RECONSTRUCTION

### COURSE 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

**32 Hours | 32 ACTAR CEUs**

***Prerequisites: Traffic Crash Reconstruction 1 & 2***

In 2021, 14% of all traffic fatalities were motorcycle operators, according to the NHTSA, which also reports that this is the highest number of motorcycle driver fatalities since 1975. Our hands-on course helps reconstructionists develop the special skills required for advanced investigation and analysis of motorcycle crashes.

In this four-day course, students examine the unique characteristics and special challenges that arise in collisions involving motorcycles and their operators. Reconstructionists are equipped with a firm understanding of motorcycle crash causation, inspection, and dynamics.

Our curriculum includes a review of kinematics — including conversions and derivations of basic equations — and simulation analyses for impact speed determination, Monte Carlo Analysis for speed ranges, and more. Participants benefit from a combination of in-class lecture with practical lessons using real motorcycles and sample evidence.

# Traffic Crash Investigation & Reconstruction

## ELECTIVE COURSES



### COURSE CONTENT

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

### HEAVY VEHICLE FORENSIC MECHANICAL INSPECTION FOR COLLISION INVESTIGATORS

*40 Hours | 40 ACTAR CEUs*

Traffic collisions that involve heavy vehicles often encompass unique documentation and analysis components. In this new course offering, students learn to inspect collision-damaged heavy vehicles and gain the skills required to investigate commercial vehicle traffic collisions.

**This is a hands-on, basic investigation course for proper documentation and evidence preservation.**

Course curriculum includes lecture and hands-on experience with collision-damaged trucks. Forensic work is conducted on the braking systems, suspension systems, wheel systems, and steering systems. Instructors provide foundational information about each component, and students learn to use that knowledge to mechanically examine and test a previously damaged heavy vehicle. Additional hands-on training examines undamaged heavy trucks for a better understanding of components.

After successfully completing this course, students are able to demonstrate their ability to restore a damaged air-braking system on a heavy-duty commercial vehicle to its pre-collision condition for the purpose of collecting data to perform calculations that are used in evaluating the braking efficiency of a heavy-duty commercial vehicle. Students also will be able to identify parts and pieces of steering and suspension systems and explain how the components may have been a factor in a crash.

# Traffic Crash Investigation & Reconstruction

## ELECTIVE COURSES

### COURSE CONTENT

- Heavy vehicle nomenclature
- Braking systems
- Special component issues
- Off-tracking
- Rollovers
- Basic heavy vehicle EDRs
- Proper data collection
- Conspicuity
- Speed analysis
- Collision behavior, momentum & damage
- Computer analysis
- Field testing & analysis
- Heavy vehicle tire stamping

### COURSE CONTENT

- History of injury trauma & biomechanics
- Automotive safety systems: 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

## HEAVY VEHICLE CRASH RECONSTRUCTION

*40 Hours | Prerequisites: Traffic Crash Reconstruction 1 & 2*  
**40 ACTAR CEUs**

Heavy vehicles provide their own challenges when they are involved in traffic crashes. Their braking systems differ from those found in passenger vehicles, and articulated vehicles (semi-tractor/trailer combinations) also behave differently than single units. Heavy Vehicle Crash Reconstruction exams the critical and unique elements of reconstructing collisions that involve these vehicles.

Through lecture, field work, and case studies, this course expands students' knowledge of heavy vehicle braking systems, vehicle behavior, and specific, complex component issues that can be present in crash reconstruction. Course curriculum also includes speed analysis techniques, Event Data Recorder (EDR) basics, and more. Through multiple hours of field testing, this course demonstrates various vehicle behaviors, examines braking and acceleration characteristics, and provides students with the opportunity to analyze and apply the collected data. Case studies show how various analytic techniques can be applied to real-world crashes.

## INJURY BIOMECHANICS & TRAFFIC CRASH RECONSTRUCTION

*24 Hours | 24 ACTAR CEUs*

Our in-depth course offers a detailed examination of injury biomechanics for investigators, reconstructionists, and other professionals involved in vehicle crash investigation. Each topic discusses mechanism and method of injury, analysis, and tolerances. **Injury Biomechanics** also covers vehicle-vs.-vehicle and vehicle-vs.-pedestrian collisions, the injury investigation, and advanced procedures for matching injuries to vehicle collisions. Case studies are paired with lecture material specific to vehicle-vs.-vehicle collisions (front, side, and rear) and pedestrian-vs.-vehicle to examine injury patterns.

# Traffic Crash Investigation & Reconstruction

## ELECTIVE COURSES



### PEDESTRIAN & BICYCLE CRASH RECONSTRUCTION

#### COURSE 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
- Field projects
- Case analysis / case studies

**40 Hours | 40 ACTAR CEUs**

***Prerequisites: Traffic Crash Reconstruction 1; Traffic Crash Reconstruction 2 is encouraged***

Vehicle-vs.-pedestrian and vehicle-vs.-bicycle crashes often result in severe injuries to the pedestrian or bicyclist, escalating the importance of investigating and reconstructing these crashes. In revised 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 lab workshops — including a nighttime pedestrian visibility workshop. Participants are exposed to the different effects of illumination, luminance, and glare and learn to discern the roles that visual acuity and contrast sensitivity play in the driving process. Other field projects include developing data from pedestrian and bicycle velocities and studying drag factors of bodies on various surfaces.

# Traffic Crash Investigation & Reconstruction

## ELECTIVE COURSES

### COURSE CONTENT

- Basic & advanced spreadsheet operations
- Working with 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

### USING EXCEL IN COLLISION INVESTIGATION

**40 Hours | 40 ACTAR CEUs**

**Prerequisites:** *Traffic Crash Reconstruction 1 & 2*

In five days students learn how to use Microsoft Excel in the field of crash investigation. Our course sets itself apart from standard college-level Excel courses as ours focuses on the application’s use in traffic crash investigation and reconstruction rather than in a general business environment.

Using Excel in Collision Investigation is hands-on, with students working in Excel the entire week. Participants themselves create all of the spreadsheets used in the class. The course begins with basic Excel operations and builds from there. By the end of the week, students will be able to complete such advanced Excel functions as writing macros, working complex “if” statements, and creating form controls, and using goal seeker and solver.

***“I attended Crash 1 & 2, Vehicle Dynamics, and Crash Reconstruction 1 & 2 approximately 10 years ago but haven’t done many major crashes since. This refresher is an excellent way to get my gears moving again and help remember what I have learned. Definitely leaves me more confident moving forward.”***

*— Louis Easton, Villa Park (IL) Police Dept. on Traffic Crash Reconstruction Update & Refresher*

### COURSE CONTENT

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

### TRAFFIC CRASH RECONSTRUCTION UPDATE & REFRESHER

**40 Hours | 40 ACTAR CEUs**

**Prerequisites:** *Traffic Crash Reconstruction 1 & 2*

Our refresher course is designed for those who completed our Traffic Crash Reconstruction 1 & 2 more than three years ago. The course updates reconstruction professionals on industry advances and utilizes real-world case studies to refresh students’ knowledge in the core topics covered in Traffic Crash Reconstruction 1 and Traffic Crash Reconstruction 2.

# Traffic Crash Investigation & Reconstruction

## ELECTIVES IN CRASH DATA RETRIEVAL



### CRASH DATA RETRIEVAL OPERATOR

*16 Hours | 16 ACTAR CEUs*

#### COURSE CONTENT

- CDR 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
- Hands-on practice

This two-day, entry-level course is for those new to the Bosch Crash Data Retrieval (CDR) System and to the Hyundai, Kia, and Tesla systems. Instructors start with such basic CDR components as in-vehicle connections (DLC) and direct-to-module cables, add-on adapters, minimum computer requirements, and software installation. Students then learn operation basics: how to determine if a vehicle is CDR supported; selecting the appropriate connection method to safely image data; using the CDR software application; how to save imaged data for later use; and, creating reports. An emphasis is placed on in-vehicle connections wherever possible, with added explanations of the 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 experience hands-on practice using the Bosch CDR System and Hyundai and Kia EDR Tools to image a variety of modules and vehicles and to back power.

# Traffic Crash Investigation & Reconstruction

## ELECTIVES IN CRASH DATA RETRIEVAL

### COURSE 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: which systems record x-axis only; which record x & y axis; and, for what time period data is recorded
- 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

**40 Hours | 40 ACTAR CEUs**

**Prerequisites: Traffic Crash Reconstruction 1 & 2, CDR Operator**

Crash reconstruction professionals gain an understanding of the function of the Event Data Recorder information that is obtainable from electronic control modules present in most late-model vehicles. Among many topics, instructors cover Crash Pulse recording methodologies, crash sensing and timelines, delta-v recording variations, and airbag system–deployment decision making related to the recorded data within the airbag control modules of supported vehicles.

Using case studies, CDR reports from actual crashes, and crash tests, the curriculum covers 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.

Instructors also discuss applying 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. Further lessons involve methods of comparing internally recorded data, data from external sources, and how they handshake for comparison.

### All CDR-supported vehicle systems are discussed in this course, including but not limited to:

- BMW vehicles & data from its ACM (aka ACSM for Advanced Crash Sensing Module)
- Chrysler vehicle reports & recorded data from first coverage through the most recently supported vehicles
- Ford vehicle reports, including ACM and PCM (Powertrain Control Modules) data elements, from the initial Ford CDR up through the latest ACM, which now contains pre-crash data
- Ford PCM data timing relating impact to “time 0” and restraint deployment signal (RDS) reception
- GM CDR reports by generation, including ROS (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 for all supported Nissan vehicles to assist in back-powering
- Suzuki CDR reports and model-year ACM data and sources for back powering
- Volvo vehicle CDR reports
- Toyota ACM data, from Generation 1 through the new added Gen 3 (12EDR) modules, with & without pre-crash
- Hyundai & Kia EDR Tool reports, content, and data integrity

# Traffic Crash Investigation & Reconstruction

## ELECTIVES IN CRASH DATA RETRIEVAL

### COURSE 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

### COURSE CONTENT

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

### ADVANCED COLLISION RECONSTRUCTION WITH CDR APPLICATION

**40 Hours | 40 ACTAR CEUs**

**Prerequisites: Traffic Crash Reconstruction 1 & 2, Crash Data Retrieval Analysis & Application**

This CDR reconstruction course explores advanced methods for analyzing CDR data in collision reconstructions.

Drawing from the skills and lessons taught in Crash Data Retrieval Analysis & Applications, the course curriculum 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.

Reinforcing that the techniques taught in this class can be applied to the real-world situations, all of the presented projects in this class are based on actual crashes and utilize data downloads obtained from those collisions.

### TRAFFIC RADAR / LIDAR INSTRUCTOR TRAINING

**40 Hours**

Designed for experienced operators, this 5-day course instructs participants in training new RADAR / LIDAR operators in their own agencies. Students learn to develop and implement their own operator course and acquire proficiencies in instructional methodology and the technical and legal aspects of RADAR / LIDAR operation.

This NHTSA-approved course provides prospective instructors with the latest information, methodology, content, and materials needed to successfully train new operators. In addition to classroom time, students take part in practical field exercises involving the latest equipment. All instructional material is provided in PowerPoint, including the course administrator manual, teaching outlines, and the student-operator manual.

# Traffic Crash Investigation & Reconstruction ELECTIVES IN sUAS



## COURSE 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

## sUAS CRASH INVESTIGATION REMOTE PILOT

**8 Hours | 14 ACTAR CEUs**

***Prerequisites: sUAS FAA Knowledge Test Preparation or equivalent; 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 skill box.

In addition to flight planning and patterns, image capturing in day and nighttime lighting, and field measurements, our course covers such real world 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 the expected results of a mock crash scene.

# Traffic Crash Investigation & Reconstruction

## ELECTIVES IN sUAS

### COURSE CONTENT

- Structure from Motion (SFM) concepts
- EXIF data
- Geographic projections & geo-referencing
- Generation of sparse & dense point clouds
- Creating textured meshes
- Selection & use of manual tie points
- Converting to local coordinate systems
- Generating X,Y,Z point lists
- Common problems
- Exporting to CAD software

### COURSE CONTENT

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

### CRASH INVESTIGATION & RECONSTRUCTION AERIAL PHOTOGRAMMETRIST

*16 Hours*

This hands-on course utilizes the Pix4DMapper photogrammetry modeling software to teach students how to develop 3D models and orthomosaics from crash scene evidence captured with aerial and terrestrial photography. The three-day class 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.

### sUAS FAA KNOWLEDGE TEST PREPARATION

*8 Hours*

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 will also 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.



# Northwestern Police Motorcycle Training Program™

**The Northwestern Police Motorcycle Training Program™ is the nation's premier training for instructors and operators from local and state agencies.** Our training features the most experienced police motorcycle instructors available and who have trained thousands of students from agencies across the U.S. and around the world. Better instruction cannot be found.

# Police Motorcycle Training Program

## COURSE 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 to this course with the benefit of training on the bike they use each day.

## COURSE CONTENT

- Whether on-ground or virtual, 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

**3 weeks | Prerequisites: Police Motorcycle Operator (recommended); valid, unrestricted motorcycle endorsement from student's state of residence (temporary or provisional permits not accepted). Registration is restricted to law enforcement, military police, or approved emergency response personnel.**

NUCPS provides the high-quality training that is key to a successful police motorcycle team. The three-week Northwestern Police Motorcycle Instructor Training™ 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 initial Northwestern Police Motorcycle Instructor certification, which is valid for three years and permits them to teach our copyrighted curriculum.

**By demonstrating an ability to conduct high-caliber training, certified Northwestern Police Motorcycle Instructors provide their agencies with reduced risk and improved safety.**

Week One familiarizes instructor trainees with course set up and basic exercises, reviews adult education methods, and provides opportunities for feedback on instructional techniques. 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

**1 day | Virtual / Online | Prerequisites: Police Motorcycle Instructor Training; valid, unrestricted motorcycle endorsement from student's state of residence (temporary or provisional permits are not accepted).**

Recertification ensures all instructors maintain the superior knowledge, skills, and teaching methods expected of NUCPS-certified police motorcycle instructors. **NUCPS-certified motorcycle instructors can renew their with expiring or recently expired certificates at a one-day, on-ground program or through a virtual program.** Both formats involve a test of riding and teaching abilities. Upon successful completion, participants receive a new 3-year instructor certificate, which authorizes them to continue training police motorcycle operator students at their agencies using our copyrighted training curriculum.

# HOST A NUCPS COURSE

On-site at the location of your choice. Earn seats for up to 4 students. Be recognized 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](mailto:NUCPS@NORTHWESTERN.EDU)
- CALL (800) 323-4011
- VISIT  
[NUCPS.NORTHWESTERN.EDU/HOSTACOURSE](http://NUCPS.NORTHWESTERN.EDU/HOSTACOURSE)
- USE 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.

## NORTHWESTERN 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.

# 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.

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Center for Public Safety

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Evanston, Illinois 60201-3193

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