

THE  
**PERFORMANCE**  
**DRIVING**  
GLOSSARY



PRESENTED BY THE INSTRUCTOR SUMMIT  
EDITED BY CHUCK TUCKER & CHUCK HAWKS



## Experts praise ***The HPDE Curriculum Guide***

The concepts in ***The HPDE Curriculum Guide*** are the same concepts I use when coaching my pro driver clients. They are THE fundamentals. I highly recommend this guide to any HPDE instructor looking to deliver high performance results to their students.

*Shea Holbrook Chorley, Pro Coach/Pro Driver, Owner BSI Racing*

***The HPDE Curriculum Guide*** gives a great overview and checklist of all the keys to putting on a safe/educational event. It covers all the topics that you don't know you don't know.

*Robby Foley, IMSA Race Winner, Professional Driving Coach*

***The HPDE Curriculum Guide*** is a perfect example of the type of best practice resources the HPDE community needs. The Motorsport Safety Foundation will be sharing this guide far and wide with our audience.

*Scot Elkins, FIA Race Director/Track Inspector,  
COO Motorsport Safety Foundation*

***The HPDE Curriculum Guide*** is exactly the kind of guidance and information that this community needs. The materials are organized, digestible, and dive into all of the most important aspects of driving on track. Everyone who gets on a racetrack should study this in order to step up their level of safety and to improve their driving, both of which equate to more fun every time they get behind the wheel.

*Cameron Parsons, Pro Driver,  
Product Engineer & Field Analyst-Toyo Tires*

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Eric Meyer, Peter Puffer, John Santiago, and Pat Sullivan

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# Welcome!

Driving on the racetrack has its own language, and ordinary words like “early” and “late” have special meaning when we talk about driving on track. Learning the language of the track and the concepts behind the words is an important part of becoming a skilled high-performance driver. Not to worry – ***The Performance Driving Glossary*** is here to help.

There are many ways to use ***The Performance Driving Glossary***:

1. If you are currently learning about performance driving, this glossary will help you better understand what your instructors and fellow drivers are saying on track, in the classroom, in the paddock, and at dinner.
2. If you teach high-performance driving, this glossary is an immensely useful tool for you to better and more quickly connect with your students – quite literally getting them on the same page as you! It’s also a great addition to a classroom curriculum.
3. If you lead a high-performance driver education organization or run track events, this glossary will provide a common base for everyone involved, so they’re all literally speaking the same language. Imagine a streamlined path to a better understanding between all parties involved. Wait... You don’t have to imagine it – you’re reading it!

We sincerely hope ***The Performance Driving Glossary*** helps you and your organization, no matter how you choose to use it. That’s why we’ve made it *free* to download.

We originally developed this glossary as part of the industry-leading book ***The HPDE Curriculum Guide: What to Teach in High Performance Driver Education***. The contributors to that guide sought to create a comprehensive glossary of terms used in high-performance driving. They also planned for the guide and its glossary to grow and improve over time. To suggest terms to add to the glossary, or to recommend improvements in future editions of the full curriculum guide, e-mail us at [chuck@instructorsummit.com](mailto:chuck@instructorsummit.com).

We highly encourage sharing! To share this glossary with others, simply point them to <https://instructorsummit.com/glossary> where they can download it for free. If you’d like a copy of the full ***HPDE Curriculum Guide***, a free electronic version is available at <https://instructorsummit.com/curriculum-guide>. You can also purchase the [paperback edition](#) of the full guide from [Amazon.com](https://www.amazon.com). Please do share these links to ***The Performance Driving Glossary*** and ***The HPDE Curriculum Guide*** with others so that more people in our sport can benefit from these exceptional resources.

Stay safe, enjoy your driving, and keep learning.

Now, on to the glossary!

Chuck Tucker  
Chuck Hawks

# Glossary of Common Terms

Words in *italics* are defined elsewhere in this glossary.

**9-and-3:** Refers to the optimal position of the driver's hands on the steering wheel – at the nine o'clock and three o'clock positions when the vehicle is going straight. Most instructors advocate keeping the hands fixed on the wheel in these places during turns, if this can be done without overly crossing the arms. Otherwise, *shuffle steering* or *pre-positioning/pre-setting* may be used in addition to the 9-and-3 technique.

**ABS:** Anti-lock Braking System. Installed on most modern cars, ABS automatically modulates *brake pressure* at the limit of *traction* to maximize brake system efficacy, while providing the driver better directional control than if the tires were allowed to remain in lockup/skid. ABS also prevents flat-spotting the tires.

**accelerator:** The *throttle* pedal or gas pedal.

**alternate visual reference:** A *visual reference point* that can be used when primary visual references are obscured (e.g., by nearby cars), or otherwise impractical.

**apex:** The point in a turn where the vehicle most closely approaches the inside of the track. See also *early* and *late*.

**autonomous emergency braking (AEB):** An electronic system that applies heavy braking automatically when the vehicle detects that a forward collision is imminent, based on sensors (RADAR, SONAR, etc.) that measure forward closing rate with objects and other vehicles. ***This system may be inappropriate for use on the track and its use/status should be evaluated carefully.***

**balance:** (1) The distribution of lateral *grip* between the front and rear of a car, and thus the resultant handling qualities of the car. Balance ranges from *understeer* (not enough front grip) to *oversteer* (not enough rear grip). A vehicle that is neither understeering nor oversteering is "neutral" or "balanced." (2) The weight distribution of the vehicle across the *chassis* and *contact patches*. An instructor may advise the driver to "balance the car" using one or more inputs (throttle, brake, steering) to cause *weight transfer*.

**beginning of braking (BoB):** The point in the *braking zone* where the brakes are first applied. Same as *braking point*. See also *end of braking*.

**black flag station:** Either (1) the designated corner station(s) that will display a black flag to individual drivers, instructing them to come to the pits, or (2) a location, usually in pit lane, where drivers report for further information when they have been shown an individual black flag on track.

**black flag all:** When all manned corner stations are displaying a black flag, indicating that all cars are to exit the track and/or report to the pits.

## The Performance Driving Glossary

- bleeding the brakes:** The process of removing any air from the brake system by forcing fresh *brake fluid* from the brake *master cylinder* through the lines that lead to each brake caliper. May also refer to a complete replacement of the brake fluid. Often considered regular maintenance in track applications.
- blend line:** A line painted on the track surface at pit exit to separate cars entering the track from cars already circulating on the track. A blend line serves to keep entering cars from moving too quickly into the path of faster cars. May also be used at *pit-in* for cars exiting the track. Cars entering or exiting the track should avoid crossing the blend line from its beginning to its end.
- blip:** Quickly pressing and releasing the *throttle* pedal. This is performed when doing a *heel-and-toe downshift*.
- BoB:** See *beginning of braking*.
- both feet in:** The action of simultaneously pressing the clutch pedal (if present) and brake pedal fully. If the vehicle has no clutch pedal, the driver may place both feet on the brake pedal to maximize pressure. Used in a spinning vehicle to provide a predictable trajectory that other cars can avoid (by locking the wheels) and to prevent damage to the engine (by pushing the clutch in). As the saying goes, "In a spin, both feet in."
- brake fade:** A loss of stopping power due to overheating of the brake system. There are two versions: (1) pad fade, where the brake pads get too hot, causing poor grip between the pads and rotors. The brake pedal usually remains firm but braking performance is significantly reduced or eliminated. (2) fluid fade, where the *brake fluid* becomes too hot and boils. This produces a soft or "spongy" pedal feel and results in significantly lower brake performance. If heat continues to accumulate, the brake pedal may go to the floor and produce little, if any, braking force.
- brake fluid:** Fluid used in vehicle brake systems; is pressurized to activate the brakes. Brake fluid is susceptible to heat and moisture, both of which can degrade the quality of the fluid and thus the brake system's effectiveness.
- brake pressure:** The force with which the driver presses the brake pedal. Learning to gauge brake pressure, and how it varies from beginning to end of braking, is an important skill for developing drivers. Accomplished drivers often collect brake pressure data along with other variables to assess and improve their performance.
- braking point:** The point approaching a turn where the brakes are first applied. Same as *beginning of braking*. May also refer to a *visual reference point* used to begin braking.
- braking zone:** An area on track where brakes are applied before a turn. Some braking zones have distance markers next to the track to serve as *visual reference points* for the *beginning of braking*.
- breathe:** To very slightly reduce throttle application or brake pressure. Example: "Breathe off of the throttle just before the kink to transfer weight to the steering tires."

**brush braking:** A technique of applying and releasing the brakes gradually with minimal *brake pressure*. May be used to transfer weight to the front of the vehicle and promote steering response as much as, or in place of, reducing velocity.

**camber (of the track):** The side-to-side tilt of the pavement, usually in reference to a turn. A portion of the track is *on-camber* if the surface is lower near the inside of the turn and higher near the outside. This is favorable to lateral grip. If a portion of the track is higher near the inside of the turn and lower near the outside, it is *off-camber*, and is unfavorable to lateral grip. On-camber turns can be taken faster than off-camber turns of the same radius. Compare to *slope*.

**camber (of the suspension):** The side-to-side tilt of a wheel and tire relative to the pavement. The camber of each wheel is important part of the vehicle's alignment. With *negative camber* the top of the tire is closer to the vehicle centerline than the bottom. Some negative camber is considered a benefit for driving on road courses and is used to achieve a larger contact patch on the outside wheels when turning. With *positive camber* the top of the tire is farther away from the center of the vehicle than the bottom. Positive camber is not normally used for road courses, where the car turns both directions.

**carousel:** A turn, or series of turns in the same direction, with a large radius and well over 90 degrees of direction change.

**chassis:** The main load-bearing structure of the vehicle (unibody or frame), which supports the suspension, drivetrain, and other components.

**check ride:** An on-track examination performed to assess the skills and abilities of a driver, usually before promotion to the next *run group* or authorization to drive *solo*.

**checkered flag:** Black and white checkerboard flag displayed to indicate the end of a session on track and summon all cars to the pits. There should be no passing beyond the location where this flag is displayed.

**coasting:** Strictly speaking, coasting means driving when the transmission is in neutral or the clutch pedal is depressed, and the wheels are free to rotate. A vehicle can lose speed while coasting due to friction of the tires on the pavement, in moving parts of the car, and from aerodynamic drag. In contrast, releasing the throttle while the transmission is still engaged produces *engine braking*.

**cold tire pressure:** Air pressure in a tire measured when the tire is at ambient temperature, before it has been worked or driven. Vehicle manufacturers specify proper cold pressures for OEM and equivalent tires, printed on a sticker placed on the door frame. Cold pressures are easier to measure consistently than *hot tire pressures*. Cold tire pressures serve as a baseline and are used together with *hot tire pressures* to make adjustments for optimizing tire performance and/or driving style. Note that there may not be enough time between track sessions for the tires to fully cool and return to the cold tire pressure.

**collect (a car):** Regain control after a significant loss of *traction*. "Save it."



- compress a braking zone:** To move the driver's selected *braking point* or *BoB* closer to the *turn-in* point, with the ultimate goal of beginning to brake as late as possible. This usually requires braking harder over a shorter distance.
- constant radius:** Describes a turn whose curvature is steady throughout, as compared to a turn that becomes more or less sharp the further one travels through it. See *decreasing radius* and *increasing radius*.
- contact patch:** The area where a tire touches the pavement at any given instant. All forces between the vehicle and track surface are transmitted through the contact patches. The size and shape of the contact patch, together with the downward force on the tire, determine the amount of *grip* a tire has at any given moment.
- cool-down lap:** The remainder of the drive back to the pits after passing the location where a *checkered flag* has been displayed. Generally driven at a relaxed pace and used to cool down brakes, engine, etc. There should be no passing during the cool-down lap.
- corner entry:** The portion of a turn from *turn-in* to *mid-corner*, where the vehicle is reducing speed and increasing lateral G forces.
- corner exit:** The portion of a turn from *mid-corner* to *track-out*, where the driver is increasing speed and progressively *unwinding* the steering wheel.
- crown (of the track):** A side-to-side shape of the track surface where the center is higher than either edge. Road surfaces are normally crowned to allow rainwater to run off to the sides. When the track has significant crown, the track will go from *on-camber* to *off-camber* (or vice-versa) as the vehicle crosses the crown. The highest point will not necessarily be halfway between the track edges.
- curb:** An edging to the track surface, usually made of concrete and raised relative to the pavement surface. Curbs are normally painted to make them more visible, though painted curbs may have reduced *grip*, especially if the track is wet. Track edgings that are intentionally rough to discourage cars from driving over them are called *gators* or *rumble strips*. Curbs, gators, and rumble strips are typically found near the *turn-in*, *apex* and *track-out* regions of turns.
- decreasing radius:** Describes a turn that tightens, gets sharper, or closes towards the end, as compared to a turn that does not change curvature or one that opens up the further one travels through it. Compare to *constant radius* and *increasing radius*
- diamond line:** A V-shaped path that turns more sharply near the middle of the corner than elsewhere. The diamond line is often used for corners with a large radius, such as a *carousel*, that benefit from using more than one *apex* point. See also *double apex* and *square a corner*. Often referred to as "diamonding it off."
- double apex:** A *line* through a turn, or series of turns in the same direction, where the car touches the inside of the track in two places rather than one. Sometimes used in *carousels* and/or with a *diamond line*.

**downshift:** To change from the current gear to a lower gear. Downshifts on the track are usually performed while braking for a turn. See also *heel-and-toe*.

**early (turn-in, apex, track-out):** Describes a *line* that is closer to the beginning of a turn than some reference line; the opposite of *late*. Generally, an earlier *turn-in* produces an earlier *apex* and an earlier *track-out*. Turning in and apexing too early requires the driver to increase steering input near the apex to keep the vehicle on track. At best this reduces the driver's speed exiting the corner; at worst it requires the driver to put *two or four wheels off* the track, or else spin the car. While a very early turn-in can be a mistake for a beginning driver, skilled drivers may use a slightly earlier line to carry more speed into a turn. There also may be turns that are best driven using an early line.

**electronic driver aids:** Systems installed on a vehicle by the manufacturer to automatically aid a driver in the interest of safety. *ABS* and *stability management systems* are common in most street vehicles. Newer vehicles may have *lane-keep assist*, blind-spot monitoring, *autonomous emergency braking*, and more. These latter systems are less compatible with driving on racetracks and it is often desirable to disable them, if possible, for driving on the track. Some systems may not offer the option to disable, while others may never be invoked, such as adaptive cruise control. ***Student drivers should not change the status of any of these systems unless they have consulted with and gained agreement from their instructor.***

**electronic stability control:** See *stability management system*.

**end of braking (EoB):** The point where a driver has fully released the brakes. For beginners this is usually near the *turn-in* point. When a driver is *trail braking*, the end of braking will come well after turn-in.

**engine braking:** Using the engine to reduce vehicle speed by partially or fully releasing the throttle while the drive line is engaged. Engine braking provides a greater rate of deceleration than actual *coasting*, and this rate can be adjusted using gear selection, engine compression ratio, and other variables. Sometimes imprecisely referred to as coasting. Also called "compression braking" due to engine compression ratio.

**entry:** See *corner entry*.

**entry speed:** The vehicle speed at a select area of the track, usually at *turn-in*.

**EoB:** See *end of braking*.

**ESC:** Electronic stability control. See *stability management system*.

**exit speed:** The vehicle speed at a select area of the track, usually at *track-out* or some other point where the steering wheel is (nearly) straight. Often checked by *glancing* at the *tachometer* or speedometer at some *reference point*, such as the end of the exit *curb*.

**fade:** See *brake fade*.

**fast hands:** Moving the steering wheel more rapidly, especially when entering a turn. The opposite of *slow hands*. Skilled drivers learn to vary the rate at which they dial in steering angle, especially during corner entry, to get the most out of their cars.

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- feather:** To hold a pedal at an intermediate position and make small, precise adjustments. Commonly associated with release of the clutch to avoid a stall. One can also feather the throttle or the brakes.
- flag station:** A location, visible from the track, where flags are displayed to provide information to drivers on track. Flag stations are often associated with specific corners or placed where the track ahead is not visible to drivers. They also provide protection for the flaggers.
- flat:** At full throttle; flat out. Same as wide open throttle; *see WOT*.
- four wheels off:** An event where all four of a car's tires leave the designated track and/or pavement. Usually involves utilizing a *run-off area* or invading the nearby agriculture.
- gator:** A portion of pavement that is intentionally rough; *see rumble strip*.
- glance:** A direct but brief look at something, using the central *visual focus*. Glances are used to check *flag stations*, conditions far down the track, or otherwise gain situational awareness.
- grid:** Either the area where cars are staged just before going on track, or the act of moving cars into the grid formation in preparation for going onto the track. *See also pre-grid*.
- grip:** The maximum force parallel to the road surface that a tire can provide at a given time. May also refer to the combined maximum force for all tires on a vehicle, or to the frictional properties of the track surface. Same as *traction*. Lateral grip is required for cornering and to steer the car. Longitudinal grip is required for acceleration and braking.
- HANS device:** A well-known brand of *head and neck restraint system*, currently owned by Simpson Performance Products. The name stands for "head and neck support" and is pronounced "häns."
- harness:** A driver restraint system that includes a lap belt, two shoulder belts, and usually one or more "sub" belts holding the lap belt down (5-point or 6-point harnesses). Harnesses hold the driver tightly in the seat, in contrast to the three-point belts that are standard in passenger cars. Many organizations require a *head and neck restraint system* to be worn if also using a harness.
- head and neck restraint system:** A support system for the head and neck used by drivers and passengers to mitigate injury in the case of an impact. These systems greatly reduce the chances of a fatal [basilar skull fracture](#). The *HANS* and Hutchens devices are examples. Some track events and most race-sanctioning organizations require this device.
- headed for the wall – hands off all:** When contact with a wall, guardrail, or other obstruction is imminent, drivers should remove their hands from the steering wheel just prior to impact. This reduces the chance of injury to hands and wrists should the front wheels impact the obstruction and abruptly turn the steering wheel. *See also both feet in*.
- heel-and-toe:** A technique of *downshifting* in a manual transmission vehicle with a clutch pedal. Most drivers use the ball of their right foot on the brake pedal and the right edge of that

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foot to *blip* (quickly depress and release) the throttle just before the clutch is released. The left foot operates the clutch pedal. When done correctly, the driver matches engine RPM relative to vehicle speed in the new gear as the clutch pedal is released, minimizing changes in the vehicle's weight distribution.

**hot tire pressure:** Air pressure in a tire measured immediately after it has been driven or worked, and thus has an increased temperature and pressure. Hot tire pressures are more indicative than *cold tire pressures* of the tire's condition from being driven on track. Experienced drivers usually seek specific hot pressures for each tire when choosing cold tire pressure and/or suspension settings. Driving a *cool-down lap* before measuring tire pressures will make hot tire pressures less accurate.

**increasing radius:** Describes a turn that opens up or becomes less tightly curved towards the end, as compared to a turn whose curvature does not change or one that becomes tighter the further one travels through it. Compare to *constant radius* and *decreasing radius*

**kerb:** British spelling of *curb*; used widely in Europe.

**lane-keep assist:** A system on some newer cars that uses cameras to identify and track lane markings on the pavement. When the system detects a possible lane departure with no turn signal active, it will notify the driver, adjust steering angle automatically, or both in order to keep the vehicle in its current lane. This system is considered incompatible with driving on a racetrack and should be disabled, if possible.

**late (turn-in, apex, track-out):** Describes a *line* that is closer to the end of a turn than some reference line; the opposite of *early*. Generally, a later *turn-in* produces a later *apex* and a later *track-out*. A line that apexes slightly later than the geometric center of the turn is often optimal, as it allows the driver to begin accelerating and unwinding the steering at or near the apex. This can increase corner *exit speed*. A turn-in and apex that are too late require the driver to sacrifice too much *entry* and *mid-corner* speed, so that acceleration begins from a slower speed. A driver who turns in extremely late may not be able to get the vehicle to the apex and/or will not need the full width of the track at track-out. Beginning students are often taught a line that is somewhat later than optimal, so that variations from lap to lap will not result in a dangerously early line. As drivers progress and become more consistent, they can experiment with slightly earlier lines and seek the best trade-off between carrying speed into the corner and accelerating out sooner.

**learning goals:** Incremental improvements sought in driver skill or understanding, often during a single track session. Can also relate to a day or an entire track event.

**learning mindset:** Mental focus on mastery of driving skills and safety, rather than focusing exclusively on lap times or comparison to other cars/drivers. Individuals with a learning mindset seek to build their own skills, are continually looking for new ideas and new approaches to high performance driving, and they use data such as lap times as one of several indicators of their progress.

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- lift:** Releasing the throttle partially or fully. Used to slightly reduce speed or, while turning, to adjust the *balance* and turning rate of the car. See also *throttle steering*, *rotation*, and *trailing-throttle oversteer*.
- line:** Either the desired path around the track, or the path actually taken by a driver. May also refer to the portion of the track where most cars drive, which may be *polished* and collect more rubber. While beginners may view the optimal line as fixed, accomplished drivers can regularly make small adjustments to their line to seek the best *grip* and/or use all the capabilities of their car. HPDE drivers and instructors often prefer lines that are fast while providing ample margin for error.
- linked turns:** Two or more consecutive turns, close enough together that the optimal line through one turn is affected by the other turn(s). Examples are a left turn followed immediately by a right turn, or two closely spaced turns in the same direction.
- lug nut torque:** Torque (“twisting force”) used when tightening a wheel’s lug nuts or lug bolts. Measured with a torque wrench and specified in foot-pounds or Newton-meters.
- maintenance throttle:** Applying just enough throttle in a turn to maintain a constant speed. This keeps the *chassis balanced* and provides more cornering *grip* than *coasting*, *engine braking*, or strong acceleration. Often used in the central portion of long corners.
- marbles:** Rubber debris left in turns because of heavy tire stress. As tires are worked hard in cornering, hot pieces of rubber roll off the tread and are slung away. Marbles usually accumulate *off-line* and reduce *grip* potential. Marbles can also stick to hot tires, creating vibration and reducing performance. HPDE drivers should avoid driving through marbles when possible.
- master cylinder:** A mechanical component of an automotive braking system that, when actuated by the brake pedal, forces *brake fluid* under pressure to the brakes at each wheel. Normally found under the hood, just beneath the brake fluid reservoir.
- medium braking:** A technique in which *brake pressure* is substantial but below (or only briefly at) the limit of *threshold braking*. Used for corners where threshold braking slows the vehicle too much, but *brush braking* does not slow the vehicle enough.
- mid-corner:** The central portion of a turn, usually approaching and around the *apex*, where the vehicle has finished slowing and is not yet strongly accelerating. Often the place in a turn where the *chassis* is most *balanced* and steering angle is the most stable.
- mirror scan:** The act of *glancing* at a vehicle’s mirrors to increase situational awareness and/or determine if other cars are nearby.
- modulate:** To vary *braking pressure* or *throttle* application by small amounts over time, increasing, decreasing, or both. Used to control the vehicle by adjusting weight distribution among the *contact patches*. See also *breathe* and *feather*.
- negative camber:** A suspension setting where the top of the tire is closer to the centerline of the vehicle than the bottom. See *camber (of the suspension)*.

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- off:** A departure of the vehicle from the designated track boundaries, usually no longer on the pavement. “I had an off in turn 7.” See *two wheels off* and *four wheels off*.
- off-camber:** A portion of the track where the surface is higher near the inside of a turn and lower near the outside. See *camber (of the track)*.
- off-line:** On a path different from the desired path, or different from the path that gives the best speed around the track. A driver may have to drive off-line to pass another vehicle or to avoid an obstacle.
- on-camber:** A portion of the track where the surface is lower near the inside of a turn and higher near the outside. See *camber (of the track)*.
- open the wheel:** Reduce steering input; partially straighten the steering wheel. Same as *unwinding* the steering wheel.
- oversteer:** A state of *chassis balance* where the rear tires have less *grip* than the front tires. Also known as “loose.” Small, controlled amounts of oversteer may be intentionally induced by *throttle steering*, to take the vehicle more toward the inside of a turn. Large or uncontrolled amounts of oversteer correspond to “losing the back end,” and can result in a spin. Compare to *understeer*.
- paddock:** The area where drivers park their cars while not on track. Usually near the *grid* and pit areas.
- parade laps:** Laps driven at a significantly reduced speed, often led by a pace car and generally not requiring helmets or other special safety gear. Seat belts or *harnesses* (if applicable) should always be worn on track. Also called “touring laps.”
- passing signal:** See *point-by*.
- passing zone:** An area on track where vehicles are allowed to pass one another, usually with a *point-by*, per the rules of the event. Different *run groups* may be restricted to specific passing zones based on their experience.
- peripheral vision:** The portion of the human visual system that allows us to see things we are not looking at directly, i.e., away from the area of *visual focus*. Peripheral vision can detect shape, movement, and some color, but not fine detail.
- pit signal:** Universal signal to inform other drivers and flaggers that one is going into the pits. This is indicated by holding a fist as high as possible out the driver’s side window.
- pit-in:** The area where drivers leave the active racetrack and enter the pits. Also, the action of entering the pits or an instruction to do so. See also *blend line*.
- pit-out:** The area where drivers exit the pits and enter the active racetrack. Also, the action of entering the track from the pits. See also *blend line*.
- point-by:** A signal given by one driver to another driver behind them indicating “It is OK to pass me now.” Usually, the signaling driver puts their arm outside the window and points to the side of their vehicle where the trailing vehicle should pass. Some organizations use turn signals for point-bys. Also known as a *passing signal*.

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**polished:** Used to describe any portion of the track that has a smoother surface texture than the surrounding pavement. Polishing occurs due to frequent use, so the most desired *lines* are usually polished. Polished areas have less *grip* when wet compared to unpolished areas, which have a rougher surface texture that better allows water dispersion.

**positive camber:** A suspension setting where the top of the tire is further away from the centerline of the vehicle than the bottom. See *camber (of the suspension)*.

**pre-grid:** See *grid*. Can also be an area to line up vehicles before they enter the grid.

**pre-positioning/pre-setting:** A steering technique where the driver judges ahead of time the amount of steering needed at an upcoming turn. Before turn-in, the driver places their hands on the wheel such that returning the wheel back to a *9-and-3* hand position produces the maximum steering angle needed for the turn. This places the driver's hands at 9-and-3 mid-turn in preparation for any needed adjustment, but both hands grip the wheel during corner *entry* and *exit*. Compare to *shuffle steering*.

**present (for a pass):** Moving one's vehicle into a position close behind another vehicle and offset to the side on which a pass is anticipated. This makes the presenting vehicle visible in two mirrors of the forward vehicle and communicates that the presenting vehicle is ready for a *point-by*.

**rain line:** An optimal or desired path around the track when the surface is wet. A rain line is generally chosen to avoid areas with standing water collection and/or lack of *traction* from *polished* areas, and to make use of un-polished areas with better *grip*.

**red mist:** A mental state in which a driver loses situational awareness by overly focusing on their position relative to nearby vehicle(s) on track. Red mist can cause drivers to make significant mistakes, such as underestimating their speed or overestimating their vehicle's braking or cornering ability, possibly resulting in an *off*.

**redline:** The maximum RPM at which the engine can be run safely, indicated by red markings on the *tachometer*. Most vehicles have rev limiters that prevent the driver from accelerating past the redline, also known as over-revving.

**reference point:** See *visual reference point*.

**ride-along:** Riding with another driver on track. Sometimes students will go on a ride-along with their instructor to learn. Other times, this may be more leisure oriented, e.g., *parade laps*.

**roll (onto/out of the throttle):** To change *throttle* position substantially in a smooth, progressive manner. Rolling onto the throttle is the opposite of suddenly "flooring it."

**rotation:** Movement of a vehicle around a vertical axis, where the rear of the vehicle moves away from the direction of steering. Intentional rotation is a small, controlled amount of *oversteer*, induced through *trail braking* or *lifting* off the *throttle* (*trailing throttle oversteer*) to reduce the radius of the vehicle's path. Unintentional rotation can lead to a spin or other loss of control.

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- rumble strip:** A portion of the track that is intentionally rough, meant to discourage driving in that area. Due to the oscillation or pattern of a rumble strip, *traction* is also generally reduced when on top of it. Note that there may be additional pavement beyond a rumble strip that is considered “off track” or out of bounds, depending on the organization, track and configuration. Also called a *gator*.
- run group:** A group of drivers assigned to drive on track together. Drivers are usually grouped by skill and/or vehicle type, e.g., the novice run group, the instructor run group.
- run-off area:** Any area adjacent to the track that can be driven on in an emergency. Typically used to prevent loss of control, deal with brake failure, or avoid hitting other cars. Run-off areas may have gravel or sand to slow a vehicle’s speed, or may be pavement, grass or dirt. Some run-off areas may not be large enough to prevent contact with guardrails or other obstructions.
- set:** See *take a set*.
- short shift:** To change into the next higher gear before reaching either the RPM to shift for optimal power or the *redline*. Typically used just before a corner where the next higher gear would be required before the end of that turn. Short shifting may allow more speed to be carried through the corner, since shifting in the corner can upset the *balance* of the car. It can also be used to allow greater *throttle* application without inducing sudden *weight transfer* or spinning the drive tires, as might occur in a lower gear.
- shuffle steering:** A steering technique where the driver’s hands alternately grip and slide over the steering wheel. For example, to initiate a right-hand turn the right hand grips the steering wheel and moves down from the 3 o’clock to 6 o’clock position, while the left hand slides down to 6 o’clock from the 9 o’clock position. The left hand then grips and continues moving the wheel, rising from 6 to 9 o’clock, while the right hand slides back to the 3 o’clock position. At that point the driver could stop rotating the steering wheel, gripping with both hands, or repeat the technique to continue rotating the steering wheel. The process is reversed as the vehicle exits the turn. Shuffle steering allows the driver to have a *9-and-3* hand position *mid-corner* such that more steering is always available, even for unexpected events. The technique can also be used on the upper half of the steering wheel using the 9, 3, and 12 o’clock positions. A disadvantage is that the driver only has one hand gripping the wheel at any time during the shuffle, especially during corner *entry*. Compare to *pre-positioning/pre-setting* and *9-and-3*.
- slip angle:** The difference in angle (measured in degrees) between the direction a tire is pointed and the direction the tire is actually traveling on the pavement. Tires require some slip angle to develop side force, and do not necessarily have to slide over the pavement to achieve this. Side force increases with slip angle up to some maximum, then decreases for larger slip angles.
- slope:** Change in track elevation in the direction of travel, i.e., the uphill or downhill orientation of the track. Contrast with *camber*, which is the side-to-side variation in track height.



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**slow hands:** Moving the steering wheel more gradually, especially when entering a turn. The opposite of *fast hands*. Skilled drivers learn to vary the rate at which they dial in steering angle, especially during corner entry, to get the most out of their car's *traction*.

**solo:** The act of driving alone on track, without an instructor.

**square a corner:** To use a very *late turn-in* and potentially late *apex* for a turn, with the vehicle's path being more squared (closer to 90° angle) than rounded relative to the arc of the turn. This can be used to *double apex* longer-duration turns, maximize the length of a straight, or exploit the acceleration capability of certain vehicles. See also *diamond line*.

**stability management system:** Often called electronic stability control (ESC) or a variant thereof, these systems intervene in certain circumstances (e.g., substantial *oversteer*) to help the driver maintain control of the vehicle. The system generally employs components of the anti-lock braking system and is required on all passenger vehicles in the USA starting with model year 2012. Systems on SUVs usually also incorporate rollover mitigation. Highly skilled drivers may prefer to disable stability management for driving on track. Some vehicles may not allow stability management to be disabled, while others offer intermediate settings that will only intervene in more severe situations. For less experienced drivers, leaving the system fully active is highly recommended. Stability management systems can be also used as a coaching tool, alerting drivers when they have asked the vehicle to do something beyond its *traction* and stability limits. ***Student drivers should avoid disabling or changing the settings of their stability management system unless they have consulted with and gained agreement from their instructor.***

**tachometer:** A gauge that displays engine speed in revolutions per minute (RPM). Used by drivers to determine when to *upshift*.

**take a set:** The moment during corner *entry* where weight has fully transferred to the outside wheels and will only shift again when the driver makes further adjustments.

**target speed:** An aspired speed for a select area of the track, usually measured on a straight or at turn entry/exit.

**threshold braking:** A braking technique that uses the maximum *traction* of the tires to slow the vehicle. Typically used when a fast straight is followed by a slow corner. The goal in threshold braking is to apply as much *brake pressure* as possible without locking up the tires. In cars without *ABS*, this requires considerable skill and practice. Since *ABS* employs threshold braking, the driver of a vehicle so equipped can flirt with *ABS* activation to know when they are at the threshold/limit.

**throttle:** The pedal on the far right that makes the vehicle go faster. Usually tall and skinny in shape. "Gas pedal," "*accelerator*," "happy pedal."

**throttle steering:** *Modulating* the *throttle* while turning to adjust the rate at which the vehicle turns without necessarily moving the steering wheel. See also *trailing-throttle oversteer*.

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**track insurance:** A short-term insurance policy, separate from normal automobile insurance, covering vehicle damage that occurs on track at an HPDE event. Some policies may also cover damage to the facility and/or personal injury.

**track map:** A two-dimensional diagram of the track or its path. Often used to teach the *line* around the track, or to record information from past sessions for analysis and improvement.

**track-out:** The point on a track where a driver has completed a turn, often resulting in a steering wheel that is straight. This usually occurs at the outer boundary of the track.

**traction:** See *grip*.

**trail braking:** Overlapping a gradual release of the brake pedal with progressively increased steering in the *entry* phase of a turn. When well executed, trail braking takes full advantage of the car's *grip* in combined turning and deceleration. Highly skilled drivers use trail braking to induce a small amount of controlled *oversteer*, *rotating* the vehicle toward the *apex* as they turn in and ultimately using less steering angle.

**trailing-throttle oversteer (TTO):** Releasing and/or *modulating* the *throttle* to move weight forward in the *chassis*, such that the vehicle *rotates* on its axis toward the inside of the turn without increasing steering input. Can refer to intentional *throttle steering* or to unintentional *oversteer*. Brakes are not used in TTO.

**turn-in:** The point at which a driver begins moving the steering wheel to navigate a corner. May also refer to a desired point for initiating a turn, described relative to a *visual reference point*.

**two wheels off:** An event where two of a car's tires leave the designated track and/or pavement. Considered less serious than *four wheels off*.

**understeer:** A state of *chassis balance* where the front tires are *gripping* less than the rear tires. Also called "push" or "tight." Small, controlled amounts of understeer may be induced by *throttle steering* or intentionally applying too much steering angle. Large or uncontrolled amounts feel like the front tires are "washing out," or "plowing" and may result in leaving the track.

**unwind:** To progressively release steering angle that was applied previously, typically while *exiting* a turn. Also called straightening the wheel or *opening the wheel*. Unwinding the steering wheel allows the driver to add more *throttle*.

**upshift:** To change from the current gear to a higher gear.

**visual focus:** The place one is looking directly, using the center of one's visual field. The central portion of our vision is how we see detail, and drivers learn when and where to direct their visual focus to gather the information they need.

**visual reference point:** Any fixed mark or object on or near the track, or landmark in the distance, used by a driver to execute a desired *line* repeatably. Common visual reference points include distance marker signs, *curbs*, patches and seams in the track,

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trees, buildings, and tire walls. Cones are poor visual reference points because they are easily moved by other cars. Also known as a *reference point*.

**weight transfer:** A change in the way that downward load is distributed among the vehicle's *contact patches*. Weight transfer is induced by accelerating, decelerating, or turning. Applying the brakes creates weight transfer from the rear tires to the front tires, while turning the car at speed creates weight transfer from the inside tires to the outside tires.

**WOT:** Wide open *throttle*, where the throttle pedal is pressed to its maximum limit. Also called *flat* or "flat out."



## About the Instructor Summit

The Instructor Summit seeks to improve high performance driver education (HPDE) by supporting instructors who want to build their skills, and organizations that want to improve their programs.

The Instructor Summit brings people together from HPDE organizations everywhere to exchange ideas, learn from experts, and identify best practices. From live events to *The HPDE Curriculum Guide*, the Instructor Summit is your dedicated resource for all things instructing in HPDE. Go to [InstructorSummit.com](http://InstructorSummit.com) for more information, or search [MotorsportReg.com](http://MotorsportReg.com) for "Instructor Summit" to find events and register.





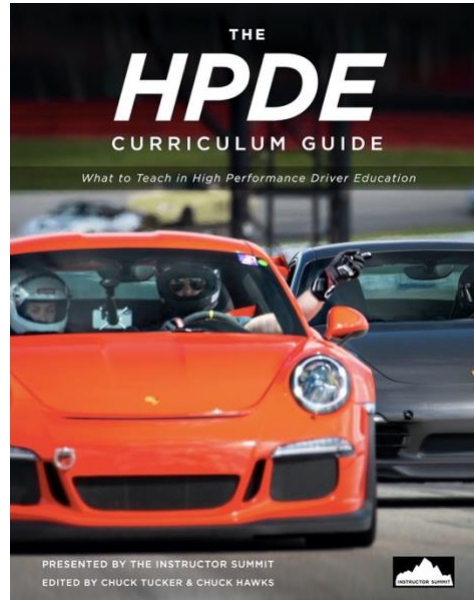
## More praise for *The HPDE Curriculum Guide*

There is not a doubt in my mind, the information contained in *The HPDE Curriculum Guide* will be a Rosetta Stone for HPDE organizations, from new to well established.

*Andy Pilgrim,  
Traffic Safety Education Foundation*

THE Guide is useful for every group, from the most seasoned to the freshest. It's a must read for any organizer or instructor.

*Matt Romanowski, TrailBrake.com*



This is exactly what the HPDE industry needs. The ability to build a common understanding of what we need to teach new students at an HPDE and how to measure progress in consistent way is a game changer.

*Dale Rabeneck, Chief Driving Instructor – PeachState PCA*

This guide has reached across the marquee club/non-profit organizations and for-profit groups and distilled it down to a great collection of themes and best practices for classroom. It's great to see how a simple twist of phrase or slight shift of terms can shed new light onto something that you've been using for years.

*Bill Wade, BMW Car Club of America / BMW CCA Foundation / MSF*

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