INSTRUCTIONS:
Fill out the hazard analysis and risk assessment below.
HA-001 should be for the lane departure warning function as discussed in the lecture.
HA-002 should be for the lane keeping assistance function as discussed in the lecture.
Then come up with your own situations and hazards for the lane assistance system. Fill in the HA-003 and HA-004 rows.
When finished, export your spreadsheet as a pdf file so that a reviewer can easily see your work.

Hazard ID	Situational Analysis						
	Operational Mode	Operational Scenario	Environmental Details	Situation Details	Other Details (optional)	Item Usage (function)	Situation Description
HA-001	OM03 - Normal Driving	OS04 - Highway	EN06 - Rain (slippery road)	SD02 - High speed		IU01 - Correctly used	Normal driving on a highway during rain (slippery road) with high speed and correctly used system
HA-002	OM03 - Normal Driving	OS03 - Country Road	EN01 - Normal conditions	SD02 - High speed	the driver is misusing the lane keeping assistance function as an autonmous function	IU02 - Incorrectly used	Normal driving on country roads during normal conditions with high speed and incorrectly used system (the driver is misusing the lane keeping assistance function as autonomous function)
HA-003	OM03 - Normal Driving	OS04 - Highway	EN04 - Snowfall (degraded view)	SD02 - High speed		IU01 - Correctly used	Normal driving on a highway during snowfall (degraded view) with high speed and correctly used system
HA-004	OM03 - Normal Driving	OS01 - City Road	EN04 - Snowfall (degraded view)	SD03 - Low speed		IU01 - Correctly used	Normal driving on city roads during normal conditions with low speed and correctly used system

Hazard ID	Hazard Identification					
	Function	Deviation	Deviation Details	Hazardous Event (resulting effect)	Event Details	Hazardous Event Description
HA-001	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	DV04 Actor effect is too much	The LDW function applies an oscillating torque with very high torque (above limit)	EV00 - Collision with other vehicle	High haptic feedback can affect driver's ability to steer as intended. The driver could lose control of the vehicle and collide with another vehicle or with road infrastructure	The LDW function applies too high an oscillating torque to the steering wheel (above limit)
HA-002	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV03 Function always activated	The driver was misusing the function by taking both hands off the wheel and thus the lane keeping assistance function is always activated	EV00 - Collision with other vehicle	When the driver is misusing LKA as fully autonomous driving by taking both hands of f the steering wheel, while LKA only provides limited amount of time of steering torque, then the car could still lose control and collide with other vehicle.	When the driver is misusing LKA as fully autonomous driving by taking both hands of f the steering wheel, while LKA only provides limited amount of time of steering torque, then the car could still lose control and collide with other vehicle.
HA-003	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	DV05 Actor effect is too less	The LDW function applies an oscillating torque with very low torque (below minimum torque to warn the driver of potential lane departure)	EV00 - Collision with other vehicle	Low haptic feedback is not enough to warn the driver of lane departure. Without effective warning, car will still depart the intended lane and thus cause collision with other vehicle.	The LDW function applies too low an oscillating torque to the steering wheel (below minimum torque to warn the driver of potential lane departure)
HA-004	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	DV07 Actor effect is too late	The LDW function applies an oscillating torque too late (after the car has already departed a lot from intended lane)	EV00 - Collision with other vehicle	When LDW is applying oscillating steering torque too late to warn the driver of departing lane, then the car is already in another lane, and thus cause a collision with other vehicle.	The LDW function applies an oscillating torque too late to the steering wheel after the car has already departed from intended lane.

Hazard ID	Hazardous Event Classification					
	Exposure (of situation)	Rationale (for exposure)	Severity (of potential harm)	Rationale (for severity)	Controllability (of hazardous event)	Rationale (for controllability)
HA-001	E3 - Medium probability	According to functional safety stardard, driving on wet road has E3 exposure.	S3 - Life-threatening or fatal injuries	According to ISO26262, high speed driving has S3 severity of potential harm.	C3 - Difficult to control or uncontrollable	If the lane departure warning function causes the steering wheel to vibrate excessively with wild swings of the steering wheel, most drivers will have difficulty controlling the vehicle.
HA-002	E2 - Low probability	The driver is on a country road and misusing the system. That combination probably does not happen often, so it is labeled with exposure E2 - low probability.	S3 - Life-threatening or fatal injuries	According to ISO26262, high speed driving has S3 severity of potential harm.	C3 - Difficult to control or uncontrollable	The malfunction was that the lane keeping assistance was always on and had no time limit, so drivers could take both hands off the wheel. Because hands aren't on the wheel at high speeds, a vehicle accident would not be controllable. So it is labeled as C3 - difficult to control or uncontrollable.
HA-003	E2 - Low probability	Snowfall occurs a few times a year for the great majority of drivers	S3 - Life-threatening or fatal injuries	According to ISO26262, high speed driving has S3 severity of potential harm.	C3 - Difficult to control or uncontrollable	If the lane departure warning function does not provide enough oscillating torque to the steering wheel to warn driver of departing intended lane. The car will leave the lane and thus have an accident with vehicle on ther lane at high speeds. So it is labeled as C3 - difficult to control or uncontrollable.
HA-004	E4 - High probability	The driver is on a city road and the LDW is too late. That combination does happen often, so it is labeled with exposure E4 - high probability.	S1 - Light and moderate injuries	In city traffiic, speed of vehicle is expected to be low	C1 - Simply controllable	At city speed, most drivers will be able to control the situation by applying brakes and steering to steer the car back and stop the car and there is additional illmunitation on city roads

Hazard ID	Determination of ASIL and Safety Goals	
	ASIL Determination	Safety Goal
HA-001	C	The oscillating steering torque from the lane departure warning function shall be limited.
HA-002	B	The lane keeping assistance function shall be time limited and the additional steering torque shall end after a given time interval so that the driver cannot misuse the system for autonomous driving.
HA-003	B	The oscillating steering torque from the lane departure warning function shall be always be above minimum threshold which is enough to warn the driver of lane departure.
HA-004	QM	The oscillating steering torque from the lane departure warning function shall be always be applied in time when the car starts to depart from intended driving lane.