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							Hazard Identification						Hazardous Event Classification						Determination of ASIL and Safety Goals	
	Operational Mode	Operational Scenario	Environmental Details	Situation Details	Other Details (optional)	Item Usage (function)	Situation Description	Function	Deviation	Deviation Details	Hazardous Event (resulting effect)	Event Details	Hazardous Event Description	Exposure (of situation)	Rationale (for exposure)	Severity (of potential harm)	Rationale (for severity)	Controllability (of hazardous event)	Rationale (for controllability)	ASIL Determination	Safety Goal
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 a correctly used system	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).	E3 - Medium probability	Occurs once a month or more often for an average driver. This is determined from the functional safety standard	S3 - Life-threatening or fatal injuries	Vehicle to vehicle head on crashes at high speed caused by the LDW failure can result in fatal injury. More than 10 % probability of AIS 3-6 (and not S3)	C3 - Difficult to control or uncontrollable	Less than 90 % of all drivers or other traffic participants are usually able, or barely able, to avoid harm. Let us assume that testing has indicated most drivers are not capable of responding to high torque output from the steering wheel LDW system.	ASIL C	The oscillating steering torque from the lane departure warning function shall be limited.
HA-002	OM03 - Normal Driving	OS03 - Country Road	EN01 - Normal conditions	SD02 - High speed		IU02 - Incorrectly used	Normal driving on country roads during normal conditions with high speed (the driver is misusing the lane keeping assistance function as an autonomous function)	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV03 - Function always activated	The LKA function continues to operate while the driver does not intput into the controls	EV00 - Collision with other vehicle	The LKA is not designed and tested to work as an autonomous system. The system could collide the car with another vehicle or obstacle.	The LKA continues to operate without the presence of driver input. It is not designed for the purpose of autonomous driving	E2 - Low probability	Misuse of the LKA on country roads probably does not happen often. Occurs a few times a year for the great majority of drivers	S3 - Life-threatening or fatal injuries	Vehicle to vehicle head on crashes at high speed caused by the LDW fault can result in fatal injury. More than 10 % probability of AIS 3-6 (and not S3)	C3 - Difficult to control or uncontrollable	Both hands aren't on the wheel at high speeds. The accident would not be controllable	ASIL 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	OM03 - Normal Driving	OS10 - Road with construction site	EN01 - Normal conditions	SD02 - High speed	construction zone on a high speed road	IU01 - Correctly used	Normal driving on roads with active construction at high speeds with the system used correctly	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV19 - Sensor detection is wrong	The LKA function miscalculates the lane lines and steers the vehicle in the opposite direction required to keep the lane	EV-06 - Front collision with oncoming traffic	The LKA may encounter a situation where it is not capable of measuring the lane lines correctly. It makes a mistake	The LKA senses the lane lines incorrectly and applies steering torque in the opposite direction of the lines	E3 - Medium probability	Occurs once a month or more often for an average driver. It is reasonable to assume a driver passes through a construction zone more than once a month.	S3 - Life-threatening or fatal injuries	Vehicle to vehicle head on crashes at high speed caused by the LDW fault can result in fatal injury. More than 10 % probability of AIS 3-6 (and not S3)	C2 - Normally controllable	Testing has shown that most drivers operating the LKA are capable of overcoming the faulty steering torque and controlling the vehicle in the proper direction.	ASIL B	The lane keeping assistance shall use self diagnostics and track a confidence score in the lane measurement and position calculation. The system shall deactivate and warn the driver if the confidence score is too low.
HA-004	OM03 - Normal Driving	OS01 - Any Road	EN07 - Snow (slippery road)	SD02 - High speed		IU01 - Correctly used	Normal driving on any road at high speed in adverse weather conditions such as snow, obstructing visibility of the lane markings.	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV13 - Sensor sensitivity is too low	The LKA camera sensor is not capable of measuring lane markings in adverse weather conditions	EV-07 - None	The LKA shuts off unexpectedly and does not provide steering assistance.	The LKA cannot measure lane markings in adverse weather. The system shuts down and does not provide lane assistance.	E3 - Medium probability	Occurs once a month or more often for an average driver. It is assumed that the driver operates the vehicle in rain, snow or fog on average once a month or more	S0 - No injuries	The driver is capable of piloting the vehicle without the Lane Keep Assistance	C0 - Controllable in general	The LKA is not required for normal vehicle driving. A driver should be capable of operating the vehicle without it.	QM	The lane keep assistance shall deactivate if lane markings are not detected (due to adverse weather or other sensor obstruction).