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	Normal driving	highway	rain (slippery road)	high speed		correctly used system	Normal driving on highway during rain (slippery road) with high speed and 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 lane departure warning function applies an oscillating torque with very high torque (above limit)	EV00 - Collision with other vehicle	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.	E3 - Medium probability	Highway driving during rain with slippery roads is considered on an average occurence a medium probability event with 1 to 10 % chance of occuring in an average operating time and atleast once a month for an average driver.	S3 - Life-threatening or fatal injuries	High speed driving is considered a high severity of harm as accidents could result in fatal injuries	C3 - Difficult to control or uncontrollable	High haptic feedback could result in big swings in the vehicle which makes the event uncontrollable by the driver	ASIL C	Oscillating steering torque from lane departure warning function shall be limited
HA-002	Normal driving	country roads	normal conditions	high speed	(the driver is misusing the lane keeping assistance function as an autonomous function)	incorrectly used system (forseeable)	Normal driving on country roads during normal conditions with high speed and incorrectly used system (forseeable)	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV03 - Function always activated	The lane keeping assistance function is kept on permanently by the driver to use it as an autonomous driving system	EV00 - Collision with other vehicle	Collision with other vehicle	When the lane keeping function is turned on permanently to be used as an autonomous driving function, it would result in vehicle collision when user tries to switch lanes or when emergency vehicles pass by in highway at high speeds.	E2 - Low probability	Driver is misuing the system for autonomous driving in country roads. Hence the exposure of such instances is of low probability	S3 - Life-threatening or fatal injuries	High speed driving is considered a high severity of harm as accidents could result in fatal injuries	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	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	Normal driving	highway	rain (slippery road)	high speed		correctly used system	Normal driving on highway during rain (slippery road) with high speed and correctly used system	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	DV01 - Function not activated	The lane departure warning function does not work	EV-02 - Side collision with other traffic	Side collision with other traffic	No haptic feedback due to an activation error is available to the user on an un-intendend lane departure due to a distracted driving moment / missed blind-spot check. The driver could result in an accident due to a side collision.	E1 - Very low probability	A software defect could result in activation error post production. Since the likelihood of this occuring in a car is very low, marking this a low probability	S3 - Life-threatening or fatal injuries	High speed driving is considered a high severity of harm as accidents could result in fatal injuries	C3 - Difficult to control or uncontrollable	A driver error due to a missing lane departure warning could result in big accidents	ASIL A	(Non-)Availability of lane departure warning system shall be indicated to the driver at the start of the vehicle(at the time of malfunction).
HA-004	Normal driving	highway	rain (slippery road)	high speed		correctly used system	Normal driving on highway during rain (slippery road) with high speed and correctly used system	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane	DV12 - Sensor sensitivity is too high	The lane keeping assistance function has a high sensitivity to small departure from the center of the lane that it moves the steering wheel by a large angle (above the limit). This causes the vehicle move away from the center of ego-lane in the opposite direction and eventually cause high-swings.	EV00 - Collision with other vehicle	Collision with other vehicle	Steering torque provided by LKA is very high that it results in vehicle's collision with another vehicle or with road infrastructure.	E2 - Low probability	Highway driving during rain with slippery roads is considered on an average occurence a medium probability event with 1 to 10 % chance of occuring in an average operating time and atleast once a month for an average driver. However, the high sensitivity of the lane keeping system sensor might be a post-production error which reduces the exposure to a lower probability of occurrence.	S3 - Life-threatening or fatal injuries	High speed driving is considered a high severity of harm as accidents could result in fatal injuries	C3 - Difficult to control or uncontrollable	High steering torque feedback could result in big swings in the vehicle which makes the event uncontrollable by the driver	ASIL B	Steering torque applied to the steering wheel for keeping to the center of ego-lane shall be limited.