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.
When finished, export your spreadsheet as a pdf file so that a reviewer can easily see

Hazard ID	Situational Ar			
	Operational Mode	**Operational Scenario**	**Environmental Details**	**Situation Details**
HA-001	**OM03** Normal Driving	**OS04** Highway	**EN06** Rain (slippery road)	**SD02** High speed
HA-002	**OM03** Normal Driving	**OS03** Country Road	**EN01** Normal conditions	**SD02** High speed
HA-003	**OM03** Normal Driving	**OS02** City Road	**EN02** Sun blare (degraded view)	**SD02** High speed
HA-004	**OM03** Normal Driving	OS02 City Road	**EN07** Snow (slippery road)	**SD02** High speed

	nalysis		
Other Details (optional)	**Item Usage (function)**	**Situation Description**	**Function**
	IU01 Correctly used	Normal Driving on Highway at high speed with correctly used system.	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback
	IU02 Incorrectly used	Normal Driving on Highway at high speed with incorrectly used system	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane
	IU01 Correctly used	Normal Driving on city road at high speed with correctly used system	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback
	IU01 Correctly used	Normal Driving on city road at high speed with correctly used system	Lane Keeping Assistance (LKA) function shall apply the steering torque when active in order to stay in ego lane

Hazard Identification			
Deviation	**Deviation Details**	**Hazardous Event (resulting effect)**	**Event Details**
DV04 Actor effect is too much	The Lane Departure Warning applies too much oscillating torque (above threshold)	**EV00** Collision with other vehicle	High haptic feedback can affect driver's ability to steer as intented. The driver could lose control and could collide with another vehicle, pedestrian etc
DV03 Function is always activated	Lane Keeping Function always actively scans the road and tries to keep car in ego lane.	**EV00** Collision with other vehicle	LKA always stays active but the driver tries to misuse it as an autonomous driving function. Thus car gets into a collision.
DV19 Sensor detection is wrong	Straight exposure to sun rays limiting the Camera ECU's ability to detect lane lines correctly.	**EV-02** Side collision with other traffic	The Lane Departure warning system doesn't work as intended in keeping car in middle of lane due to camera ECU's inability to detect lanes correctly.
DV10 Actor effect is reverse	Snowy conditions makes impossible to detect lane lines and thus limiting LKA's ability to maintin car in lane.	**EV-02** Side collision with other traffic	The LKA function fails to maintain car in middle of lane .

Hazardous Event Description	Exposure (of situation)	Rationale (for exposure)	Severity (of potential harm)
The LDW function applies above threshold oscillating torque to the steering wheel.	**E3** Medium probability	Driving on a highway during rain can happen more than once for an average driver	**S3** Life-threatening or fatal injuries
The Driver didn't use the LKA function as intended	**E2** Low probability	Probability of a driver misusing LKA on a country road is very low under normal driving conditions.	**S3** Life-threatening or fatal injuries
The LDW function didn't work as intended, i.e. it didn't warn the driver when he is steering off the lane.	**E2** Low probability	Straight exposure to sun rays happen rarely and additionally depends upon road lane conditions.	**S3** Life-threatening or fatal injuries
The vehicle moves off the lane and collides with the traffic in the other lane	**E1** Very low probability	Snow fall happens very rarely in most part of the country.	**S3** Life-threatening or fatal injuries

dous Event Classification

Rationale (for severity)	Controllability (of hazardous event)	Rationale (for controllability)
Collision on highway can result in life-theratening injuries.	**C3** Difficult to control or uncontrollable	It is difficult to control steering wheel with excessive vibrations at high speeds for most of the drivers
Collision at high speeds can result in life threatening injuries	**C3** Difficult to control or uncontrollable	Lane Keeping Assistance is always on here, the driver may assume that the car is driving and take both his hands away from steering wheel thus limiting his ability to promptly react and recover from situation. This can lead to fatal accident.
Side Collision at high speeds can result in life threatening injuries	**C3** Difficult to control or uncontrollable	The Driver believes that the system is working as intended and car is in middle of lane and there fore becomes less precautionary while driving.
Side Collision at high speeds can result in life threatening injuries	**C3** Difficult to control or uncontrollable	The Driver believes that the lane keeping assistance system is keeping the car in the center of the lane and thus takes less precautions while driving.

Determination of ASIL and Safety Goals	
ASIL Determination	**Safety Goal**
ASIL C	The oscillating steering torque from the lane departure warning shall be limited
ASIL B	The Lane Keeping Assistance system shall be time limited, thus after a lane keeping manoeuvre, the control is given back to the driver
ASIL B	The Lane Departure Warning System shall warn the driver when one of its sensor isn't giving proper values.
ASIL A	The Lane Keeping Assistance system shall not adjust the steering wheel and should alert the driver when it doesn't receive proper values from camera.