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	OS03 – Highway	EN06 - Rain (slippery Road)	SD03 - High speed	N/A	IU01 - Correctly Used	Normal Driving on Highway during Rain with High speed	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 amplitude (above limit) and The lane departure warning function Applies an oscillating torque with very high torque frequency (above limit)	EV-05 - Front collision with ahead traffic	Vehicle crashes into the ahead traffic with injury to driver	Loss of steering	E3 - Medium Probability	driving on highway when it is raining occurs once a month or more often for an average driver	S3 - Life-threatening or fatal injuries	On highway speed is very high, injury must be serious	C3 - Difficult to control or uncontrollable	The malfunction was that the Lane Departure Warning (LDW) applied too much oscillating torque and frequency, so drivers loss control of the vehicle steering. Because steering was lost at high speeds, a vehicle accident would not be controllable. We will label this hazardous situation as C3.	C	The oscillating steering torque from the lane departure warning function shall be limited
HA-002	Normal Driving	OS03 - Country Road	EN01 - Normal conditions	SD03 - High speed	N/A	IU02 - Incorrectly used	Normal Driving on Country Road 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 lane keeping assistance function is not limited in time duration which leads to misuse as an autonomous driving function	EV-06 - Front collision with oncoming traffic	Vehicle crashes into the oncoming traffic with injury to driver	Driving on country road at high speed and misusing the system.	E2 - Low probability	The driver is on a country road and misusing the system. This combination probably does not happen often, so we will label the exposure E2.	S3 - Life-threatening or fatal injuries	highe speed injury always severe	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. We will label this hazardous situation as C3.	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	OS02 - City Road	EN01 - Normal conditions	SD01 - Low speed	N/A	IU01 - Correctly Used	Normal Driving on City Road during Normal conditions with Low speed.	Lane Departure Warning (LDW) function shall apply an oscillating steering torque to provide the driver with haptic feedback	DV02 - Function unexpectedly activated	The lane departure warning function activates unexpectedly and starts oscillating the steering wheel.	EV-05 - Front collision with ahead traffic	Vehicle crashes into the ahead traffic with injury to driver	Driving on city road at low speed and partial loss of steering	E4 - High probability	driving on city road is a regular activity	S1 - Light and moderate injuries	Speed is expected to be low in city road	C0 - Controllable in general	At city speed, most drivers will be able to control the situation by applying brakes. We will label this hazardous situation as C0.	QM	The camera sensor ECU shall check the LA on/off, active/inactive and malfunction warning status before sending torque requests to the lane departure warning system
HA-004	Normal Driving	OS03 – Highway	EN01 - Normal conditions	SD03 - High speed	construction lane split,multiple lane marks with different color	IU01 - Correctly Used	Normal Driving on City Road during Normal conditions with Low speed.	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 not able to diffrentiate yellow lane mark and white lane mark due to construction, which leads to keeping the wrong lane.	EV08 - Collision with other vehicle	Vehicle crashes into other vehicles with injury to driver	following the wrong lane by mistakenly applying steering torque	E2 - Low probability	Highway is not always in construction and only if the work involves lane expanding can leads to such situation	S3 - Life-threatening or fatal injuries	This collision could happen with front, side, or back vehicle at high speed	C3 - Difficult to control or uncontrollable	At high speed, most drivers will not be able to control the situation since the lane keeping assistance malfunction led to an undefined steering torque application. We will label this hazardous situation as C3.	B	The lane keeping assistance function shall deactivate when the camera sensor stops detecting multiple lane marks and shall warn the driver of its deactivation