AV - COURSE CATALOG

ONLINE COURSE - ILT

Develop a deep understanding of auto-driving cars & acquire the skillset to support you in a building and manipulating a whole system for driverless vehicles.

51 hours of ILT - sessions

18 hours of TA - sessions

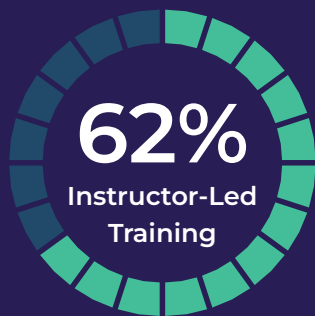10-8 hours/ week of self-paced

Free access to DataCamp courses

OVERVIEW

Learning the top practices and in-demand skills in self-driving cars is possible and achievable through this online and live training course. This revolutionary and interdisciplinary engineering is striking through the high-tech market and driving countless opportunities for professionals, geeks, planners, and even at the basic level of those beneficiaries: car drivers, and passengers!

Talking about driverless or autonomous cars is provoking the concept behind this technology of steering a vehicle remotely or autonomously that requires no or little human interaction and control, which is allowing users to safely travel and transport goods with that comfort like never before. The content and deliverables of this specialization are rooted in problem-based learning, in which you'll be exposed to real-world obstacles during the live training and mentor-led classes will support you in mastering the key skills and a pragmatic experience by engaging in actual use cases, hands-on tasks, and your capstone project.

Graduates of this specialization will be able to walk away with:

- Hands-on experience in ROS and AGV simulators like Gazebo or Carla

- Understanding the applications of Linux/Bash, C++, and Python in the autonomous driving cars

- Understanding of autonomous vehicles concepts and modules

- Understanding of vehicles kinematics, dynamics, and control

- Understanding of the control theory: optimization (e.g. VPH+ for navigation)

- Hands-on experience in the AI: training and testing of ML models (e.g. Computer Vision)

62%
Instructor-Led Training

18
Weeks

8-10 hrs
Week-load

15%
Prerequisite Courses

Instructors from top companies

ROLLS ROYCE

BIOCORTEX
Tomorrow's therapeutics today

University of Salford
MANCHESTER

SAXION
UNIVERSITY OF
APPLIED SCIENCES

PD AEROSPACE

SYLLABUS

Build and refine your knowledge of the Autonomous Driving fundamentals and practices as you work through the weekly modules of this online specialization.

PHASE I: INITIAL COURSES   12 CREDITS

COURSE 1: PROGRAMMING FOR AV PREREQUISITE COURSE

`9 HRS - ILT`

Learning various programming skills and the ability to implement course contents in simulation and real-life.

SCHEDULE:

📅 Lecturing days: lectures are supposed to be conducted on Wednesday on weekly basis over the weeks.

🕐 Lecturing times: teaching hours will be conducted afternoon - due to the difference between time zones, in the period of 4:00 Pm - 9:00 Pm (KSA) on a time average of 23-h per session.

WEEK 1	`3 HRS - ILT`	Linux & ROS	• DataCamp Content • Week 1 hands-on assignment
WEEK 2	`3 HRS - ILT`	C++ & Python	• DataCamp Content • Week 1 hands-on assignment
WEEK 3	`3 HRS - ILT`	Open CV	• DataCamp Content • Week 1 hands-on assignment

COURSE 2: VEHICLES DYNAMICS AND KINEMATICS - PREREQUISITE COURSE

`3 HRS - ILT`

Introduction to vehicle engineering and physics, kinematics, dynamics, and control.

SCHEDULE:

📅 Lecturing days: lectures are supposed to be conducted on Saturday on weekly basis over the month.

🕐 Lecturing times: teaching hours will be conducted in the mornings - due to the difference between time zones, in the period of 10:00 Am - 2:00 Pm (KSA) on a time average of 23-h per session.

| WEEK 1 | `3 HRS - ILT` | Vehicle kinematics and dynamics | • Weekly Assignment:
• Self-Paced Content |

COURSE 3: LOCALIZATION, MAPPING, AND ROUTING

8 HRS - ILT

Understand the use of GNSS to know the current vehicle position from GPS and orientation from IMU, using maps/HD maps for mapping, and route generating.

SCHEDULE:

📅 Lecturing days: lectures are supposed to be conducted on Saturday and Wednesday on weekly basis throughout the month

🕐 Lecturing times: teaching hours will be conducted in the mornings - due to the difference between time zones, in the period of 10:00 Am - 6:00 Pm (KSA) on a time average of 4h per Saturday session, 4:00 Pm - 8:00 Pm (KSA) on a time average of 12-h per Wednesday's session.

WEEK 1 **4H-ILT**

Path planning and emergency stop
Collision avoidance

- Weekly Recap Session
- Weekly Assignment
- Self-Paced Content

WEEK 2 **4H-ILT**

Control of Speed
Brake, and steering

- Weekly Recap Session
- Weekly Assignment
- Self-Paced Content

COURSE 4: OPTIMIZATION

8 HRS - ILT

SCHEDULE:

📅 Lecturing days: lectures are supposed to be conducted on Saturday and Wednesday on weekly basis throughout the month.

🕐 Lecturing times: teaching hours will be conducted in the mornings - due to the difference between time zones, in the period of 10:00 Am - 6:00 Pm (KSA) on a time average of 4h per Saturday session, 4:00 Pm - 8:00 Pm (KSA) on a time average of 12-h per Wednesday's session.

WEEK 1 **4H-ILT**

Optimisation 1 (Planning, Scheduling and Route Optimisation)

- Weekly Recap Session
- Weekly Assignment
- Self-Paced Content

WEEK 2 **4H-ILT**

Optimisation 2 (Resource Allocation)
+ Optimisation in Rolls-Royce

- Weekly Recap Session
- Weekly Assignment
- Self-Paced Content

PHASE II: CORE COURSES   54 CREDITS

COURSE 1: PERCEPTION AND SENSOR FUSION

`4 HRS - ILT`

Understand sensors' role in AGV and sensor fusion algorithms for object detection, sensors data, sensor fusion, image processing, object detection and classification, object heading, depth estimation, ... etc.

SCHEDULE:

📅 Lecturing days: lectures are supposed to be conducted on Saturday and Wednesday on weekly basis throughout the month.

🕐 Lecturing times: teaching hours will be conducted in the mornings - due to the difference between time zones, in the period of 10:00 Am - 6:00 Pm (KSA) on a time average of 4h per Saturday session, 4:00 Pm - 8:00 Pm (KSA) on a time average of 12-h per Wednesday's session.

WEEK 1   `4H-ILT`   AGV Sensors & State Estimation

- Weekly Recap Session
- Weekly Assignment

COURSE 2: AI AND COMPUTER VISION

`8 HRS - ILT`

Understand sensors' role in AGV and sensor fusion algorithms for object detection, sensors data, sensor fusion, image processing, object detection and classification, object heading, depth estimation, ... etc.

SCHEDULE:

📅 Lecturing days: lectures are supposed to be conducted on Saturday and Wednesday on weekly basis throughout the month.

🕐 - Lecturing times: teaching hours will be conducted in the mornings - due to the difference between time zones, in the period of 10:00 Am - 6:00 Pm (KSA) on a time average of 4h per Saturday session, 4:00 Pm - 8:00 Pm (KSA) on a time average of 12-h per Wednesday's session.

WEEK 1   `4H-ILT`   Computer Vision 1 (Detection and Tracking)

- Weekly Recap Session
- Weekly Assignment
- Self-Paced Content

WEEK 2   `4H-ILT`   Computer Vision 2 (Image Recognition)

- Weekly Recap Session
- Weekly Assignment
- Self-Paced Content

COURSE 5: CONTROL SYSTEM

`8 HRS - ILT`

Understand how to control the vehicle's longitudinal and latitudinal motion with adaptive cruise control, steering and brake control.

SCHEDULE:

📅 Lecturing days: lectures are supposed to be conducted on Saturday and Wednesday on weekly basis throughout the month.

🕐 Lecturing times: teaching hours will be conducted in the mornings - due to the difference between time zones, in the period of 10:00 Am - 6:00 Pm (KSA) on a time average of 4h per Saturday session, 4:00 Pm - 8:00 Pm (KSA) on a time average of 12-h per Wednesday's session.

CAPSTONE PROJECT   15 CREDITS

BUILD A REAL-WORLD PROJECT

`10 HRS - ILT`

Learn and apply! As a complementary part of this specialization, and under the supervision of your instructor, you have to finish building a real-world project to get graduated. In order to leverage the theoretical and practical knowledge, you gain from the courses, you have to reach and pass the last milestone of this specialization which is the graduation project. The project will include developing AGV specific algorithms, such as in areas within perception, mapping, routing, planning or control. Moreover, the project will include implementing your algorithm in Python/C++ and ROS and deploying the algorithm in an AGV simulator.

WEEK 1	• Team formation and project selection
WEEK 2	• Research
WEEK 3,4	• Design and implementation
WEEK 5	• Documentation • Presentation & Graduation Day

PROGRAM REWARDS

⭐ Mentorship session

Graduates who successfully did it to the finish line will have the opportunity to attend Peer-to-Peer sessions, to get career advice based on their progress and evaluation along with the specialization. Besides all that, they will be supported in building their LinkedIn profiles to appear with a professional look. Moreover, they might get endorsed to pursue a certain position in the field. Your instructors will be also part of your connections network, this will let you build great potential & bring you superior opportunities.

⭐ Well recognized portfolio

You will prepare a portfolio that will give you the opportunity to show your potential employers what you can actually do. In this portfolio, you can include the final project that you have worked on during the cohort.

⭐ Your Certificates

- **Certificate of Completion**
  Earn your completion certificate, and get your recognition of your newly developed skills. Assessment is continuous and based on a series of practical evaluations completed online on Phi's LMS & completed a comprehensive application of a real-world project. In order to be issued with a Phi certificate of completion, you'll need to meet the requirements outlined in this course guide brochure. The brochure will be made available to you as soon as you begin the course.

  Your certificate will be issued in your legal name and sent to you upon successful completion of the course, as per the stipulated requirements.

- **Certificate of Recognition**
  To get an honorable mention on a certificate, you should come up with a total grade in both the project and practical evaluation that exceed %85.

- **Recommendation Letter**
  You can earn such a letter signed by your instructor once complete your final project.

JOIN & LEARN WITH THE BEST

Muhannad Al Omari

Head of AI at Rolls-Royce and a Cofounder at BioCorteX

Muhannad Alomari is currently the Head of AI across Europe for R-2Factory at Rolls-Royce plc, working on solving some of the most challenging engineering problems through the applications of AI. Muhannad is an Honorary Fellow at the Neuroscience Department at University College London, and at the Computer Science Department at City, University of London. Supervising a number of Ph.D. and MSc students at both universities. He has a background in Autonomous Systems Engineering, and a Ph.D. in AI and Machine Learning from the University of Leeds, where he was awarded the highly prestigious "Research Excellence Award" and the "runner-up best Ph.D. dissertation award" by the European Association for AI, among other awards for his work in advancing the fields of Artificial Intelligence and Cognitive Robotics.

Omar Jasim

Postdoctoral Researcher at the University of Salford - Manchester

Omar is currently a postdoctoral researcher and lecturer in robotics and autonomous systems at the Autonomous Systems and Advanced Robotics Centre - University of Salford, United Kingdom. He holds a Ph.D. in control, robotics, and autonomous systems engineering from the Department of Automatic Control and Systems Engineering, University of Sheffield, United. His areas of expertise are autonomous driving cars, unmanned aerial vehicles (UAV), drones, robotics, and control systems.

INSTRUCTOR

Ayham Alharbat

Robotics Researcher -Saxion University of Applied Sciences

Ayham is currently working as a researcher and lecturer in the Mechatronics Research Group at Saxion University of Applied Sciences - the Netherlands. His areas of expertise are Dynamic Systems Modeling, Simulation, Predictive Control, Physical Interaction Control, Aerial Robotics, and Embedded Control Systems.

INSTRUCTOR

Amr Halawa

Spaceplane R&D Engineer at PD Aerospace, LTD

Amr is currently working as a research & development engineer on a spaceplane development project at PD Aerospace in Japan. Amr holds a Ph.D. in Aerospace & Wind Energy from Kyushu University, Japan, and has over 10 years of work experience in both academia and industry in applied aerodynamics and CFD as well as a strong knowledge of various engineering tools and programming languages.

FREQUENTLY ASKED QUESTIONS

1- What is a Self-driving car?

Basically "Driverless". The concept behind it is fairly simple: build a car with cameras and sensors which can track all objects around it and charter its navigation accordingly. These vehicles are using extra advance technological systems with in-car computers that know all driving rules, they should be able to navigate to their destination successfully.

2- How to get started in self-driving car engineering?

You need to have basic knowledge of mathematics, computer programming, and computer vision. This should push you to start an entry-level career and create algorithms that are integral to self-driving car technologies like the automated sensor system.

3- What do self-driving engineers work on?

In this specialization, you will learn the most demanded programming skills like ROS, and Python,...and integrate them with the core concepts of vehicle kinematics and dynamics to be able to understand perception and sensor fusion. This will advance your steps in getting a role in this field, and work on training the vehicle to detect and identify obstacles to inform navigation.

4- Who is this course suitable for?

Learning autonomous vehicles is not that easy, yet it's possible. You can do it by self-paced learning, there's a huge amount of tutorials and online courses available on search engines. Meanwhile, it might take a long time to achieve the desired outcomes yet no practical experience might be done nor a mentor tracking. This course will help you achieve your goals if you're having a basis in engineering or computer science. You're expected to have at least the basic knowledge of mathematics and mainly programming. Need help to determine whether this course is right for you? Contact us.

5- Can I skip a certain course?

Not exactly, you can only waive courses in the initial phase (prerequisites kit). We recommend you to apply and join these foundational courses, to learn basic components before digging deep into the advanced level since the whole curriculum is designed following the synoptic methodology. You can waive these courses upon your responsibility if you submitted documents met the pre-evaluation criteria. (Read more in the syllabus)

6- Is this program accredited?

This specialization program is non-academia-recognized. Our AGV professional training kit is designed and developed in collaboration with the industrial leads in the field, learning outcomes and the curriculum are articulated to meet market-based and in-demand skillset in such vacancies globally and regionally. Once completed the program, you will be qualified to apply for entry-level jobs in the field.

7- Does Phi Science offer financial aid or discounts?

As part of paying back to our society, Phi is glad to provide up to 2 full scholarships for any of its specializations.

Please submit your application form. Moreover, you can get your early-bird registration discount when enrolling in any of the announced programs 2 weeks at least before the kick-off day.

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