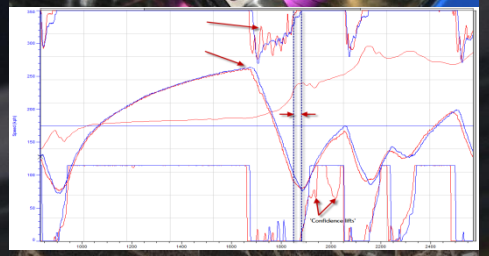
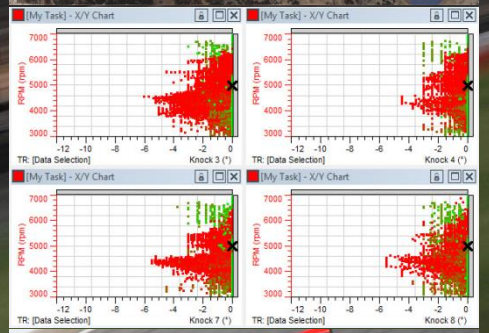
Race Car Data Acquisition & Analysis Seminar 2018

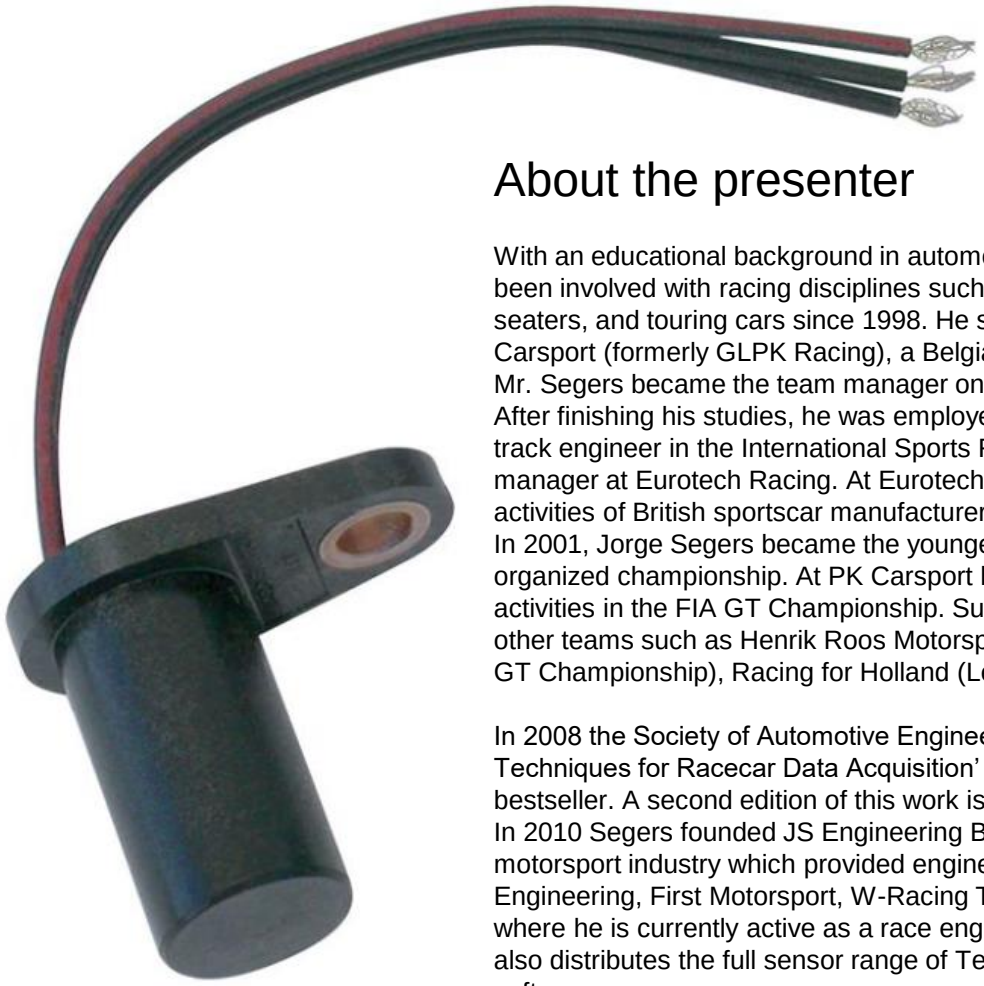
Seminar brochure





Jorge Segers

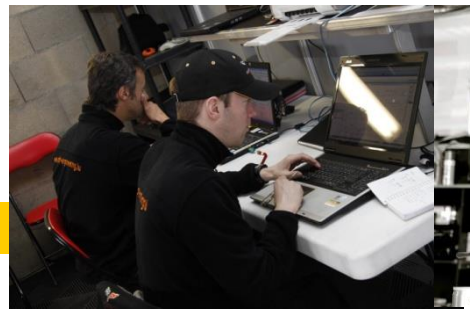
Competition Consultancy
JS Engineering BVBA



About the presenter

With an educational background in automotive engineering, Jörge Segers has been involved with racing disciplines such as GT and sportscar racing, single seaters, and touring cars since 1998. He started with an apprenticeship at PK Carsport (formerly GLPK Racing), a Belgian team active in international GT racing. Mr. Segers became the team manager only three years later.
After finishing his studies, he was employed at BPR Competition Engineering as track engineer in the International Sports Racing Series and later as development manager at Eurotech Racing. At Eurotech, he was involved with the GT racing activities of British sportscar manufacturer Marcos Cars.
In 2001, Jorge Segers became the youngest team manager ever in an FIA organized championship. At PK Carsport he was responsible for the team's activities in the FIA GT Championship. Subsequently, he has been working for other teams such as Henrik Roos Motorsports (FIA GT), DKR Engineering (French GT Championship), Racing for Holland (Le Mans 24 Hours) and Carsport Modena.

In 2008 the Society of Automotive Engineers published Segers' book 'Analysis Techniques for Racecar Data Acquisition' which in 2009 made the status of bestseller. A second edition of this work is was released in early 2014.
In 2010 Segers founded JS Engineering BVBA, a consultancy company to the motorsport industry which provided engineering support to teams such as DKR Engineering, First Motorsport, W-Racing Team, Phoenix Racing and Abt Sportsline where he is currently active as a race engineer in the DTM series. The company also distributes the full sensor range of Texense Chassissim lap time simulation software.



Seminar Overview

Data acquisition is an invaluable tool for establishing racecar and driver performance. The technology that was once only applied by high-end racing teams with considerable financial resources has found its way over the last decade to all racing disciplines. Today systems are available that give even the club racer an enormous amount of data logging capabilities. This 2-day seminar teaches the participants how to analyze the data logging system's output and convert this knowledge into a key advantage on the racetrack. The latest available technologies are covered.

The seminar begins with a general introduction into data acquisition and measurement technology. The participants will learn then how to analyze the driver activities and use this analysis to improve driver performance.
Vehicle performance analysis is extensively covered with an emphasis on vehicle balance, stability, wheel loads and weight transfer, aerodynamics and shock absorbers. The use of infrared temperature sensors to measure brake and tire temperature is also extensively covered.

This seminar is developed for everybody in the racing community wishing to extend their knowledge about racecar data acquisition analysis. Engineers, crew chiefs, drivers, mechanics or motorsport engineering students would benefit from this course especially as it will emphasize mainly on real-world examples.

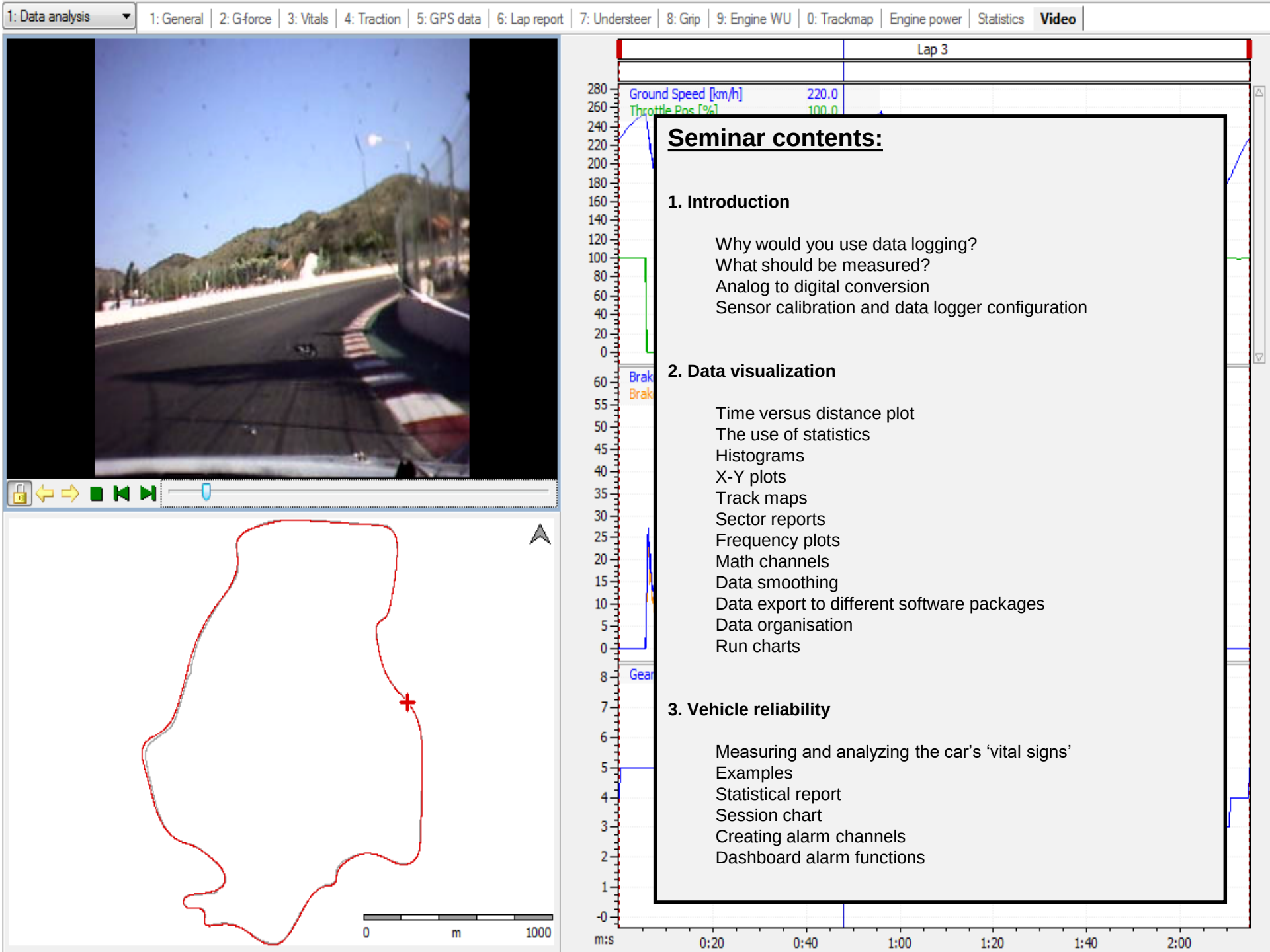
This seminar doesn't concentrate on one data analysis package. However, mathematical channels are extensively used. All attendees will receive a list with the math channel syntaxes and detailed explanations of all channels covered in the seminar for most of the commercially available data acquisition systems.
This way, at the end of the course the attendee will be armed to apply the newly gained knowledge immediately.

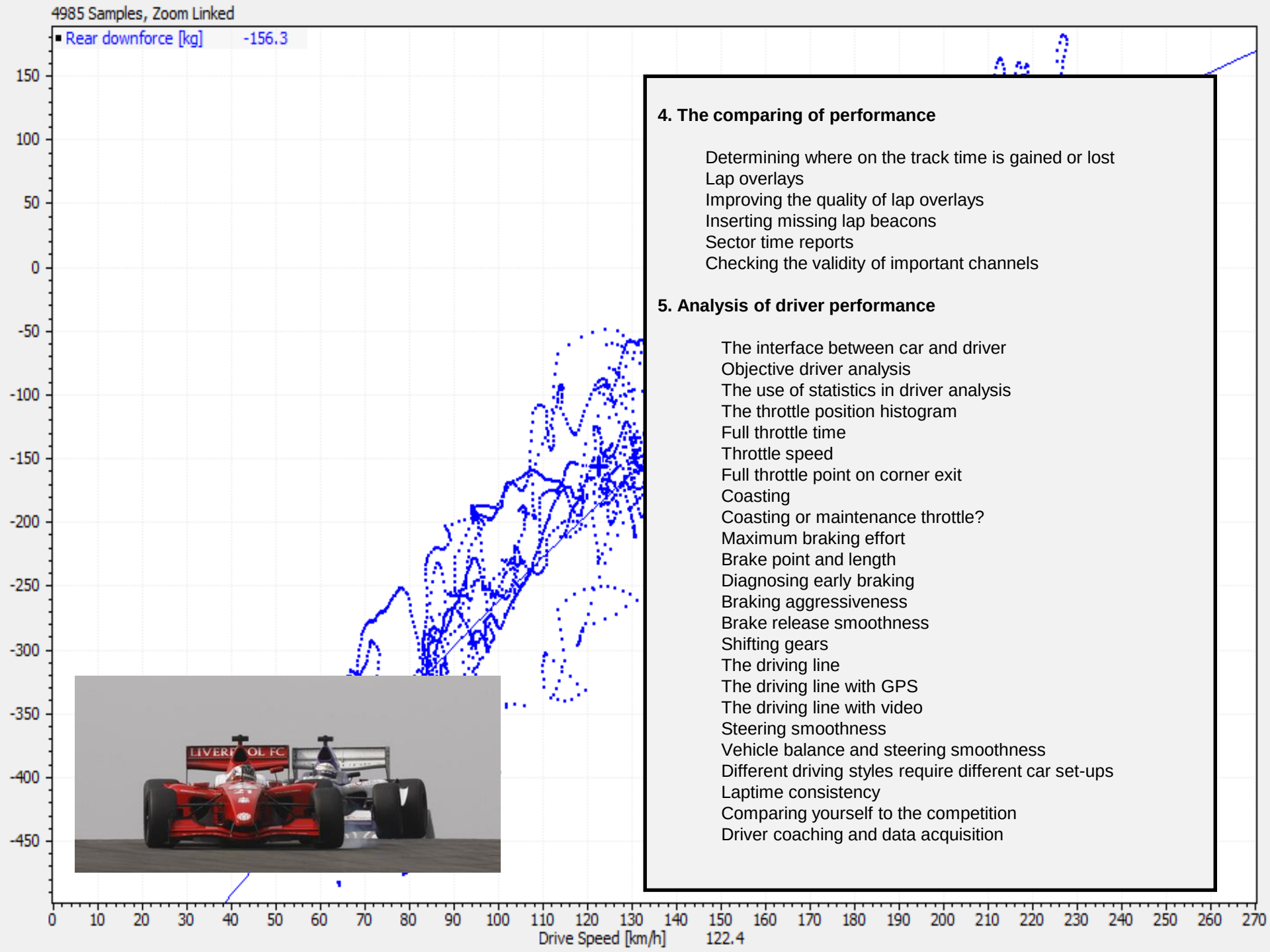
By attending this course you will be able to:

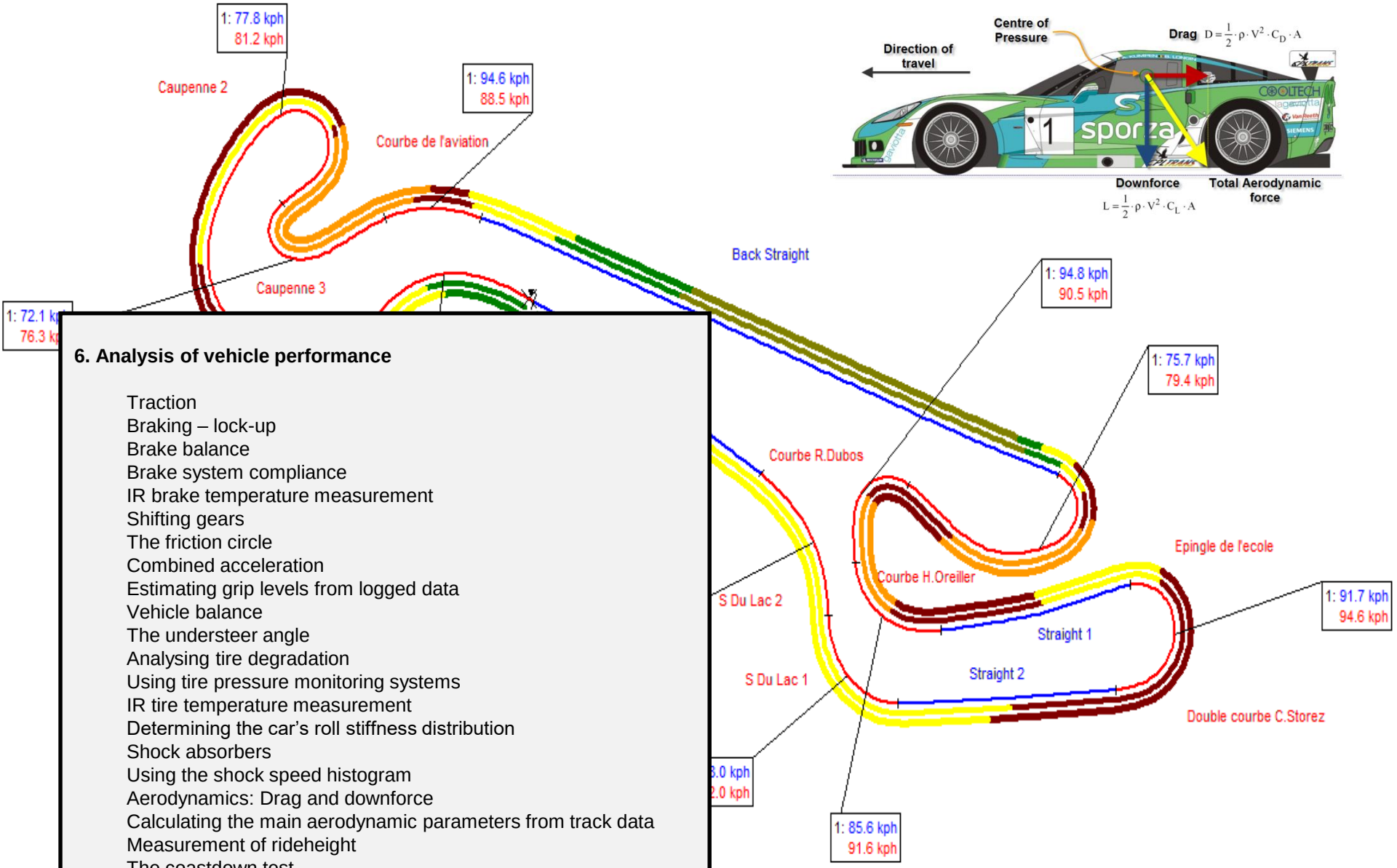
- Choose the appropriate hardware for your data acquisition system
- Identify the basics of electronically measuring physical parameters
- Develop procedures to effectively analyze your logged data
- Designate the best way to visualize and organize your data for efficient analysis
- Diagnose problems from logged data and determine reliability risks
- Compare the performance of different drivers and cars not only during one lap but also over longer periods of time (a session, test day, race event, season…)
- Statistically track driver performance over a race weekend or racing season
- Determine the amount of grip available on a given racetrack
- Determine a vehicle's balance from logged data
- Determine which vehicle balance to aim for with setup changes
- Evaluate vehicle balance using infrared tire temperature sensors (determine if and – more importantly – why a car is over- or understeering)
- Perform aerodynamic measurements on a vehicle
- Analyze and alter the transient vehicle balance through damper tuning
- Effectively use shock speed histograms
- Characterize a track and determine the main set-up variables for specific tracks
- Plan an appropriate race strategy

20 examples of questions that you should be able to answer after attending this seminar:

1. What is the difference when I connect a suspension potentiometer with a 5V supply voltage to an analog data logger input with a range of 12V instead of 5V?
2. How can I visualize my data so that they show me trends over a longer period of time (eg. a complete race event or even a complete season)?
3. How can I manually insert a missed timing beacon in the data using the suspension movement data?
4. I work in a professional racing series where all drivers are performing in a very close range. Difference in braking points, cornering speeds and throttle application points are very small. How can I still discover fundamental driving style differences from the data which can help my driver improve his performance?
5. How does the way the driver applies and comes off the brakes influence the chassis platform?
6. The ever returning question: 'I'm taking Turn 3 in second gear. Do you think it would be better to take it in 3rd?'
7. How do I know if my driver is taking the fastest driving line around the track?
8. How do I compare 2 different types of braking pads for their temperature working range, bite, longevity and modulation?
9. How much grip are the tires on my car developing in braking, cornering and traction and how much of this grip is the driver using?
10. How does the track grip develop over a race weekend?
11. How can I put some objective numbers on how much my car is over- or understeering?
12. How can I calculate the roll stiffness and roll stiffness distribution of my car from the data and use this information as a set-up tool?
13. How do I work with tire pressure monitoring systems? How do they help me to figure out which running pressures to aim for and calculate the corresponding cold pressures?
14. How is tire surface temperature created and how can I influence this with the setup of the car?
15. How can I use the data from infrared tire temperature measurements to find out WHY my car is over- or understeering?
16. How can I use the data from infrared tire temperature measurements to put an objective number on how good (or bad) the setup of my car is?
17. How do I know if I'm running the right camber or tire pressure?
18. What kind of information can I extract from the shock speed histogram about my car's suspension?
19. How do I compare different tracks and adapt the set-up of the car accordingly?
20. How can I improve the accuracy of my fuel consumption measurements and use this information to stretch the fuel mileage of my car to its limit?


1: Data analysis
1: General
2: G-force
3: Vitals
4: Traction
5: GPS data
6: Lap report
7: Understeer
8: Grip
9: Engine WU
0: Trackmap
Engine power
Statistics
Video
Lap 3
Ground Speed [km/h] 220.0
Throttle Pos [%] 100.0
Seminar contents:
1. Introduction
Why would you use data logging?
What should be measured?
Analog to digital conversion
Sensor calibration and data logger configuration
2. Data visualization
Time versus distance plot
The use of statistics
Histograms
X-Y plots
Track maps
Sector reports
Frequency plots
Math channels
Data smoothing
Data export to different software packages
Data organisation
Run charts
3. Vehicle reliability
Measuring and analyzing the car's 'vital signs'
Examples
Statistical report
Session chart
Creating alarm channels
Dashboard alarm functions
0
m
1000
m:s
0:20
0:40
1:00
1:20
1:40
2:00


4985 Samples, Zoom Linked
Rear downforce [kg] -156.3
150
100
50
0
-50
-100
-150
-200
-250
-300
-350
-400
-450
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270
Drive Speed [km/h] 122.4
4. The comparing of performance
Determining where on the track time is gained or lost
Lap overlays
Improving the quality of lap overlays
Inserting missing lap beacons
Sector time reports
Checking the validity of important channels
5. Analysis of driver performance
The interface between car and driver
Objective driver analysis
The use of statistics in driver analysis
The throttle position histogram
Full throttle time
Throttle speed
Full throttle point on corner exit
Coasting
Coasting or maintenance throttle?
Maximum braking effort
Brake point and length
Diagnosing early braking
Braking aggressiveness
Brake release smoothness
Shifting gears
The driving line
The driving line with GPS
The driving line with video
Steering smoothness
Vehicle balance and steering smoothness
Different driving styles require different car set-ups
Laptime consistency
Comparing yourself to the competition
Driver coaching and data acquisition



6. Analysis of vehicle performance

- Traction
- Braking – lock-up
- Brake balance
- Brake system compliance
- IR brake temperature measurement
- Shifting gears
- The friction circle
- Combined acceleration
- Estimating grip levels from logged data
- Vehicle balance
- The understeer angle
- Analysing tire degradation
- Using tire pressure monitoring systems
- IR tire temperature measurement
- Determining the car's roll stiffness distribution
- Shock absorbers
- Using the shock speed histogram
- Aerodynamics: Drag and downforce
- Calculating the main aerodynamic parameters from track data
- Measurement of rideheight
- The coastdown test
- The constant velocity test
- Putting together the car's aeromaps

7. Track characteristics

Lap statistics for track characterisation
Friction circle comparisons
Determining the road profile
Information from other sources

8. Race strategy

Accurately determining the car's fuel consumption
Calibrating the fuel consumption calculation
Tire consistency
Driver consistency
Information from other sources

9. Seminar evaluation

Testimonials

“When I learned that Jorge Segers, a Belgian race engineer, the youngest FIA GT Crew Chief ever and the author of a landmark textbook on data acquisition released earlier in the year was presenting his Seminar on Data Acquisition in Orlando leading up to the Performance Racing Industry trade show, it was a no-brainer for me to attend.

While I am more than familiar with most interfaces and interpretation programs to divine the subtleties of driver performance, I wanted to learn more about the whole picture of what to do with the mountains of data generated monitoring not only the driver, but also the car. Jorge’s presentation was fantastic!

Suffice to say that I learned more in two days than in the last two years on how to glean useful information about the function and the properties of the car AND the driver! Quite remarkable how listening to the author expand on simple passages in his book can cause the light to come on.
I’m really anxious to get started at the track in 2009 and putting some of this knowledge to good use. I’m pleased that professional continuing education like this is available to continue lifelong learning.”

Peter Krause, Director of Krause & Associates LLC

“This seminar will pay for itself in both money and time as we get more value from our investment in data acquisition equipment and track time.“

Kamal Amer, Director Star Racing Technology

"Great program, lots of useful information and new ideas to utilize our current data.“

Kirk Spencer, driver GrandAm Koni Sportscar Challenge for Georgian Bay Motorsports

"A practical approach of what every race engineer should concern and analyze during a race event"

Gustavo Brambilla, Engineer Porsche GT3 Cup Brasil

"This program is great for anyone who needs to further their knowledge or get their feet wet in the subject. The knowledge and personality of the instructor make this course what it is."

Lee Stark, Student Purdue University Indianapolis

"As a driver I enjoyed the driver analysis and car vital signs modules. I believe that all the topics will help me communicate better with my engineer at the racetrack. I really enjoyed the program and I feel it could help members of the racing community at all levels.“

Ashley McCalmont, driver GrandAm Koni Sportscar Challenge for Georgian Bay Motorsports

Upcoming seminar

Birmingham, UK
9&10 January 2018
Prior to Autosport International
The Best Western Plus Manor Hotel
Main Road, Meriden, Solihull
West Midlands, CV7 7NH

Registration fee: € 750,-
Students and FSAE members: € 550,-

The seminar fee includes:

Lunch and drinks during the 2 seminar days

Binder with presentation handouts

Math channel syntax list for most commercially available data acquisition systems

Copy of ‘Analysis Techniques for Race Car Data Acquisition, 2nd Edition’

Register now for an upcoming seminar!

Register by e-mail:
Download the registration form on **www.js-engineering.be** and mail to **jorge.segers@js-engineering.be**. We will send you our bank details.

Register by phone: +32 495 260789

The seminar is strictly limited to 30 persons and a first come first served policy is applied. The order of registrations is determined by the date that the full payment for the seminar registration is received.

Pre-payment is required to confirm the attendee's registration. Registrations without payment received will not be confirmed until after payment is received.

Seminar cancellation policy

We know things come up from time to time and there could be a possibility that you have to cancel. We also know and appreciate your understanding in regards to operation and overhead costs involved when planning seminars; therefore, cancellations will be handled in the following manner:

All cancellations and changes must be presented to us in writing (e-mail, fax or letter).

If you cancel more than 10 days prior to the seminar starting date, we will issue a refund minus a €200.00 administration fee.

If you cancel less than 10 days prior to the seminar starting date, no refund will be issued. In this case it is possible to reschedule to a future seminar subject to a €200.00 administration fee.

There will be no refunds or rescheduling for no-shows.

JS Engineering BVBA reserves the right to cancel or reschedule seminars in case of insufficient attendance, provided that advanced notice is provided to registered attendees. In the event of cancellation or rescheduling, the limit of liability on JS Engineering will be the original seminar fee. JS Engineering accepts no responsibility or liability for any other costs or fees incurred by attendees including, but not limited to, expenses associated with pre-booked travel arrangements.

For more information contact us at **jorge.segers@js-engineering.be**