

Course-PM for SD2307 Rail Vehicle Technology

Academic year 2020/2021, period 2 (Oct 2020–Jan 2021) – updated 23 Oct 2020

Do you want to make an impact on the climate crisis? The transport sector accounts for more than 25% of the global energy consumption, and the most impactful action to reduce this is to shift passengers and goods to the modes of transport with highest capacity and energy efficiency; which, for most operations, is Railways.

Rail Vehicle Technology gives an extensive overview to rail vehicles and their technical basis, while you as a student design a commuter-type train in a course-long project task. The lectures and the project task advance in parallel throughout the course, in a weekly basis, so that technical aspects used in the design of the vehicle are available to the students throughout the lectures and online recordings.

Additionally, the course offers an optional study visit to the SJ Hagalund depot, so that you can see and feel in reality how different rail vehicles are, linking theory and simulations from the course to real life engineering practice.

Content and learning outcomes

The overall course aim is to describe the components and functions of rail vehicles as well as the various demands a rail vehicle must fulfil. The course should give you a good platform for work in the field of rail vehicle engineering.

Course contents *

The areas covered in the course are the following: mass and adhesion; running resistance and aerodynamic phenomena; running gear and carbody tilting; vehicle traction mechanics, motors, transmission and current collection; vehicle braking systems and control; carbody mechanics, gauging; interior design, comfort systems and passenger environment; internal noise and vibrations; and rail vehicle market and vehicle development from a manufacturers perspective. Study visit to a local train depot.

Intended learning outcomes *

After a completed course you should, among other things, be able to:

- explain how bogies, carbodies, traction and brake systems work and can be improved
- calculate train performance like acceleration and braking capacity, average speed and energy usage
- determine outer dimensions and interior design for a train at a given operational task
- discuss the trends and future potential for rail vehicles

Language

English – knowledge of Swedish is not necessary, teaching language, course information and examination are in English; Swedish terminology can still appear during the course.

Detailed schedule

Week	Day	Date	Time	Room	Lecture	Teacher
w44	Tue	2020-10-27	10-12	VEL	Intro, Project task intro, rail veh. overview	CC CC
w44	Wed	2020-10-28	15-17	online	Vehicle mass, adhesion, tractive forces	CC CC
w44	Fri	2020-10-30	13-15	VEL	Running resistance, curving, carbody tilting	RP RP
w45	Tue	2020-11-03	10-12	VEL	Running gear & bogies	SSt SSt
w45	Wed	2020-11-04	16-18	online	Running gear & bogies, traction mechanics	SSt MB
w45	Fri	2020-11-06	13-15	online	Electric/diesel traction	ZL ZL
w46	Tue	2020-11-10	10-12	VEL	Electric/diesel traction, Project task reserved time	ZL CC
w46	Thu	2020-11-12	08-10	online	Braking	ZL ZL
w46	Fri	2020-11-13	13-15	online	Braking	CC CC
w47	Wed	2020-11-18	15-18	online	Project task: Intermediate presentation	CC
w47	Fri	2020-11-20	13-15	VEL	Carbody mechanics	CC CC
w48	Tue	2020-11-24	10-12	VEL	Carbody mechanics, Aerodynamic phenomena	CC CC
w48	Thu	2020-11-26	08-10	online	Interior noise etc, rail vehicle development	SSt SSt
w48	Fri	2020-11-27	13-15	online	Vehicle gauging	RP RP
w49	Mon	2020-11-30	09-12	HGL	<i>Preliminary - Optional study visit to Hagalund</i>	CC
w49	Tue	2020-12-01	10-12	VEL	Carbody interiors and comfort systems	MB MB
w49	Fri	2020-12-04	13-15	online	Pantograph dynamics, rail development in China	ZL ZL
w50	Wed	2020-12-09	15-18	VEL	Project task: Final presentation	CC
w1	Thu	2021-01-07	08-13	M37	Final Exam	

Lecture rooms:

VEL = [Vehicle Engineering Laboratory](#), Teknikringen 8, ground floor

Online = zoom link provided in the Canvas page of the course

HGL = Hagalund Depot

M37 = [Brinellvägen 64](#)

Literature and preparations

Specific prerequisites *

150 university credits (HP) In engineering and documented proficiency in English corresponding to English B/ English 6.

Recommended prerequisites

150 university credits (HP) In engineering and documented proficiency in English corresponding to English B/ English 6.

Fundamentals of mechanical and electrical engineering. The KTH course SD2221 Vehicle System Technology is recommended.

Literature

“Rail Systems and Rail Vehicles”, E. Andersson, M. Berg, S. Stichel, C. Casanueva, 2018
The digital documentation consists of slides and recordings as well as project task and sample written exams. It is available on the KTH course management system, Canvas.

A printed textbook is also available for 300 SEK for programme students in the student office in Teknikringen 8D (600 SEK for people taking SD2307 as a single course; "fristående studerande")

UIUC students: books for each student will be sent to UIUC, contact your program manager for further details. Other online students please contact the course responsible (carlosc@kth.se).

Reading instructions

During the course additional indications will be given for sections of the book that are not covered by the course and are therefore not evaluated in the final exam.

The book chapter covered by each lecture is specified in the course schedule.

Disability

If you have a disability, you can get support through Funka:

<https://www.kth.se/student/studentliv/funktionsnedsattning>

In addition, inform the course leader if you have special needs, and show your certificate from Funka.

Examination and completion

Grading scale *

A, B, C, D, E, FX, F

44.0 – 50.0 points:	grade A	
38.0 – 43.9 points:	grade B	
32.0 – 37.9 points:	grade C	
26.0 – 31.9 points:	grade D	
20.0 – 25.9 points:	grade E	passed
18.0 – 19.9 points:	grade Fx	not passed
0.0 – 17.9 points:	grade F	

Examination *

Written Exam (TEN1; 4,5 hp; P/F)

Project Task (PRO1; 3 hp; P/F)

Other requirements for final grade *

Written Exam (TEN1; 4,5 hp; P/F), compulsory

Project Task (PRO1; 3 hp; P/F), compulsory.

Note that both TEN1 and PRO1 need a Pass grade in order to pass the course.

Examiner

Carlos Casanueva, carlosc@kth.se

Ethical approach *

1. All members of a group are responsible for the group's work.

2. In any assessment, every student shall honestly disclose any help received and sources used.
3. In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.

Examination details

Project Task (PRO1; 3 hp; P/F)

Work carried out in groups of 2-3 people on "Principle design of a fast train for regional traffic". The task includes two compulsory meetings:

- Intermediate presentation, online/zoom (18th of November, 15:00-18:00)
- Final presentation in VEL (9th of December, 15:00-18:00)

A project report is to be submitted by the 4th of January 2020. If submitted in time, the report can give you up to 10 bonus points.

UIUC and Online students: presentation slides are to be sent to the course responsible (carlosc@kth.se) the day before each presentation (26th of November and 10th of December respectively). A videoconference schedule will be arranged for each group the week before the KTH presentation. A project report is to be submitted by the 15th of December 2019.

Written Exam (TEN1; 4,5 hp; P/F)

A five-hour written exam given the 7th of January 2021, 08:00-13:00. Details for the exam will be explained in due time. A maximum of 40 points can be achieved; for pass at least 20 points are required.

The Written Exam includes theory and practical problems and is based on both the lectures and the project task.

UIUC and Online students: For UIUC students, an earlier exam will be arranged during week 51, exact day to be defined before December 2020. Other online students who need special arrangements please contact the course responsible (carlosc@kth.se).

Opportunity to complete the requirements via supplementary examination

If you got the grade Fx considering only the written exam (TEN1) you get the possibility of a supplementary written exam. Such an exam will comprise of parts where you obviously need to improve. Usually 5 points can be achieved, while 3 points are needed for passed. The time available is one hour (60 minutes). The supplementary exam must be written within six weeks after the result has been announced. After that period grade Fx will be changed to F (not passed).

If you did not pass the Project Task (PRO1) you get the possibility of a completion.

Guidelines will be sent to the group in order to complete it within six weeks after the result has been announced. A successfully completed task gives 5 out of 10 points for the calculation of the final grade.

For grade calculation after re-examination of one requirement, a previously passed TEN1 or PRO1 can be used in the final grade calculation with the previously obtained grade.

Opportunity to raise an approved grade via renewed examination

A student that want to increase the grade can apply for a regular re-examination (TEN1).

The highest grade of the two applies. There is no possibility of re-examination of the project task (PRO1).

If the course is modified or discontinued

If the examination of the course is changed, specific course transition provisions will be included in the new course syllabus, which will define how the person who has passed some of the previous examination elements should be examined.

When the course is discontinued, the student has the opportunity to be examined for another two academic years.

Further information

Other regulations *

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Learning platform

Canvas

Offered by

SCI/Aeronautical and Vehicle Engineering

Teachers

CC = Carlos Casanueva, associate professor, course responsible carlosc@kth.se

MB = Mats Berg, professor mabe@kth.se

SSt = Sebastian Stichel, professor stichel@kth.se

ZL = Zhendong Liu, PhD, researcher zhendong@kth.se

RP = Rickard Persson, PhD, researcher patper@kth.se

RK = Rohan Kulkarni, PhD student rohank@kth.se

Communication with the teachers

You can communicate with the teachers via e-mail or Canvas, office drop-in questions are to be avoided due to COVID restrictions.

Course analysis and course development

The SD2707 Rail Vehicle Technology course is developed in a yearly basis. After each course examination, a learning questionnaire is produced. With the answers to this LEQ, a group of three to five teachers and assistants discuss the results and propose course development possibilities that will address the results of the course analysis.

You can find the course analysis of previous years in the course web page.