KF2150 **Surface Coatings Chemistry, 7.5 credits**

Warmly welcome to the course in ”Surface Coatings Chemistry”! The course is offered by KTH Fiber and polymer technology, Division of Coating Technology, Teknikringen 48, floor 4.

The aim of the course is to introduce the students to the field of organic coating chemistry comprising synthesis, applications and evaluation/characterization. The course will build on prior knowledge in polymer chemistry, polymer physics and polymeric materials. The area is closely related to important industrial challenges and we will meet quite a large number of guest lecturers from different companies throughout the course.

The course will be managed through the CANVAS-platform. To access the platform you need to be registered for the course. If you have not registered yet, please do so as soon as possible. Unfortunately, we can´t help you with registration details so if you have questions regarding this, please contact the student admin office to which you belong.

Please find course schedule and course-PM under "Modules" (on the left hand side) and then "Course admin". The course content is managed through "Modules" - in the menu on the left hand side. There will be three tracks of Modules: Lectures (L), Seminars (S), and Lab course (Lab). There will also be a Module assigned to the study visit - "Study visit". Apart from these Modules, there may also be others if need be.

Learning outcomes

- Describe what a coating system is and use the terminology in the field of organic coatings
- Discuss aspects of choice of substrate, chemistry of the coating resin and properties of the dry/cured surface coating
- Discuss environmentally driven challenges related to the coatings industry
- Demonstrate knowledge regarding industrial coating processes

Course content

- Coating resin systems
- Application strategies and methods
- Wetting, flow and adhesion
- Film formation procedures in physically and chemically drying systems
- Environmental effects of different surface treatment systems
- Seminars by invited industrial guess
- Study visit to paint manufacturing industry

Experimental work:

- Synthesize a polymer suitable as a resin for organic coatings
- Characterize the coating resin with regards to composition and properties
- Apply the coating on substrates
- Follow the drying/curing of the coating resin by suitable methods
- Evaluate the properties (adhesion, hardness etc) of the dried/cured film.

Prerequisites

KF1010 Polymer technology with cellulose technology or corresponding knowledge.
For further administrative details, please visit https://www.kth.se/student/kurser/kurs/KF2150?l=en

Course organization

Theory part, 4,5 credits (TEN1)	Lectures. Seminars by industry representatives.
Lab course, 3 credits (LAB1)	Scheduled individually for each group Study visit, refer to schedule for place and time

This course has a lot of structure. CANVAS is used as the learning platform to provide the skeleton for the course. In CANVAS, you will find that each course week is described under a separate heading. Make sure to check CANVAS often in order to follow the course accordingly. Some sessions are best perceived if you have prepared according to the instructions.

Theory part, including literature (4.5 credits)

Several different books, papers and web-sites will be used as course literature. Lecture slides and all textbook material will be available through CANVAS (pls no hand-outs will be distributed) . Make sure to work your way through the course material.

We are also providing the ”BASF Handbook on Basics of Coating Technology” as a reference book. It can be used at the Division of Coating technology, Dept of Fiber and polymer technology, Teknikringen 48 (available in a limited number) but there is a copy machine available nearby.

Lab course (3 credits)

The lab course is a very important part of the course and is conducted as a project-based activity. There will be several project assignments and each student will be assigned to a project. All groups should synthesize, characterize and cure/dry a thin film and subsequently characterize the dry film, using conventional coating technology characterization techniques. Each group will be supervised by at least two supervisors. See separate listing in CANVAS, tab Lab course.

Please note that the lab course is not scheduled! Each group shall, together with the supervisor/s decide when to conduct the lab work. Keep in mind that not everybody in the group has to do all the work together; sometimes it is more efficient to divide the group into sub-groups! As a benchmark, every student is anticipated to spend *approximately 60-80 hours on the lab course* (3 credits)!

Note: Project activities should be documented in a log book. Each group is responsible for one log book. Please see info in CANVAS, tab Lab course. Both lab supervisors and examiner will follow the progress in the log book.

After approximately 2 weeks (check schedule), each group should present their initial findings and a plan for the experimental work, including a short background, to the other course participants.

The experimental part of the course is examined by an oral presentation for all course participants and via a written report. Each group will be assigned to another group’s report to oppose on, during the oral presentation. Therefore, the lab reports have to be submitted in due time prior to the presentation.

Examination and grading

The course is examined with the grades F-FX-E-D-C-B-A
TEN1 - Examination, 4.5 credits, grade scale: F-FX-E-D-C-B-A
LAB1 - Laboratory Course, 3.0 credits, grade scale: P, F*

The exam is scheduled for January 2020. Do not forget to sign up!!

No old exams will be distributed; a few examples of examination problems are posted on CANVAS.

Homework assignments (HWA) will be offered as continuous examination throughout the course. HWA will be posted through CANVAS three times during the course. Each HWA will be open for submission for one week. The HWAs are always due on Tuesdays at 10 am (sharp). You have to have 80% of the total points and points on each of the HWAs to pass the continuous examination. A student who passes the continuous examination will receive the grade E on the theory part of the course.

The experimental part of the course is very important and a well conducted project assignment (lab work + written and oral presentation) can raise the course grade to a D without taking the written exam. For a higher grade than D the student is required to take the written exam.

What is required to pass the lab course with extinction to qualify for grade D?

- Active participation in all parts of the lab work
- Show that you can work independently
- Demonstrate that you use a scientific approach (scientific methods, scientific language, contextualization etc)
- Active during presentations and discussions
- The log book should be used to document the project

Course staff

Responsible teacher	Eva Malmström (mavem@kth.se) - examiner
Teacher	Mats Johansson (matskg@kth.se)
Lab course, adm issues	Linda Fogelström (lindafo@kth.se)

Teachers and graduate students of the Division of Coating technology
Guest lecturers from industry. Please refer to the separate schedule for a complete listing.

KF2150 Learning outcomes and grading

	Grade E	**Grade D**	**Grade C**	**Grade B**	**Grade A**
Coating chemistry	Exemplify various chemistries and drying mechanisms applied for coating resins. *(Part A, TEN 1)*	Describe how the chemical structure of a binder resin can be characterized. *(LAB 1)*	Reflect on various chemistries used for coatings and identify advantages and disadvantages. *(TEN 1)*	Discuss how various curing chemistries relates to each other and identify pros and cons. *(TEN 1)*	Design, from a chemical point of view, a binder system for a particular curing/drying mechanism and substrate. *(TEN 1)*
Physical performance of a coating system	Identify parameters that are crucial for the performance of a wet coating resin. *(Part A, TEN 1)*	Exemplify how various properties of a wet resin can be assessed. *(LAB 1)*	Describe the film formation process for various binder systems. *(TEN 1)*	Explain how mechanical properties of a dry film can be assessed. *(TEN 1)*	Elucidate relationship between chemical composition and performance. *(TEN 1)*
Industrial applications	Exemplify industrial coatings processes. *(Part A, TEN 1)*		Describe industrial coatings processes and discuss pros/cons. *(TEN 1)*		
Environmental awareness	Identify sustainability challenges related to the coating industry. *(Part A, TEN 1)*		Discuss and suggest how to overcome environmental hazards related to the coatings industry. *(TEN 1)*		

Grade E 80% correct answers on all questions Part A TEN 1 (also eq. to a total of 80% correct answers on each homework assignment)

Grade D Fulfilled requirements for Grade E + approved lab activities (oral and written works) as detailed above.

Grade C-A As outlined as above. Each exam questions should attain 80% of the total point to fulfill the grading criteria.