



FBB3150 Biomimetiska bio- och nanokompositer 7,5 hp

Biomimetic Bio- and Nano Composites

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

Fastställande

Kursplan för FBB3150 gäller från och med HT10

Betygsskala

Utbildningsnivå

Forskarnivå

Särskild behörighet

Students enrolled in the “Graduate School for Biomimetic Engineering” are prioritized. The applicant must hold a University degree in natural science. Graduation in engineering, biology, chemistry or biotechnology is recommended. Good knowledge in written and spoken English is required.

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

The course’s goal is to provide basic knowledge about the intersection of biology, materials science, and nanotechnology, and thus to give good theoretical and experimental insight

into biomimetic designing of bio- and nanocomposites based on wood, fibers and their constituent polymers for advanced applications.

After passing the course, the student should be able to:

-Recognize the greater challenges in integrating complex biological knowledge into the design of improved materials.

-Describe how the chemical structure, physical and mechanical properties, and surface properties of biomaterials may be optimal for different applications.

-Describe the microstructure and function of wood, cellular structures and the cell wall, and how cell wall composition may be engineered for different applications.

-Describe the concepts and methods developed for obtaining a range of nanoscale biomaterial building blocks with strictly controlled size, shape, bulk and surface structure, composition and properties.

-Explain how nanoscale biomaterial building blocks can be organized and integrated into nanostructured materials using self-assembly, templating, layer-by-layer technology, and other advanced methods.

-Utilize the knowledge obtained from such multidisciplinary field to design functional bio- and nanocomposite materials using materials that occur in nature as the biomimetic model.

Kursinnehåll

The course is on the advanced level and consists of lectures, laboratory demonstrations, and a project assignment that includes literature review, biomimetic composite material design, and a seminar. The entire project assignment is presented in a seminar at the end of the course.

Assignments Between Lectures

Before each meeting there is literature to read and a written assignment to do. Directions for reading and the assignments are in the schedule. Write about one to two A4 pages in a simple format, perhaps a bullet list. Upload it to course website on Bilda.

The **purpose of the assignments** (literature and written assignments) is to:

- Generate appropriate learning activity for you
- Prepare you for the final project assignment
- Increase the quality of learning using remote online lectures

As you understand, you must set aside time for reading and working between the meetings.

Laboratory Demonstrations (Optional)

We will provide the opportunity for lab demonstrations based on the demand and interest from students. The choices of lab demonstrations include:

1. The production of microfibrillated cellulose and preparation of cellulose nanopapers.

2. The preparation of foams and aerogels from microfibrillated cellulose.
3. Bacterial cellulose cultivation.

The Project Assignment

The main goal with the project assignment is that the students will use the knowledge from this and previous courses and, according to their own interest, design a nanostructured composite material using nanoscale building blocks from cellulose, or chitin, or other bio-materials. They will prepare a written report providing a review of the state of the art and illustrating their material design, synthesis and characterization plan. They will also prepare a PowerPoint presentation with voice and upload it to course website on Bilda. The detail instruction for the project assignment is in the schedule.

Kurslitteratur

Scientific articles.

Examination

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

The course comprises written examination (4.5 hp), assignments between the lectures (1 hp), and the project assignment (2 hp). The final grade will be pass or fail on the course.

Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.