



BB2450 Cellfabriken 7,5 hp

The Cell Factory

Kursplan för BB2450 gäller från och med VT19

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

Utbildningsnivå: Avancerad nivå

Huvudområde: Bioteknik

Lärandemål

At the end of the course, students should be able to:

- Builds on knowledge of the metabolism in standard industrial workhorses like *E. coli* and *S. cerevisiae* and expands to different production systems
- Differentiate cellular organization and signaling systems between prokaryotic and eukaryotic cells
- Describe the function of cellular compartments, in particular, the subcellular localization and integration of metabolic pathways
- Describe prokaryotic and eukaryotic cell factories, including special features of eukaryotic hosts, involve codon usage, post-translational modifications, protein folding, protein processing, disulfide bond formation
- Describe new technologies in synthetic biology and how this has impact in bioproduction
- Described consequences of the complexity and elemental composition of the substrates on the growth of cell gases and how these growth conditions affect metabolic pathways and the cell's accumulation of desired macromolecules
- Describe the flux of carbon in prokaryotic and eukaryotic (including yeast, fungi, algae and higher plants) organisms in relation to carbohydrate metabolism
- Describe pathways specific to certain types of microorganisms whose products have potential industrial applications (eg leading to the production of building blocks and polymers)
- Describe complex gene regulation processes in prokaryotes, plants, and fungi
- Understand integrated pathways and regulatory processes for metabolic engineering of prokaryotes and eukaryotes that lead to the production of biomaterials
- Understand and describe cultivation processes to produce biologics by engineered organisms, including production of biologics by mammalian cells and by plant-based systems.

Kursens huvudsakliga innehåll

- Prokaryotic and eukaryotic cell structure and cellular compartment functions, including subcellular localization or specific metabolic pathway
- Prokaryotic and eukaryotic carbon flux and energy generation, with emphasis on carbohydrate metabolism

- Uptake or substrate and types of transports across biological membrane
- Specific prokaryotic and eukaryotic pathways for the production of cellulose, alginate, cellulose, and peptidoglycans, etc.)
- Regulation of gene expression in prokaryotes (eg operons) and eukaryotes, and exploitation for the manipulation of metabolic pathways
- Metabolic engineering of fungi and plants, with particular emphasis on biomaterials production, including transformation system (eg plastid targeting, Agrobacterium) - emphasis on carbohydrates, plasticizer, lipid derivatives), and punctually on biofuel production
- Exploitation on different cellular systems and their metabolic pathways for the production of energy, biopharmaceuticals, small molecules, biomaterials and vaccines
- Process of mammalian cell-based system (eg Chinese Hamster Ovary cells, HEK293)
- Demonstrator of fed-batch bioreactor process for mammalian cell culture

Kursupplägg

The course is worth 7.5 credits (ECTS) and runs over a period of approximately 8 weeks. This is equivalent to approximately 200 hours of full-time study, ie approx. 25 hours / week including lectures, journal clubs, tutorials, two assignments, and preparation for the final exam.

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Behörighet

For program students at KTH:

At least 150 credits from grades 1, 2 and 3 of which at least 100 from Year 1 and 2 and Bachelor work must be completed. In de 150 punten worden ingevulde voltooide cursussen binnen een programma opgenomen die: minstens 20 studiepunten mathematica, numerieke methoden, data bevatten, waaronder minstens 5 studiepunten samengesteld door numerieke methoden en gegevens, 30 hp chemie waar ook de cursus van chemische meetmethoden kan worden opgenomen, and 20 credits Biotechnology, biochemistry or molecular biology.

For independent students, a

total of 20 ECTS credits in biochemistry, microbiology and genetics / molecular biology. 20 ECTS credits, en totalt 20 studiepoeng i matematik, numeriske metoder, data, eller som mindst 5 studiepoints består af numeriske metoder eller tilsvarende og dokumenteret færdighed i engelsk svarende til engelsk B.

Litteratur

Lezing of chapters from the following textbooks is recommended: Biochemistry (Foot and Foot, latest edition); Microbiology: principles and explorations (Black, 7th Edition); Microbial Physiology (Moat et al., 4th Edition); Genes IX (Lewin); Ozturk S and Hu WS (2006) "Cell Culture Technology for Pharmaceutical and Cell-Based Therapies" Taylor and Francis ISBN 0-8247-5334-8

But the course has a wide width and more specialized material will be made available during the course. Materials from one of the following bookkeepers will be offered: Plant Biotechnology, Genetic Engineering of Plants (Slater, Scott and Fowler, 2nd Edition); Microbial production of biopolymers and polymer precursors (Rehm, 1st edition); Plant lipids: biology, utilization and manipulation); etc

Examination

- KON1 - Kontrollskrivning 1, 1,0 hp, betygsskala: P, F

- KON2 - Kontrollskrivning 2, 1,0 hp, betygsskala: P, F
- NÄR1 - Närvarokrav föreläsningar, 1,0 hp, betygsskala: P, F
- TEN1 - Tentamen, 4,5 hp, betygsskala: A, B, C, D, E, FX, F

Het eindcijfer is gebaseerd op de uiteindelijke schriftelijke uiteindelijke examen (90% van de uiteindelijke punten) en de twee tussenbeoordelingen tijdens de cursus (die samen 10% van de finale score vertegenwoordigen).

The course is worth 7.5 credits

Grading scale: **A to F** , where **A** is the highest grade, **F** is **not known**

Krav för slutbetyg

Pass KON1, Assignment, Lab Assignment, and TEN1

KON1- Intermediate Exam, 1.0 credit, grade scale, P, F

Assignment - 1.0 credit, grade scale, P, F

Lab Assignment - 1.0 credit, grade scale, P, F

TEN1-Written Examination, 4.5 credits, grade scale: A, B, C, D, E, FX, F