

# SDC

The university partnership  
Denmark – China

Master's Programme in

# Life Science Engineering and Informatics



Academic Regulations

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## Legal Frame

Students enrolled in this programme are admitted as full-time students at University of Chinese Academy of Sciences.

This curriculum applies to students enrolled in the programme from 2018.

This master's programme is established within the framework of the following:

- Partnership Agreement between Graduate University of Chinese Academy of Sciences and University of Copenhagen (KU), Aarhus University (AU), University of Southern Denmark (SDU), Aalborg University (AAU), Roskilde University (RUC), Technical University of Denmark (DTU), Copenhagen Business School (CBS), IT University of Copenhagen (ITU), on the establishment of the Sino-Danish *Centre for Education and Research*, Graduate University of Chinese Academy of Sciences, signed on 12 April 2010
- Agreement between Graduate University of Chinese Academy of Sciences (GUCAS) and University of Copenhagen (KU), Aarhus University (AU), University of Southern Denmark (SDU), Aalborg University (AAU), Roskilde University (RUC), Technical University of Denmark (DTU), Copenhagen Business School (CBS), IT University of Copenhagen (ITU) concerning *Master's Programmes at Sino-Danish Centre for Education and Research*, Graduate University of Chinese Academy of Sciences, signed on 29 August 2011
- Agreement between Graduate University of Chinese Academy of Sciences and Technical University of Denmark concerning Provision of the *Master's Programme in Life Science Engineering and Informatics* at Sino-Danish Centre for Education and Research (SDC), University of Chinese Academy of Sciences

Students must observe and act accordingly to the following rules issued by the SDC Directors:

- Courses and Exams
- Exam regulations
- Thesis regulations 10 steps
- Avoid cheating on exams
- Student complaints

Students must also observe and act accordingly to Rules and Regulations for UCAS International Students. SDC rules are published on Moodle.

## Title and degree

The degree awarded by Technical University of Denmark is Master of Science in *Life Science Engineering and Informatics*. The degree awarded by University of Chinese Academy of Sciences is Master of Biochemistry and Molecular Biology/ Bioinformatics/Genomics.

## Duration

The master's programme has a duration of two academic years equivalent to 120 ECTS points (European Credit Transfer System). 60 ECTS points correspond to one year of full-time studies.

### 4-YEARS LIMIT

All SDC students must complete their Danish and UCAS degree within 4 years from the enrolment. This period includes leave of absence. It is possible to apply for an exemption due to illness or other extraordinary circumstances.

The 4-year limit for the Danish degree applies for the 2016 cohort and onward. Students in the 2012-2015 cohorts have to complete their studies before the 1st of January 2020 to obtain their Danish degree.

When choosing thesis period *Danish/International students* must be aware of UCAS' 4 years limit for awarding diploma. UCAS' degree application procedure *STEP 10 CN*(see Thesis regulations 10 steps) has to be completed within 4 years from enrolment. This period includes leave of absence.

## Admission requirements

- Admission to the Master's programme in *Life Science Engineering and Informatics* is based on a successfully completed bachelor's degree (or equivalent) in:
  - Biochemistry and Molecular Biology from University of Southern Denmark or from a Chinese university.
  - Biochemistry and Molecular Biology with a minor in Chemistry from University of Southern Denmark or from a Chinese university.
  - Biomedicine from University of Southern Denmark or from a Chinese university.
  - Pharmacy from University of Southern Denmark or University of Copenhagen or from a Chinese university.
  - Biotechnology from Technical University of Denmark or from a Chinese university.
  - Technical Biomedicine from Technical University of Denmark or from a Chinese university.
  - Molecular Medicine from Aarhus University or from a Chinese university.
  - Molecular Biology from Aarhus University or from a Chinese university.
  - Biotechnology from Aarhus University or from a Chinese university.
  - Biology from Aarhus University or from a Chinese university.
  - Biochemistry from University of Copenhagen or from a Chinese university.
  - Biology and Biotechnology from University of Copenhagen or from a Chinese university.
  - Molecular Biomedicine from University of Copenhagen or from a Chinese university.
  - Food Science from University of Copenhagen or from a Chinese university.
  - Animal Science from University of Copenhagen or from a Chinese university.
  - Or Veterinary Medicine from University of Copenhagen or from a Chinese university.

The following bachelor degrees may grant admission to the Master's Programme in *Life Science Engineering and Informatics* on an individual assessment:

- Either a BSc in Computer Science from a Chinese university, supplemented with additional knowledge in Molecular Life Sciences
- Or a BSc in Chemistry from a Chinese university, supplemented with additional knowledge in Molecular Life Sciences

Other bachelor programmes that are similar to the above in level, extent or content within the Life Science area may grant admission. The institution receiving the application individually determines this.

High-level English language proficiency.

All applicants may be interviewed prior to admission to assess skills, motivation and knowledge of English.

## General programme regulations

The language of instruction in the SDC master's programmes is English. Teaching, supervision and assessment will be carried out in English.

Students will be graded according to both the Chinese and the Danish grading scale. However, for the Master's Thesis, students will be graded according to the Chinese 4-point scale. See Thesis regulations 10 steps.

DK	12	10	7	4	02	00	-3
CN	100-95	94-90	89-76	75-61	60	(59-40)	39-0

Leave of absence can be granted to students on the grounds of becoming a parent, illness, military service or exceptional circumstances

Students who wish to complete degree programme elements at another university or institution of higher education in Denmark, China or abroad as part of their degree programme may apply the Teaching Committee for advance approval of transfer credit for planned subject elements.

Students can maximum be granted 30 ECTS credit transfer.

Either the Teaching Committee or the SDC Directors may grant exemptions to this curriculum or other SDC rules. Applications for exemption must be submitted to the SDC Secretariat

## Qualifications

### Purpose

*Life Science Engineering and Informatics* is a post-genome life science research discipline, in which publicly available DNA sequence data are crucial in both experimental design and data interpretation. It is a holistic-oriented research approach, which contrasts with the traditional reductionistic methodology used in biochemistry, molecular biology etc., in that *Life Science Engineering and Informatics* attempts to give an unbiased survey of the situation within the biological entity of interest. *Life Science Engineering and Informatics* is an extension of central life science disciplines, such as cell biology, molecular biology, biochemistry, physiology, microbiology etc., where the large-scale approach is the novel dimension. *Life Science Engineering and Informatics* utilises knowledge and methods from other scientific disciplines – especially bioinformatics, computer science, statistics and analytical biochemistry; but knowledge in other scientific disciplines – especially within life science – is required for a full understanding of a given project.

The MSc programme in *Life Science Engineering and Informatics* deals with large-scale surveys of defined groups of biomolecules that are present in a biological entity. *Life Science Engineering and Informatics* includes, but is not limited to, the genetic constitution of an organism (Genomics), expression of genes at the RNA level (Transcriptomics), the protein profile of a biological entity (Proteomics), the products of complex metabolic processes (Metabolomics) and variations in the above between different situations (“quantitative Omics”). The programme includes experimental design based on statistics and existing database information, knowledge of the various technological platforms used to perform large-scale studies, computer-based analysis and interpretation of very large data sets, and the extraction of biologically relevant information for the development of testable hypothesis. The integration of different Omics datasets will be addressed theoretically as well as in practice with the students’ own data.

### Qualification Profile

#### Knowledge

The graduate must:

- possess knowledge regarding post-genomic molecular life science, analytical biochemistry or bioinformatics, based on the highest international research within one field defined by the master’s thesis project.
- be able to understand and reflect on knowledge regarding post-genomic molecular life science, analytical biochemistry and bioinformatics, based on a scientific approach.
- be able to identify scientific problems connected to omics-approaches and reflect on application of the different available techniques.

#### Skills

The graduate must master specific scientific tools and methods within post-genomic molecular life science, analytical biochemistry and bioinformatics:

- Tools and databases used in *Life Science Engineering and Informatics*
- DNA-sequencing
- mRNA expression analyses by sequencing and micro arrays
- Qualitative and quantitative proteomics using mass spectrometry and electrophoretic techniques
- Metabolite analyses by chromatography, NMR and mass spectrometric detection
- Quantification in connection with gene expression
- Interaction analyses
- Chromatography and electrophoresis

The graduate must master the following general skills which are connected to employment in scientific research:

- Acquisition of knowledge within a defined area of topics
- General experimental design
- Detailed planning of experiments
- Interpretation of experimental data
- Keeping of laboratory journals in execution of experiments

The graduate must:

- be able to choose among scientific theories, methods, tools and general properties within analytical biochemistry, bioinformatics and different *Life Science Engineering and Informatics* approaches and apply these on scientific questions.
- on the basis of experiments and newly obtained knowledge be able to establish testable hypotheses or improve on existing ones.
- be able to design experiments to verify or falsify a given hypothesis.
- be able to discuss and arrange new experimental data in context of already existing knowledge.
- be able to disseminate research based knowledge and discuss professional and scientific problems with both peers and non-specialist.

### *Competences*

The graduate must be able to:

- control and develop complex processes within different *Life Science Engineering and Informatics* approaches and suggest novel options if unexpected situations occur.
- The graduate must be able to independently initiate and implement disciplinary and interdisciplinary cooperation and to assume professional responsibility based on professional expertise.
- The graduate must be able to independently take responsibility for his/her own professional development and specialisation.

## Structure

The programme contains these elements

Semester	Course / Programme element	Exam	Grading	Examiners	ECTS
1	Omics brush-up	Oral	Pass/Not-pass	Internal	5
	Introduction to Omics	Assignment and oral	Pass/Not-pass	Internal	6
	Analytical biochemistry and sample preparation for Omics	Written	7/100 scale	Internal	8
	Unix and Python for Data Science	Exercises and project	7/100 scale	Internal	5
	Personalized Track	Assignment and oral	Pass/Not-pass	Internal	7
2	Molecular genetics and epigenetics	Oral	7/100 scale	Internal	5
	Central techniques in Omics	Written	7/100 scale	Internal	9
	Bioinformatics and Systems Biology	Assignments	7/100 scale	Internal	7
	Biostatistics	Assignments	7/100 scale	Internal	3
	Applied Omics in Food and Veterinary Sciences	Assignment and oral	7/100 scale	Internal	5
3	Thesis	Assignment and oral	7/4 scale	External	60
4					

The first two semesters provide the common core of the programme. In the 3rd and 4th semester, the student will write the thesis.

## Commencement

Effective as of 01.09.2019

## Changes to the Academic Regulations

From the autumn semester 2019, the course descriptions are now placed in a separate course catalogue for the autumn and spring semesters.