

## INTERNATIONAL SEMESTER 2018–2019

### Chemical Engineering

#### AUTUMN SEMESTER 2018

##### Future Materials and processes semester: **Nanotechnology semester**

(Up to 30 ECTS for the fall semester + optional courses)

Code	Course name	ECTS
1002339	Nanotechnology - future prospects and business opportunities	15
5021165	Biomaterials manufacturing processes	5
5021193	Food engineering	5
1002309	Innovation project	5

#### Course descriptions:

##### **Nanotechnology – future prospects and business opportunities (15 ECTS)**

The Nanotechnology semester will focus on changes in manufacturing, materials, products and services in future. After completing the semester the students are able to assess business opportunities related to nanotechnology and nanomaterials. The students are also able to communicate more effectively in different business situations and with actors from different fields.

The semester consists of 3 units of 5 ECTS dealing each with how horizontal and multidisciplinary nanotechnology will revolutionize manufacturing techniques and enable new products, services and solutions, e.g., in the biotech, chemical and pharmaceutical industries, in electronics, ICT, production of energy, building materials, food products, cosmetics etc., and how nanotechnology combined with effective communication skills enables new business opportunities.

What is Nanotechnology & Future Business Visions, 5 ECTS

Nanomaterials: Products, Services, and Innovation Process, 5 ECTS

Multidisciplinary Group Assignment on Nanotech Topic of Choice, 5 ECTS

**Prerequisites:** No required prerequisites

##### **Biomaterials manufacturing processes (5 ECTS)**

Biomaterials manufacturing processes and bionanotechnology.

The participants are able to describe manufacturing methods for different types of biomaterials and for different end uses. The participants are also able to describe how nanotechnology is utilized in biomaterials, tissue engineering, diagnostics and controlled drug delivery.

##### **Food engineering (5 ECTS)**

The participants are able to describe the main ingredients and composition of food products. The participants know the legislation regarding the composition, serving, packaging, and labelling of food.



### Innovation project (5 ECTS)

Innovation project is typically a development project implemented in co-operation with a company or another external customer. However, the project may also be a part of Turku University of Applied Science's internal research and development activities or it can be based on a student's or student team's own project or business idea. Also development projects related to different student competitions are applicable.

The final extent, detailed contents, student workload and learning outcomes of the course will be defined on a project basis.

**It is possible to join the semester only for the autumn part (5 ECTS), or for a full academic year (15 ECTS).**

### Future Materials and processes semester: Sustainable Chemistry semester

(Up to 30 ECTS for the fall semester + optional courses)

Code	Course name	ECTS
5021181	Sustainable packaging	15
5021191	Circular economy in chemical engineering	5
5021192	Literature study in Current Challenges of Circular Economy	5
1002309	Innovation project	5

#### Course descriptions:

##### Sustainable packaging (15 ECTS)

The Sustainable Packaging Semester focuses on designing ecologically and economically sustainable packaging. After completing the semester participants are able to describe the purpose of packing and the role of the package in the logistics. They can also describe the role of packaging in consumer behavior and brand building. Furthermore, the participants are able to consider material efficiency and recycling aspects in package design and are able to choose a sustainable packaging material for an application. The semester includes conceiving and designing packaging for a chosen product and, when connected to a project, also implementing it.

**Prerequisites:** No required prerequisites

##### Circular Economy in Chemical Engineering (5 ECTS)

Circular economy in chemical engineering familiarizes the participants with the different concepts of circular economy and resource efficiency. The participants are able to name and describe different implementations of circular economies in the fields of chemical engineering, food technology and materials technology. Furthermore, the participants are able to recognize and describe the business potential of new innovations and entrepreneurship in circular economy.

The course is a non-stop virtual course in English. The participants are able to study individually with a flexible time schedule.

**Prerequisites:** No required prerequisites

### Literature study in Current Challenges of Circular Economy (5 ECTS)

The participants are able to describe why moving towards circular economies is essential for mankind. They are able to describe the challenges that nations, companies and individuals face while trying to execute circular economies. Furthermore, the participants are able to name and describe cases of and means for conquering such challenges. They are also able to exhibit good reporting skills.

The course is a literature survey that can be conducted individually or in groups. The topic investigated is determined separately for each participant. The survey may concern a current topic that is studied within an RDI project, or a more general topic. The participants can also freely suggest a topic of their own interest. In most cases, the participants are able to study individually with a flexible time schedule.

**Prerequisites:** No required prerequisites

### Innovation project (5 ECTS)

Innovation project is typically a development project implemented in co-operation with a company or another external customer. However, the project may also be a part of Turku University of Applied Science's internal research and development activities or it can be based on a student's or student team's own project or business idea. Also development projects related to different student competitions are applicable.

The final extent, detailed contents, student workload and learning outcomes of the course will be defined on a project basis.

**It is possible to join the semester only for the autumn part (5 ECTS), or for a full academic year (15 ECTS).**

### Optional courses

Code	Optional courses	ECTS
<a href="#">1000474</a>	Finnish for exchange students	3
<a href="#">1000393</a>	Get Finternational	3
	<a href="#">Turku Summer School</a> (August 2018 only)	...

## SPRING SEMESTER 2019

### Future Materials and processes semester: **Applied Materials Sciences semester**

(Up to **30 ECTS** for the spring semester + optional courses)

Code	Course name	ECTS
N/A	Chemical engineering project + working English	5
1002309	Innovation project	10
N/A	Module (a, b or c) a) Biomaterials and bioprocesses 1 b) Materials technology 1 c) Food engineering 1	15

#### Course descriptions:

##### Chemical Engineering project + Working English (5 ECTS)

The students design, implement and report on a chemical engineering project. They are able to use relevant field-specific information sources and perform the needed chemical or biochemical analyses, understanding the operation principles of the equipment used. Project topics vary according to ongoing research group work. The unit includes working and reporting with a focus on professional communication in English.

##### Innovation project (10 ECTS)

Innovation project is typically a development project implemented in co-operation with a company or another external customer. However, the project may also be a part of Turku University of Applied Science's internal research and development activities or it can be based on a student's or student team's own project or business idea. Also development projects related to different student competitions are applicable.

The final extent, detailed contents, student workload and learning outcomes of the course will be defined on a project basis.

#### MODULE (a, b or c)

##### a) Biomaterials and bioprocesses 1 (15 ECTS)

- different biomaterials and their applications
- basics of tissue engineering
- basics and basic techniques of genetic engineering
- essentials of diagnostics
- concepts and methods in diagnostics

The participants are able to describe specific features of different biomaterials and their applications. The participants understand the basic principles of tissue engineering and they are able to describe specific features of biomaterials used in tissue engineering. The participants are able to describe the

essentials of diagnostics and basic concepts and methods of diagnostics and genetic engineering. The participants know the basic principles and methods of genetic engineering. If the participant enrolls only in the spring semester the first part of the module provided in the autumn (5 ECTS) is conducted by reading the text provided and passing an exam.

### b) Materials Technology 1 (15 ECTS)

The Materials Technology I Semester focus on understanding the structure of different materials and how it affects to properties. After completing the semester the participants are able to describe the micro and macro molecular structures' effect on material characteristics and behavior and are able to describe the special features of a material. The participants are also able to describe manufacturing techniques and are able to choose the appropriate technique. Furthermore, the participants are able to select the most suitable materials to each application from ecological and resource efficient aspects. The semester includes laboratory analyses and project work. If the participant enrolls only in the spring semester the first part of the module provided in the autumn (5 ECTS) is conducted by reading the text provided and passing an exam.

**Prerequisites:** No required prerequisites

### c) Food Engineering 1 (15 ECTS)

The participants are able to describe main ingredients and composition of food products. The participants know the legislation regarding the composition, serving, packaging and labelling of food. The participants are able to describe food manufacturing processes from farm to fork. The participants are able to describe the requirements regarding the hygienic food processing. The participants are able to use different food processing equipment and are able to analyze the product using different analysis methods. The participants are to describe how different products stimulate senses and they are able to execute sensory evaluation tests.

Contents:

Part 1: Food ingredients and raw materials

Part 2: Food processes and manufacturing & hygiene in food processing

Part 3: Laboratory works and analysis of food products

**Prerequisites:** No required prerequisites

## Optional courses

Code	Optional courses	ECTS
<a href="#">1000474</a>	Finnish for exchange students	3
<a href="#">1000393</a>	Get Finternational	3