

EU BEC - BRAC 2023



EUROPEAN BIOPROCESS ENGINEERING COURSE



Principal Doctoral / Post Doctoral Course

Supetar, Island of Brac, Croatia

23rd - 29th September 2023

<http://www.brac-eubec2023.com/>

The European Bioprocess Engineering Course – Brac 2023

The European Bioprocess Engineering Course (EU BEC) - Brac 2023 will again be held on the Island of Brac, Croatia in the Adriatic Sea. The last, held in 2018, was the 29th anniversary of this long-running, highly successful series of courses on Brac and the next one will take place from 23rd to 29th September 2023 in the town of Supetar. It is organized under long term cooperation by the University of Ljubljana, Croatian Society of Biotechnology and EU Working Group on Bioreactor Performance. All of the lectures will be given by internationally distinguished university teachers, who also consult for industry or by leading experts from multinational companies, who are also active in encouraging academic-industry collaboration.

This updated course covers the full spectrum of bioprocess engineering, from genetic concepts for micro-organisms used to produce pharmaceutical and other products via microbial physiology, bio-reaction kinetics, screening techniques, bioreactor design and scale-up. The organisms considered range from simple bacteria to animal cell cultures including recombinant organisms, and stem and CAR-T cells for advanced medical therapy. There is also a strong coverage of measurement, control and optimization and how they interact with each other and with the specific bio-reaction of interest. Finally, there is a broad-brush coverage of state-of-the-art downstream processing. The lectures are supplemented by computer-based exercises, discussions and a Design Case Study. Participants are also encouraged to bring posters of their work with selected candidates being invited to make short oral presentations (of approximately 5 minutes duration), at the *'Chris Hewitt Speakers Corner'*, in recognition of the great contribution made by Chris to the course over many years. Finally, there is a strong social programme, which also ensure that there are many opportunities to interact with the lecturers.

The course is directed specifically for PhD students and experienced bioprocess engineers and biotechnologists from research institutes, universities and industry. Participants are expected to have a background in chemical/biochemical engineering, biotechnology, a biological science or a related discipline. The lecturers are all acknowledged specialists in their fields, so that the course also provides a forum for highlighting recent research in relevant areas.

SCIENTIFIC COMMITTEE

Prof. Dr. Henk J. Noorman, Royal DSM, The Netherlands (Chairman)

Prof. Dr. Jochen Büchs, RWTH Aachen University, Germany

Dr. Marco Jenzsch, Roche Pharma Biotech, Penzberg, Germany

Prof. Dr. Marin Berovič, University of Ljubljana, Slovenia

Prof. Dr. Stuart M. Stocks, LEO Pharma A/S, Denmark

LECTURERS

Prof. Dr. Marin Berovic, University of Ljubljana, Slovenia
Prof. Dr. Jochen Büchs, RWTH Aachen University, Germany
Dr. Marco Jenzsch, Roche Pharma Biotech, Penzberg, Germany
Prof. Dr. Goran N. Jovanović, Oregon State University, USA
Prof. Dr. Bjorn Kristiansen, GlycaNova, Norway
Prof. Dr. Ton van Maris, Royal Institute of Technology, KTH, Sweden
Prof. Dr. Henk J. Noorman, Royal DSM, The Netherlands
Prof. Dr. Qasim Rafiq, University College London, UK
Prof. Dr. Jakob Huusom, Technical University of Denmark, Denmark
Prof. Dr. Matthias Reuss, Stuttgart University, Germany
Prof. Dr. Stuart M. Stocks, LEO Pharma A/S, Denmark
Prof. Dr. Luuk A.M van der Wielen, Bernal Institute, University of Limerick, Ireland
Prof. Dr. John Woodley, Technical University of Denmark, Denmark

ORGANISING COMMITTEE

Prof. Dr. Marin Berovič, Inovine, Ljubljana, Slovenia (Chairman)
Prof. Dr. Vesna Zechner-Krpan, Faculty of Food Technol. Biotechnol., University of Zagreb, Croatia
Doc. Dr. Saso Gjergjek, Inovine, Ljubljana, Slovenia
Prof. Dr. Ivana Radojčić Redovniković, Faculty of Food Techn. Biotechn., University of Zagreb, Croatia

POSTER PRESENTATION

Poster dimensions should not exceed 1.0 m x 1.0 m. Every poster should include a title and author name(s) and affiliation(s). The posters will be on display in front of the lecture hall throughout the course for informal discussions. On the basis of the posters a group of selected candidates will be invited to make short (5 minutes) oral presentations at the *'Chris Hewitt Speakers Corner'*.

**European Bologna Studies System recognizes 5 Credits
to the Certificates of EU BEC**

SOCIAL PROGRAMME

The social programme for all participants and tutors will include several special events: a welcome party; a 'get together' party, to which, it is suggested, each participant might bring a bottle of a typical drink or food from her/his native country; an introduction to the Art of Professional Wine Tasting followed by a Competition and Tasting of Best Selected Croatian wines; Social trip and a Farewell party. Additional programs for accompanying persons are available.

DATE AND VENUE

The European Bioprocess Engineering Course Brac 2023 will be held between Saturday, 23rd September and Friday 29th September 2023 in the town of Supetar on the mountainous Island of Brac, Croatia. The lectures will commence on Saturday, 23rd September and the course will conclude Thursday evening on 28th September. Departure is scheduled on Friday morning 29th September. The Island of Brac is situated just a few kilometers from Split, an old Dalmatian harbor on the mainland with the famous Summer Palace of the Roman Emperor Diocletian. Split has an International Airport that is well connected with all Major Airports in Europe.

During the course, the accommodation and meals will be provided at the Waterman Resort Supetrus located within 10 minutes walking distance of the small town of Supetar. From Split to Supetar, there are frequent ferry-boats from Split harbor to Supetar and transfers between Supetar harbor and the Waterman Resort Supetrus will be available. Brac also has its own small airport, directly accessible from a few airports in the region.

Although Croatia has no visa requirements for many countries, participants are advised to check whether or not they require a visa.

COURSE FEE

The full all-inclusive fee for participants from industry is **2700 EUR**. It includes a **course fee, lecturing, exercises, computer workshop and course literature as well as full accommodation** from September 23rd to the morning September 29th **including all meals and all social events**. The reduced fee for students is **1900 EUR** for the same package (**accommodation in twin bed rooms**). To obtain the reduced rate, doctoral/postdoctoral students must submit written University Confirmation of their status with or immediately after registration.

The Fee for **Accompanying Person is 1000 EUR** and it **includes full accommodation and all social events of the course**.

PROGRAMME

EU Bioprocess Engineering Course 23rd – 29th September 2023

Supetar, Island of Brač, Croatia

SATURDAY 23RD SEPTEMBER, DAY 1

12.00 Arrival/Registration

16.45 - 17.00 Welcoming Addresses: M. Berovic, V. Zechner-Krpan and H.J. Noorman

Course Introduction: Some Basic Concepts

17.00 - 17.45 Lecture 1: Basic Microbiological Concepts

T. van Maris

17.45 - 18.30 Lecture 2: Basic Engineering Balances

J. Büchs

18.30 - 19.15 Lecture 3: Introduction to Modern Industrial Bioprocesses

M. Jenzsch

19.45 Dinner and Welcome Party

SUNDAY 24TH SEPTEMBER, DAY 2

Stoichiometry, Rates and Reaction Kinetics

09.00 - 09.45 Lecture 4: Stoichiometry

T. van Maris, H.J. Noorman

09.45 - 10.30 Lecture 5: Kinetics

T. van Maris, H.J. Noorman

10.30 - 11.00 Coffee break

Physical Parameters in Bioprocessing and Bioreactors

11.00 - 11.45 Lecture 6: Sterilization in Bioprocesses

M. Berovic

11.45 - 12.30 Lecture 7: Mixing, Mass and Heat Transfer in Bioreactors

H.J. Noorman

12.30 - 13.15 Lecture 8: Process Intensification

G. Jovanovic

13.30 – 14.30 Lunch

14.30 - 15.15 Lecture 9: Bioprocess Engineering in Shake Flasks and Microwells

J. Büchs

15.15 - 16:00 Lecture 10: Bioprocessing in Conventional Bioreactors

G. Jovanovic

Bioreactors and Bioprocessing I

16.00 - 18.45 Exercise 1: Design Study 1, Stoichiometry / Kinetics H.J. Noorman, S.M. Stocks, J. Büchs

19.00 - 20.00 Dinner

20.30 Get Together Party with Tasting of Participants 'National Delights' M. Jenzsch, V. Zechner-Krpan

MONDAY 25TH SEPTEMBER, DAY 3

Bioreactors and Bioprocessing II

09:00 - 09.45 Lecture 11: Industrial Bioreactors and Detailed Modelling H.J. Noorman

09:45 - 10.30 Lecture 12: Scale-Up and Scale-Down S.M. Stocks

10.30 - 11.00 Coffee break

11:00 - 11.45 Lecture 13: Microscale-Based Design of Modular Industrial-Scale Reactors G. Jovanovic

11.45 - 12.30 Lecture 14: Solid State Bioprocessing David A.Mitchell, M. Berovic

12.30 - 13.45 Lunch

Bioreactors and Bioprocessing III

13.45 - 14.30 Lecture 15: Laboratory Evolution for Strain Improvement T. van Maris

14.30 - 15.15 Lecture 16: Fed Batch and Continuous Culture J. Büchs

15.15 - 16.00 Coffee break

16.00 - 18.00 Exercise 2: Design Study 2 J. Büchs, H. J. Noorman, S.M. Stocks

19.00 - 20.00 Dinner

20.30 **Chris Hewitt's Speakers Corner** B. Kristiansen, V. Zechner-Krpan

TUESDAY 26TH SEPTEMBER, DAY 4

Dynamic Diagnostic Analysis and Modelling

09.00 - 09.45 Lecture 17: Tools for *in-vivo* Diagnosis of Pathway Reactions M. Reuss

09.45 - 10.30 Lecture 18: Dynamic Modelling of Metabolism M. Reuss

Use of Enzymes

11.00 - 11.45 Lecture 19: Biocatalytic Process Engineering J.M. Woodley

12.00 Social Boat Trip to Bol

WEDNESDAY 27TH SEPTEMBER, DAY 5

Modern Measurement Techniques and Optimisation

09.00 - 09.45 Lecture 20: Bioprocess and Fermentation Monitoring M. Jenzsch

09.45 - 10.30 Lecture 21: Soft-sensors for Bioprocess Monitoring H.J. Noorman

10.30 - 11.00 Coffee break

Special Cases 1 and 2

11.00 - 11.45 Lecture 22: Recombinant Protein Production with Different Hosts M. Jenzsch
11.45 - 12.30 Lecture 23: Bioprocess Engineering for Stem Cell Culture Q. Rafiq
12.30 - 14.00 Lunch

Downstream Processing

14.00 - 14.45 Lecture 24: Downstream Processing 1 L. van der Wielen
14.45 - 15.30 Lecture 25: Downstream Processing 2 L. van der Wielen
15.30 - 16.00 Coffee break
16.00 - 16.45 Lecture 26: Downstream Processing 3 L. van der Wielen
16.45 - 18.45 Exercise 3: Case Study-Downstream Processing L. van der Wielen
19.00 - 20.15 Dinner

20.30 Wine Culture and Art of Wine Tasting in Europe + EU BEC 2023 Wine Competition M. Berovic

THURSDAY 28TH SEPTEMBER, DAY 6

Special Cases 3 and 4

09.00 – 09.45 Lecture 27: Culture of Human Mesenchymal Stem Cells on Microcarriers Q. Rafiq
09.45 – 10.30 Lecture 28: Barriers in Industrial Production of Metabolites B. Kristiansen
10.30 - 11.00 Coffee break

Control of Bioprocesses

11.00 - 11.45 Lecture 29: Introduction to Control of Bioprocesses J. Huusom
11.45 - 12.30 Lecture 30: Advances in Control of Bioprocesses J. Huusom
12.30 - 14.00 Lunch
14.00 - 18.30 Free time
18.30 - 20.00 Dinner

20.15 Farewell Party and Presentation of Certificates and Case Study Prize

FRIDAY 29TH SEPTEMBER, DAY 7

Departure

PAYMENT

The payment must be made **before June 20th** to have guaranteed participation. Online pre-registration will be closed on **August 31st**. **After that date, a 'late-bird fee' of 100 Euro will be charged.** The payment in Euros should be made to the technical organizer by bank transfer to:

Spektar Putovanja d.o.o.
Strossmayerov trg 8
10 000 Zagreb, Croatia
<http://www.brac-eubec2023.com/>

BANK ACCOUNT:
Spektar Putovanja d.o.o.
ZAGREBACKA BANKA ZAGREB
IBAN HR1323600001500395457
SWIFT ZABA HR 2X

(With payment designation 'for Brac-BEC2023')

ATTENTION: Please note that the bank transfer charges must be paid by the sender!

Mrs. Petra Miskulin
Project Manager
SPEKTAR PUTOVANJA d.o.o.
Congress and Incentive Department
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Fax: 00385 1 4862 622
E-mail: petra@spektar-holidays.hr www.spektar-putovanja.hr

Since the total number of participants is limited, the participant list will be formed according to the date of payment. Early registration and early payment (not later than June 20th) are the best way to **assure attendance on this very popular overbooked course.**

Registration details and payment, including the information specified below, should be sent by e-mail, preferably before June 20th, to the address:

[E-mail: petra@spektar-holidays.hr](mailto:petra@spektar-holidays.hr)

<http://www.brac-eubec2020.com/>

Contacts: Organizing Committee

Chairman of Organizing Committee

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