

WORKING GROUP ON BIOREACTOR PERFORMANCE
of
European Society of Biochemical Engineering Science



**BIOPROCESS ENGINEERING
COURSE**



Principal Doctoral / Post Doctoral Course

Bol, Island of Brac, Croatia

23rd to 29th September 2018

<http://www.brac-bec2018.com/>

The Bioprocess Engineering Course - Brac 2018

The 2018 Brac Bioprocess Engineering Course will again be held on the on the Island of Brac, Croatia in the Adriatic Sea. The last, held in 2016, was the 27th anniversary of this long-running, highly successful series of courses and the next one will take place from 23rd to 29th September 2018 in Bol, the most beautiful and famous place on the Island. It is organised under the auspices of the Working Group on Bioreactor Performance of the European Society of Biochemical Engineering Sciences (ESBES), and all of the lectures will be given by internationally distinguished university teachers or by leading experts from multinational companies.

This up-dated course covers the full spectrum of bioprocess engineering, from genetic concepts for micro-organisms used to produce pharmaceutical and other products via microbial physiology, bioreaction kinetics. bioreactor design and scale-up. The organisms considered range from simple bacteria to highly specialised animal cell cultures, recombinant organisms and stem cells. There is also a strong coverage of measurement, control and optimisation and how they interact with each other and with the specific bioreaction of interest. Finally, there is a broad-brush coverage of 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 a '*Speakers' Corner*'. Finally, there is a strong social programme, which also ensure that there are many opportunities to discuss the course with the lecturers.

The course is directed specifically at Ph.D. 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. Alvin W. Nienow, University of Birmingham, UK (Chairman)
Prof. Dr. Chris J. Hewitt, Aston University, UK
Prof. Dr. Henk J. Noorman, DSM Biotechnology Centre, The Netherlands.
Dr. Marco Jenzsch, Roche Pharma Biotech, Penzberg, Germany
Prof. Dr. Marin Berovic, University of Ljubljana,

LECTURERS

Prof. Dr. Marin Berovic, University of Ljubljana, InoVine, Slovenia
Prof. Dr. Jochen Büchs, Aachen University, Germany
Prof. Dr. Chris Hewitt, Aston University, UK
Prof. Dr. Jakob Huusom, Technical University of Denmark
Dr. Marco Jenzsch, Roche Pharma Biotech, Penzberg, Germany
Prof. Dr. Andreas Lübbert, M.Luther-University Halle-Wittenberg, Germany
Prof. Dr. Ton van Maris, Royal Institute of Technology, KTH, Sweden
Prof. Dr. Alvin Nienow, University of Birmingham, UK
Prof. Dr. Henk Noorman, DSM Biotechnology Centre, The Netherlands
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

ORGANISING COMMITTEE

Prof. Dr. Marin Berovic, University of Ljubljana, InoVine, Slovenia (Chairman)
Doc. Dr. Sašo Gyergyek, InoVine, Ljubljana, Slovenia
Prof. Dr. Vesna Zechner-Krpan, University of Zagreb, Croatia
Prof. Dr. Anita Slavica 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). 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 a *'Speakers corner'*.

SOCIAL PROGRAMME

The social programme for all participants and tutors will include several special events: a 'get together' party, to which, it is suggested, each participant might bring a bottle of a typical drink or food from his/her native country; an introduction to the Art of Professional Wine Tasting followed by a Competition and tasting of best selected Croatian wines; a sailing boat trip to the Island of Hvar, a visit to local vineries and picnic on the Island of Palmižana, a swim on the the most famous Adriatic beach of the Golden Horn, and a Farewell party. Additional programmes for accompanying persons are available.

DATE AND VENUE

The Bioprocess Engineering Course will be held between Sunday, 23rd September and Saturday 29th September 2018 in Bol on the mountainous island of Brac, Croatia. The lectures will commence on Sunday, 23rd September and the course will conclude in the Friday evening on 28th September. Departure is scheduled on Saturday morning 29th September. Bol is the most beautiful place on the island, with the Golden Horn beach, famous for windsurfing, kiteboarding and diving. The Island of Brac is situated just a few kilometres from Split, an old Dalmatian harbour 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 Bluesun Hotels located within 10 minutes walking distance of the small town of Bol. From Split to Bol, there is a catamaran (passengers only) once a day, every day at 4.30 PM. There are also frequent ferry-boats from Split harbour to Supetar and transfers between Supetar harbour and the Bluesun Hotels, Bol 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 the participants are advised to check whether or not they require a visa for entering Croatia.

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

COURSE FEE

The full cost for participants is **1950 EUR**. It includes a **Course fee 1100 EUR** (lecturing, exercises, computer workshop and course literature) and **full accommodation 850 EUR** (from **September 23rd** to the morning September 29th **including all meals and all social events**). The reduced fee for students is **1580 EUR** for the same package (except that accommodation will be provided in rooms with twin beds). To obtain the reduced rate, doctoral/post doctoral students must submit written University Confirmation of their status with or immediately after registration.

The Fee for **Accompanying Person** is **950 EU** and it includes full accommodation and all social events of the Course.



Brac-BEC Course Attendees and Lecturers, 2016

PROGRAMME

Sunday 23rd September: Day 1

12.00 Arrival/Registration

16.45 - 17.00 Welcoming Addresses C.J. Hewitt, M.Berovic, A.Slavica and A.W.Nienow

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

H. J. Noorman

18.30 - 19.15 Lecture 3; Introduction to Modern Industrial Bioprocesses

M. Jenzsch

19.45 Dinner and Welcome Party

Monday 24th September; Day 2

Stoichiometry, Rates and Reaction Kinetics

09.00 - 09.45 Lecture 4; Stoichiometry

H. J. Noorman

09.45 - 10.30 Lecture 5; Kinetics

H. J. Noorman

10.30 - 11.00 Coffee break

Physical Parameters of Bioreactors and Bioprocessing

11.00 - 11.45 Lecture 6; Rheology, Mass and Heat Transfer

S. M. Stocks

11.45 - 12.30 Lecture 7; Stirred Bioreactors A. W. Nienow
12.30 - 14.00 Lunch
 14.00 - 14.45 Lecture 8; Bioreactor Alternatives to Stirred Tanks A. Lübbert
 14.45 - 15.30 Lecture 9; Scale-Up and Scale-Down S. M. Stocks
15.30 - 16.00 Coffee break
 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, A. Slavica

Tuesday 25th September; Day 3

Bioreactors and Bioprocessing

09.00 - 09.45 Lecture 10; Bioprocess Engineering in Shake Flasks J. Büchs and Microwells
 09.45 - 10.30 Lecture 11; Solid State Bioprocessing M. Berovic
10.30 - 11.00 Coffee break
 11.00 - 11.45 Lecture 12; Fed Batch and Continuous Culture J. Büchs

Biological Parameters for Bioprocessing

11.45 - 12.30 Lecture 13; Laboratory strain evolution T.van Maris
12.30 - 14.00 Lunch
 14.00 - 14.45 Lecture 14; Metabolic engineering towards anaerobic processes T.van Maris
 14.45 - 17.30 Exercise 2; Design study 2/cultivation techniques J. Büchs, H. J. Noorman, S. M. Stocks
19.00 - 20.00 Dinner
20.30 Speakers Corner C. J. Hewitt/V. Zechner-Krpan/A. Slavica

Wednesday 26th September; Day 4

Dynamic Diagnostic Analysis and Modelling

09.00 - 09.45 Lecture 15; Tools for In-vivo Diagnosis of Pathway Reactions M. Reuss
 09.45 - 10.30 Lecture 16; Dynamic Modeling of Metabolism M. Reuss
Use of Enzymes
 11.00 - 11.45- Lecture 17; Biocatalytic process engineering J. M. Woodley
12.00 Social Trip

Thursday 27th September; Day 5

Modern Measurement Techniques and Optimisation

09.00 - 09.45 Lecture 18; Modern Measurements for Diagnostics and Control C. J. Hewitt
 09.45 - 10.30 lecture 19; Process Optimisation M. Jenzsch
10.30 - 11.00 Coffee break
Special Cases 1 and 2
 11.00 - 11.45 Lecture 20; Bioreactor Engineering for Large Scale Cell Culture A. W. Nienow
 11.45 - 12.30 Lecture 21; Recombinant Protein Production with Different Hosts M. Jenzsch

12.30 - 14.00 Lunch

Downstream Processing

14.00 - 14.45 Lecture 22 Downstream Processing 1 L.van der Wielen

14.45 - 15.30 Lecture 23 Downstream Processing 2 L.van der Wielen

15.30 - 16.00 Coffee break

16.00 - 16.45 Lecture 24 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 M. Berovic

Friday 28th September ; Day 6

Special Cases 3 and 4

09.00 - 09.45 Lecture 25; Bulk Chemical Production using Biocatalysis J. M. Woodley

09.45 - 10.30 Lecture 26; Bioprocess Engineering for Stem Cell Culture J. Hewitt

10.30 - 11.00 Coffee break

Control of Bioprocesses

11.00 - 11.45 Lecture 27; Introduction to Control of Bioprocesses J. K. Huusom

11.45 - 12.30 Lecture 28; Advances in Control of Bioprocesses J. K. Huusom

12.30 - 14.00 Lunch

14.00 - 18.45 Free time

18.30 - 20.00 Dinner

20.15 Farewell Party and Presentation of Certificates and Case Study Prize

Saturday 29th September; Departure

PAYMENT

The payment must be made **at the latest by July 1st**. After that date a '*late-bird fee*' of 200 Euro will be charged. The payment in Euros should be made to technical organiser by bank transfer to:

Globtour Event d.o.o.

Trg N.Š.Zrinskog 1| 10000 Zagreb | Croatia

BEC2018@globtour.hr | www.globtour.hr

<http://www.brac-pec2018.com/>

Bank account :

Sberbank d.d., Varšavska 9, 10000 Zagreb, Croatia
IBAN: HR60 25030071100080204
Swift address: VBCRHR22

(With payment designation 'for Brac-BEC2018')

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

E - mail: bec2018@globtour.hr

GLOBTOUR EVENT d.o.o

Phone number: +385 1 4881 100

FAX: +385 1 4881 119

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 July 1st) are the best way to assure attendance on this very popular course.

Registration details and payment, including the information specified below, should be sent by e-mail, before July 1st, to the address:

[E - mail: bec2018@globtour.hr](mailto:bec2018@globtour.hr)

<http://www.brac-bec2018.com/>