

# BS935-10 Biochemical Engineering - Bioreactor Engineering & Unit Operations

**24/25**

**Department**

Life Sciences

**Level**

Taught Postgraduate Level

**Module leader**

Guy Barker

**Credit value**

10

**Module duration**

2 weeks

**Assessment**

100% coursework

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

This module will introduce students to the range of fundamental operations used by process engineers, who perform chemical and biological reactions on a large scale and separate the raw products into finished materials suitable for the market place.

### Module aims

The principle focus will be on biotechnological processes. The module will cover processing options for handling and separating compounds of interest. It aims to develop process engineering skills which will enable students to select the appropriate methods to make the required end product.

### Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be

covered. Actual sessions held may differ.

Review of Process Engineering Unit Operations including:

Feedstock variability and how to deal with this; Fermentation and Bio-Reactors; Extraction/Separation technologies - distillation/condensation; solvent extraction; crystallisation; drying/evaporation; mixing; solids separation and processing; Optimisation of performance; Dealing with waste e.g. effluent treatment with emphasis on those systems used in bioprocessing.

This will be reinforced with field visits to processing sites and through invited speakers from Industry.

## **Learning outcomes**

By the end of the module, students should be able to:

- Identify, review and select the key processing steps to convert raw materials into marketable end products.
- Demonstrate knowledge of different biotechnology reactor designs and analyse what influences the choice of different systems.
- Critically assess the choice of process options, including the difficulties experienced with scale up
- Interact effectively with Process Engineers on the conceptual design of process systems by oral, written or visual means
- Critically compare and debate alternative process options based on a critical assessment of the known data.

## **Indicative reading list**

Comprehensive Biotechnology 2nd Edition Editor Murray Moo-Young ISBN 978-0444533524

Richardson, Coulson, Backhurst, and Harker, Chemical Engineering 6th Ed Butterworth Heinemann 1999

Schuler & Kargi Bioprocess Engineering - Basic Concepts  
ISBN 0130819085

Perry Chemical Engineers Handbook Platinum Edition  
ISBN 0071355405

Bruce Nauman, Handbook of Chemical Reactor Design, Optimization, and Scaleup  
ISBN: 0071377530 McGraw-Hill Science/Engineering September 2001

Edward L. Paul (Editor), Victor Atiemo-Obeng (Editor), Suzanne M. Kresta (Editor), North American Mixing Forum, Handbook of Industrial Mixing: Science and Practice (with CD-Rom)  
ISBN: 0-471-26919-0 Wiley December 2003

MacKenzie Davis and David Cornwell, Introduction to Environmental Engineering ISBN: 0072387777 McGraw-Hill Science/Engineering September (2004)

Yang S-T (Ed) Bioprocessing for high value products from renewable resources (2014), ISBN 978-

0444521149

Shukla A A, Etzel M R & Gadam S, Process scale bioseparations for the biopharmaceutical industry, ISBN 978-1574445176

Liese A, Seelbach A & Wandrey C (Eds) Industrial biotransformations (2006 edition), ISBN 978-3527310012

Jonathan R. Mielenz [and others] (2007) Biotechnology for Fuels and Chemicals : the twenty-eighth symposium . Humana Press.

[View reading list on Talis Aspire](#)

## Subject specific skills

Demonstrate knowledge of different biotechnology reactor designs and analyse what influences the choice of different systems.

## Transferable skills

Critically compare and debate alternative process options based on a critical assessment of the known data.

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## Study

### Study time

Type	Required
Lectures	14 sessions of 1 hour (14%)
Seminars	1 session of 4 hours (4%)
Demonstrations	1 session of 1 hour (1%)
Practical classes	(0%)
External visits	1 session of 4 hours (4%)
Private study	77 hours (77%)
Total	100 hours

### Private study description

Independent and group research

### Costs

No further costs have been identified for this module.

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## Assessment

You do not need to pass all assessment components to pass the module.

### Assessment group A2

	Weighting	Study time	Eligible for self-certification
Seminar Presentation	70%		No
To deliver an illustration of how the module content has been applied in a practical example as selected from a number of alternatives that have been preselected. These examples have been selected in order to provide sufficient content and to include the background on the relevant process and the impact of the technology used.			
MCQ	30%		No
To answer 50 questions that have been set to determine the level of comprehension of the lectures given with the module.			

### Feedback on assessment

Generic oral feedback to cohort on MCQ and seminar assessments. Written individual feedback to each student on seminar assessments. Face-to-face feedback on any assessment provided on request from the student.

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## Availability

### Courses

This module is Core for:

- Year 1 of TBSS-C5N2 Postgraduate Taught Biotechnology, Bioprocessing and Business Management