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BL3301 Protein Structure and Function

(BL3301 online module handbook version 56)

Credits: 20

Semester: 1

Module Organiser
Dr Uli Schwarz-Linek
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Pre-requisite Modules:
Before taking this module you must pass BL2306 and (pass BL2302 or pass BL2309)

Anti-requisite Modules:

Post-requisite Modules:

Additional Module Information:
Please check MMS regularly for additional module information

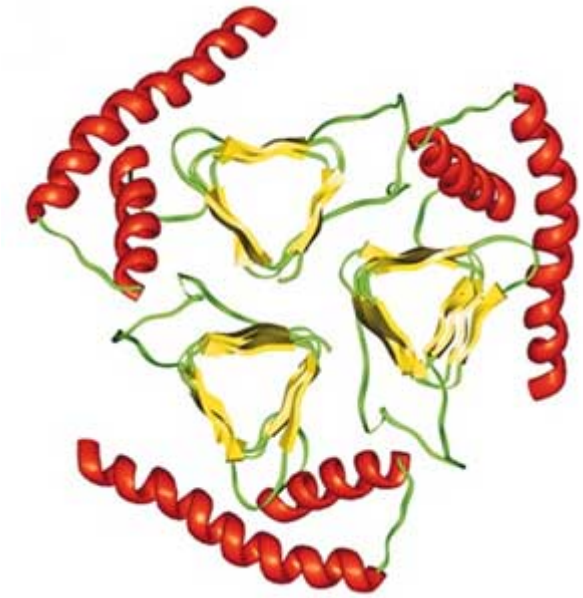

image: Image from: Govaerts et al. PNAS 101, 8342 (2004)

This module covers advanced aspects of protein science. The module introduces the major techniques for protein structure determination that are at the heart of biochemistry, molecular biology and drug discovery. The physical principles behind and strategies for elucidating protein structures by X-ray crystallography, NMR spectroscopy and cryo-electron microscopy are discussed. Membrane proteins are considered as an example of the impact of structural information on understanding biological function. The second part builds an understanding of thermodynamic and kinetic principles of protein interactions. Protein engineering by directed evolution will be introduced. This section is complemented by advanced aspects of enzyme kinetics and enzyme inhibition. The third part of the module considers protein folding and misfolding. It will be examined how proteins achieve functional three-dimensional structures. Protein misfolding diseases are used as examples to highlight the significance of protein folding. Prions and the molecular basis of spongiform encephalopathies are discussed in detail.

BL3301View content for BL3301 (2023/4) in the Module Management System (MMS)

View the current Biology Online Module Catalogue for BL3301

BL3301View BL3301 (2023/4) in the University of St Andrews Module Catalogue

Contents:

BL3301: Timetable

Legend (not all modules have every event type):

lecture	tutorial	workshop	practical	other

Semester 1: Week 1

DATE & TIME	VENUE	STAFF	EVENT
Monday 11-09-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Lecture L1: **Module introduction** 2023-4_BL3301_L1
Tuesday 12-09-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Lecture L2: **Protein Basics** 2023-4_BL3301_L2
Wednesday 13-09-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Tracey Gloster** -	Lecture L3: **Introduction to Protein Structure Determination** 2023-4_BL3301_L3

Semester 1: Week 2

DATE & TIME	VENUE	STAFF	EVENT
Monday 18-09-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Tracey Gloster** -	Lecture L4: **X-Ray Crystallography I** 2023-4_BL3301_L4
Tuesday 19-09-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre A	**Dr Tracey Gloster** -	Lecture L5: **X-Ray Crystallography II** 2023-4_BL3301_L5
Wednesday 20-09-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Tracey Gloster** -	Tutorial T1: **Lysozyme** 2023-4_BL3301_T1
Thursday 21-09-2023 09:00 to 17:00	Biomolecular Sciences Building Teaching Lab 205b	**Dr Uli Schwarz-Linek** -	Practical P1: **Lysozyme purification and SDS PAGE** 2023-4_BL3301_P1 Class section A
Friday 22-09-2023 09:00 to 17:00	Biomolecular Sciences Building Teaching Lab 205b	**Dr Tracey Gloster** -	Practical P2: **Lysozyme activity and crystallisation** 2023-4_BL3301_P2 Class section A

Semester 1: Week 3

DATE & TIME	VENUE	STAFF	EVENT
Monday 25-09-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Tracey Gloster** -	Lecture L6: **X-Ray Crystallography III** 2023-4_BL3301_L6
Tuesday 26-09-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Tracey Gloster** -	Lecture L7: **Post-Translational Modifications** 2023-4_BL3301_L7
Wednesday 27-09-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Lecture L8: **Cryo-Electron Microscopy** 2023-4_BL3301_L8
Thursday 28-09-2023 09:00 to 17:00	Biomolecular Sciences Building Teaching Lab 205b	**Dr Uli Schwarz-Linek** -	Practical P3: **Lysozyme purification and SDS PAGE** 2023-4_BL3301_P3 Class section B
Friday 29-09-2023 09:00 to 17:00	Biomolecular Sciences Building Teaching Lab 205b	**Dr Tracey Gloster** -	Practical P4: **Lysozyme activity and crystallisation** 2023-4_BL3301_P4 Class section B

Semester 1: Week 4

DATE & TIME	VENUE	STAFF	EVENT
Monday 02-10-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Lecture L9: **NMR Spectroscopy I** 2023-4_BL3301_L9

Tuesday 03-10-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Lecture L10: **NMR Spectroscopy II** 2023-4_BL3301_L10
Wednesday 04-10-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Lecture L11: **The protein folding problem and AlphaFold** 2023-4_BL3301_L11
Thursday 05-10-2023 10:00 to 13:00	Willie Russell Laboratories Teaching Lab	**Dr Tracey Gloster** Dr Uli Schwarz-Linek	Practical P5: **AlphaFold and PyMOL** 2023-4_BL3301_P5 computer-based practical

Semester 1: Week 5

DATE & TIME	VENUE	STAFF	EVENT
Monday 09-10-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Clarissa Czekster** -	Lecture L12: **Thermodynamics recap** 2023-4_BL3301_L12
Tuesday 10-10-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Clarissa Czekster** -	Lecture L13: **Equilibrium binding** 2023-4_BL3301_L13
Wednesday 11-10-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Clarissa Czekster** -	Lecture L14: **Binding kinetics** 2023-4_BL3301_L14

Semester 1: Week 7

DATE & TIME	VENUE	STAFF	EVENT
Monday 23-10-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Clarissa Czekster** -	Lecture L15: **Protein engineering and chemical biology** 2023-4_BL3301_L15
Tuesday 24-10-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Clarissa Czekster** -	Tutorial T2: **Discussion of real life examples** 2023-4_BL3301_T2
Wednesday 25-10-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Other O1: **reserve time slot** 2023-4_BL3301_O1

Semester 1: Week 8

DATE & TIME	VENUE	STAFF	EVENT
Monday 30-10-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Jacqueline Nairn** -	Lecture L16: **Membrane proteins I** 2023-4_BL3301_L16
Tuesday 31-10-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Jacqueline Nairn** -	Lecture L17: **Membrane proteins II** 2023-4_BL3301_L17
Wednesday 01-11-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Jacqueline Nairn** -	Tutorial T3: **Membrane proteins** 2023-4_BL3301_T3

Semester 1: Week 9

DATE & TIME	VENUE	STAFF	EVENT
Monday 06-11-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Lecture L18: **Assisted protein folding I** 2023-4_BL3301_L18
Tuesday 07-11-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Lecture L19: **Assisted protein folding II** 2023-4_BL3301_L19
Wednesday 08-11-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Lecture L20: **Protein misfolding and disease I** 2023-4_BL3301_L20

Semester 1: Week 10

DATE & TIME	VENUE	STAFF	EVENT

Monday 13-11-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Lecture L21: **Protein misfolding and disease II** 2023-4_BL3301_L21
Tuesday 14-11-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Lecture L22: **Protein misfolding and disease III** 2023-4_BL3301_L22
Wednesday 15-11-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Other O2: **reserve time slot** 2023-4_BL3301_O2

Semester 1: Week 11

DATE & TIME	VENUE	STAFF	EVENT
Monday 20-11-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Tutorial T4: **Exam preparation** 2023-4_BL3301_T4
Tuesday 21-11-2023 09:00 to 10:00	Biomolecular Sciences Building Lecture Theatre	**Dr Uli Schwarz-Linek** -	Other O3: **reserve time slot** 2023-4_BL3301_O3

BL3301: Reading List

BL3301Click for BL3301 reading list

BL3301: Assessment

3-hour Written Examination = 50%, Coursework = 50%

BL3301View coursework assessment details for BL3301 (2023/4) in MMS

The following related information applies to all Biology modules:

School of Biology Marking Criteria:	SeeÂ JH booklet info (st-andrews.ac.uk)Â
Late submission of continuous assessment work:	All late submissions of coursework that do not require electronic submission should be made via the Biology Teaching Office, Level 2, BMS Building, North Haugh.
Exam details:	See School of Biology UG Handbook JH booklet info (st-andrews.ac.uk)Â : All Biology exams will be conducted online for 2022-23.
Exam timetable:	See Timetables - Exams - University of St Andrews (st-andrews.ac.uk)Â
Expected attendance:	SeeÂ JH booklet info (st-andrews.ac.uk) Â for detailed attendance requirements.
Good Academic Practice & Avoiding Academic Misconduct:	SeeÂ JH booklet info (st-andrews.ac.uk)
University Student Handbook:	University Student Handbook
School and University regulations in the School and University Undergraduate Handbook relating to absence reporting, penalties and rules for late submission of work, extensions for coursework, return of coursework, S-coding, good academic practice and Academic Alerts.:	JH booklet info (st-andrews.ac.uk) University Student Handbook

Who to ask

(Information in this section applies to all Biology Modules)

Before contacting staff, students should check the content of the Biology Undergraduate Handbook, the module handbook and specific task instructions.

Questions about	**Contact**
General teaching matters	Biology Teaching Office (bioteach@st-andrews.ac.uk)
Rescheduled or cancelled events	Check your University email
Lecture or practical content	The lecturer who presented the material
Completing assessed practical assignments	The lecturer who set the assignment
Completing assessments	Module Organiser (Dr Uli Schwarz-Linek us6@st-andrews.ac.uk)
Marking on continuous assessment	The Demonstrator or Module Organiser (Dr Uli Schwarz-Linek us6@st-andrews.ac.uk)
Marking on exams	Module Organiser (Dr Uli Schwarz-Linek us6@st-andrews.ac.uk)
Rearranging practical days	Module Organiser (Dr Uli Schwarz-Linek us6@st-andrews.ac.uk)
Absence and/or extensions	Module Organiser (Dr Uli Schwarz-Linek us6@st-andrews.ac.uk) **and** the Biology Teaching Office (bioteach@st-andrews.ac.uk)
Difficulties with academic progress which impact more than one module:	Year Coordinator See School of Biology UG Handbook for list: JH booklet info (st-andrews.ac.uk)
Overall performance, progress or future directions:	Advisor of Studies
Disability:	Disability Coordinator (biodisabilities@st-andrews.ac.uk)
For advice and support on any issue e.g. academic, financial, international, personal or health matters, or if you are unsure of who to go to for help:	Advice & Support Centre Address: 79 North Street, St Andrews Email: theasc@st-andrews.ac.uk Web: https://www.standrews.ac.uk/ask-a-question/ Tel: 01334 462020
University assistance with urgent matters out of office hours:	Tel: 01334 476161 Web: https://www.st-andrews.ac.uk/students/advice/counselling/incrisis/

Biology Teaching Office:

We are happy to hear from you about teaching matters. The School of Biology Teaching Office is open Monday to Friday 09.00 - 13.00 and 14.00 - 17.00. School of Biology staff will respond to your emails during these hours. Our team will provide a response to you within three working days.

Biology Teaching Office (Level 2), University of St Andrews, Biomolecular Sciences Building, North Haugh, St Andrews, Fife KY16 9ST

Email: bioteach@st-andrews.ac.uk

Tel: 01334 46 3602 or 3566

BL3301: Contributing Staff

Dr Uli Schwarz-Linek (Module Organiser)	Senior Lecturer	us6@st-andrews.ac.uk
Dr Clarissa Czekster	Wellcome Trust Sir Henry Dale Fellow and Lecturer	cmc27@st-andrews.ac.uk
Dr Tracey Gloster	Reader	tmg@st-andrews.ac.uk
Dr Jacqueline Nairn	Senior Lecturer	jn37@st-andrews.ac.uk
Dr Uli Schwarz-Linek (Module Organiser)	Senior Lecturer	us6@st-andrews.ac.uk

BL3301: Learning Outcomes

Students completing module BL3301 successfully should be able to:

- Describe protein structure & folding using a range of examples
- Relate protein structure to protein function
- Outline the methods used to characterise protein-ligand interactions
- Demonstrate the use of enzyme kinetics to characterise an enzyme
- Design experiments to explore enzyme activity
- Describe the methods used to explore protein structure
- Use in silico tools to characterise proteins, including biomolecular databases and molecular viewers
- Outline the methods used to characterise protein-ligand interactions

BL3301: Acquired Skills

Practical Skills

- Buffers
- Enzyme assay
- Kinetic data analysis
- Molecular viewer software
- Pipetting
- Protein quantitation
- SDS PAGE

Transferable Skills

- "Short" practical write-up (e.g. completed worksheet)
- Short essay (1000-2000 words)
- Finding literature
- Referencing
- Searching databases
- Lab safety awareness
- Calculations/equations
- Concentrations
- Dilutions
- Volumes
- Working in pairs/small groups

Policies

(Information in this section applies to all Biology Modules)

- The procedures and regulations followed by the School of Biology are outlined in the University Handbook and in the School of Biology UG handbookÂ Â JH booklet info (st-andrews.ac.uk)Â
- All coursework associated with the module must be completed and submitted by its due date.
- Specific School regulations relating to absence reporting, penalties and rules for late submission of work, extensions for coursework, return of coursework, S-coding, Good Academic Practice and Academic Alert are stated in the School of Biology UG hand bookÂ JH booklet info (st-andrews.ac.uk)Â Â and students are required to carefully read these regulations.
- Students are also referred to the University Handbook, available at: http://www.st-andrews.ac.uk/studenthandbook/