

Module Specification

Module Title Module Code
Credit Value Level Mode of Delivery Semester

Pre-requisite modules	Co-requisite modules	Overlapping modules

1) Content Description

Provide a description of the module, as it will appear in the Module Directory and on the Student Information System (approx. 70-80 words).

Spectroscopic techniques have revolutionized our understanding of matter at the molecular level and are essential tools across all areas of Natural Science. This module is designed for second-year students on Chemistry and Pharmaceutical Chemistry degree programmes where its main purpose is to reinforce, integrate and extend existing knowledge of spectroscopic techniques, particularly relating to multi-dimensional NMR spectroscopy. There will be a strong emphasis on problem-solving in relation to structure determination.

2) Module Aims

Specify the aims of the module, i.e. the broad educational purposes for offering this module.

This module aims to extend students ability to apply the principles of spectroscopy and a knowledge of how spectroscopic techniques can be applied for the study of molecular structure and more generally as techniques of qualitative and quantitative chemical analysis.

3) Learning Outcomes

Identify the learning outcomes for this module, i.e. knowledge, skills and attributes to be developed through completion of this module. Outcomes should be referenced to the relevant [QAA benchmark statements](#) and the [Framework for Higher Education Qualifications in England, Wales and Northern Ireland \(2008\)](#). The [SEEC Credit Level Descriptors for Further and Higher Education 2003](#) and [Queen Mary Statement of Graduate Attributes](#) should also be used as a guiding framework for curriculum design.

Academic Content:	
A1	Double Bond Equivalents, ¹ H NMR Shielding, CW vs FT NMR, equivalency, topicity, symmetry.
A2	¹ H NMR Chemical Shift, Spin-spin coupling, Splitting, Multiplicity; ¹³ C NMR Chemical shifts, effect of spin relaxation.
A3	NMR Pulse sequences and through bond effects, COSY, DEPT, HMQC, HMBC, worked examples of 2D problems.
A4	NMR Pulse sequences and through space effects, nOe, NOESY.
A5	Mass Spectrometry ionisation methods, isotope distribution, fragmentation pathways, worked examples.

Disciplinary skills - able to:	
B1	Identify key spectroscopic concepts that relate theory with experimental observations.
B2	Comprehend and explain the importance and role of 1D spectroscopy in a range of applications.
B3	Rationalise and apply multi-dimensional NMR techniques in modern structure determination.
B4	To assimilate and interpret data from multiple spectroscopic techniques as well as mass spectrometric data to solve unseen problems relating to structure determination.

Attributes:	
C1	Acquire and apply knowledge relating to the principles of applied spectroscopy
C2	Produce analyses which are grounded in experimental evidence. Develop students' general problem solving skills.
C3	Solve problems relating to previously unseen structures based on spectroscopic data.
C4	Explain and argue clearly and concisely how a given structure would produce the observed spectroscopic data.

4) Reading List

Provide an indicative reading list for the module. This should include key texts and/or journals but **should not** be an exhaustive list of materials.

Spectroscopic Methods in Organic Chemistry, by D. Williams and I. Fleming (Mc-Graw-Hill)

Organic Chemistry, by J. Clayden et al. (Oxford University Press)

Nuclear Magnetic Resonance by P. Hore (Oxford University Press)

5) Teaching and Learning Profile

Provide details of the method of delivery (lectures, seminars, fieldwork, practical classes, etc.) used to enable the achievement of learning outcomes and an indicative number of hours for each activity to give an overall picture of the workload a student taking the module would be expected to undertake. This information will form the Key Information Set for each undergraduate programme and will be used to populate the KIS widget found on the QMUL programme information pages. More information can be found [online](#) about KIS. You may also wish to refer to the [QAA guidance on contact hours](#) when completing this section.

Activity Type	KIS Category	Time Spent (in hours)
Lectures	Scheduled	10
Practical classes and Workshops	Scheduled	10
Total		20

Specify the total module notional study hours. This should be a total of the hours given for each activity. The notional study hours for each academic credit point is 10. A 15 credit point module therefore represents 150 notional study hours.

Activity Type	Total Time Spent (in hours)	Percentage of Time Spent
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Scheduled learning and teaching	20	20
Placement	0	0
Independent Study	80	80
Total	100	100

Use the information provided in the box above to specify the total time spent and the percentage time spent in each category of teaching and learning activity.

6) Assessment Profile

Provide details of the assessment methods used to assess the achievement of learning outcomes.

Description of Assessment	Assessment Type	KIS Category	Duration/Length	Percentage Weighting	Final element of assessment	Qualifying Mark
End semester test	In class test		1 Hours	20%	Yes	
Mid semester test	In class test		1 Hours	20%	No	
Coursework	Written assignment, inc Essay	Coursework		60%	No	

Final element of assessment: The assessment that takes place last. **There should normally be only one element of assessment marked as final unless two assessment or submission dates occur on the same day.**

Qualifying mark: A specified minimum mark that must be obtained in one or more elements of assessment in order to pass a module. **This is in addition to, and distinct from, the requirement to achieve a pass in the module mark to pass the module.**

Reassessment

Provide details of the reassessment methods used, specifying whether reassessment is either standard reassessment or synoptic reassessment.

- Standard Reassessment
 Synoptic Reassessment

Synoptic reassessment details (if you have indicated synoptic reassessment above, please give details)		
Brief Description of Assessment	Assessment Type	Duration/Length of Examination/ Coursework
Resit Examination	In class test	2 Hours