

## MODULE SPECIFICATION

Please contact your College Learning and Teaching Team for guidance completing this form:  
 Colleges of Arts & Social Sciences and of Business & Law – [cass-tandlteam@salford.ac.uk](mailto:cass-tandlteam@salford.ac.uk)  
 College of Health and Social Care – [chsc-teaching@salford.ac.uk](mailto:chsc-teaching@salford.ac.uk)  
 College of Science and Technology – [cst-tl@salford.ac.uk](mailto:cst-tl@salford.ac.uk)

This form is available to download from [http://www.governance.salford.ac.uk/page/aqa\\_forms](http://www.governance.salford.ac.uk/page/aqa_forms)).

Date of completion of this version of Module Specification: 12/01/2016				
Date of approval by the USP: 26/01/2016				
1. Module Title: (Full title and short title no more than 30 characters) Classical and Quantum Waves			2.CRN: 33096 (S4)	
3.University module code: F300 20033		4.HESA/JACS subject area code <sup>1</sup> : F300		
5.Level: Level 5	6.Credit Value: 20	7.ECTS Value <sup>ii</sup> : 10	8.Length of module in semesters: 2	9.Month(s) in which to be offered <sup>iii</sup> : September
10.Module Status <sup>iv</sup> Existing	11.Title of Module being replaced ( <i>if any</i> ):		12.With effect from <sup>v</sup> (academic year): September 2016	
13.Originating School: School of Computing, Science & Engineering		14.Module Leader(s) Professor Ian Morrison		
15.Programme(s) in which to be offered <sup>vi</sup> : BSc (Hons) Physics BSc (Hons) Physics with Professional Experience BSc (Hons) Physics with Acoustics BSc (Hons) Physics with Acoustics with Professional Experience BSc (Hons) Pure & Applied Physics BSc (Hons) Pure & Applied Physics with Professional Experience MPhys (Hons) Physics MPhys (Hons) Physics with Professional Experience MPhys (Hons) Physics with Acoustics MPhys (Hons) Physics with Acoustics with Professional Experience MPhys (Hons) Physics with Studies in North America				
16.Pre-requisites ( <i>between levels</i> ): None		17.Co-requisites ( <i>within a level</i> ): None		
18.Indicative learning hours (breakdown of hours required) <sup>vii</sup> 200				
Lecture	46	Fieldwork		
Seminar		External visits		
Tutorial	23	Work based learning		
Project supervision		Guided independent study		131
Demonstration Practical classes and workshops		Placement		
Supervised time in studio/workshop		Year abroad		
Other – please specify <sup>viii</sup>				
19.Percentage of module taught by School(s) other than originating School: 0%				

20. Aims of Module<sup>ix</sup>: (maximum of 5)

1. To develop a knowledge and critical understanding in the area of classical and quantum waves including the origin and limitations of the associated laws.
2. To develop analytical and numerical problem solving skills in the area of classical and quantum waves.

21. Intended Learning Outcomes<sup>x</sup>

Knowledge and Understanding (maximum of 5)<sup>xi</sup>

On successful completion the student will be able to:

1. Demonstrate a critical understanding of the laws and their origins in the area of classical and quantum waves.
2. Demonstrate competence in the specification of problems using the laws of classical and quantum waves and their analytical and numerical solution.

Transferable/Key Skills and other attributes (maximum of 5)

On completion the student will have had the opportunity to:

3. Demonstrate Communication through written material.
4. Demonstrate problem solving skills.
5. Demonstrate key analytical and numerical skills.

22. Module mark calculation: Method A

23. Assessment components (in chronological order of submission/examination date)

Denote final assessment component in box marked **final assessment component (99)**

Type of assessment	Identify which ILO is met by number <sup>xii</sup>	Weighting %	Duration	Word count	Component pass required <sup>xiii</sup>	E Submission	Assessment organised by
Portfolio (Set Exercises and Class Tests)	2,3	40			No	No	School
					Choose an item.	Choose an item.	Choose an item.
<b>Final assessment component (99)</b> Examination	1,4,5	60	3 hours		No	No	SID

24. Is ethical approval for the module required?	No	25. Is ethical approval for an assessment component required? <sup>xiv</sup>	No
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26. Learning, teaching and assessment strategies:

The module is taught through a combination of lectures and tutorial classes.

The portfolio element is a combination of class tests and set exercises.

A set of problem solving exercises is provided for guided independent learning, which forms the basis of formative assessment and feedback in the tutorial classes.

27. Syllabus outline:

Free, damped, driven oscillators and resonance  
 Coupled Oscillators and normal modes  
 Waves and the wave equation  
 Waves on strings, acoustic waves and electromagnetic waves  
 Superposition, beats and wavepackets  
 Double slit interference  
 The Doppler Effect

Dispersion and group velocity  
Quantum matter waves: Schrödinger's wave equation.  
The Uncertainty Principle  
The wave-function and the Born interpretation.  
The time-independent Schrödinger Equation and its solutions  
Quantum Tunnelling  
The Hydrogen Atom

28. Indicative texts and/or other learning materials/resources<sup>xv</sup>:

After initial approval, up to date reading lists can be accessed at <https://salford.rl.talis.com/index.html>

**Note:** This replaces the LaSU reading lists from September 2015 onwards.

For Office Use only:

Teaching and Learning Team Comments:	
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- i See UoS guidance notes on selecting JACS codes ([http://www.planning.salford.ac.uk/jacs\\_codes/](http://www.planning.salford.ac.uk/jacs_codes/))  
see HESA JACS Codes webpage <http://www.hesa.ac.uk/index.php/content/view/356/233/>
- ii The ECTS value is half of the module credit value
- iii Please indicate the month (s) in which delivery of the module will commence.
- iv Amendments to the title or credit value constitute a new module.
- v If the delivery month of the module is to be available for different intakes of a programme, please indicate this here. E.g. Module effective from Sept 2014 – to state the module is to be available for Sept 2014 intake & Feb 2014 intake.
- vi The module will only be attached to programmes specified in this section. Any approved module can be available as a stand-alone module.
- vii These categories are used for the Key Information Set which currently applies only to full time undergraduate students only but please include for all students – for more information including definitions see [http://www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/contact\\_hours.pdf](http://www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/contact_hours.pdf) and [http://www.hesa.ac.uk/component/option.com\\_studrec/task.show\\_file/Itemid.233/mnl.13061/href.Calculations\\_methods.html/#LearningandTeaching](http://www.hesa.ac.uk/component/option.com_studrec/task.show_file/Itemid.233/mnl.13061/href.Calculations_methods.html/#LearningandTeaching)
- viii The 'other' category should not be used for learning undertaken by full undergraduate students as 'other' is not used in KIS categories
- ix The aims should express the purpose of the module.
- x The intended learning outcomes should detail the knowledge, understanding and skills that students will be able to demonstrate on successful completion.
- xi In some circumstances it may be necessary to have more than 5 intended learning outcomes. You will be asked to provide your rationale for this in discussion at the USP.
- xii For example, if the assessment is an essay and the essay meets ILOs number 1-4 and 6-7, state 1-4,6-7
- xiii If Method B is used for module mark calculation, indicate Yes to specify the assessment component(s) to be passed in order to pass the module
- xiv Please specify component(s) for which ethical approval is required.
- xv The "Indicative texts and/or learning materials/resources" box should include a maximum of five items for new modules. These should be formatted using the University's agreed referencing style for the subject area (usually APA Harvard System 6<sup>th</sup>). See [http://www.salford.ac.uk/library/infolit/tool#referencing\\_tab](http://www.salford.ac.uk/library/infolit/tool#referencing_tab) for more information. The texts should normally be recent texts (i.e. within the last six years) unless they are a particularly "classic" text. For existing modules, the "Indicative texts and/or learning materials/resources" box should include a link for USP reviewers and readers to the comprehensive reading list at <http://lasu.salford.ac.uk>