UNIVERSITY OF SALFORD FORM MS

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
College of Health and Social Care – chsc-teaching@salford.ac.uk
College of Science and Technology – cst-tl@salford.ac.uk

This form is available to download from 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)	2.CRN:
Quantum Mechanics of Atoms, Molecules and Solids	34054

3.University module code:	4.HESA/JACS subject area code[i]:
F300 30093	F300

5.Level:	6.Credit Value:	7.ECTS Value[ii]:	8.Length of module in semesters:	9.Month(s) in which to be offered[iii]:
Level 6	20	10	2	September

10.Module Status[iv]	11.Title of Module being replaced *(if any):*	12.With effect from[v] (academic year):
Existing		September 2016

13.Originating School:	14.Module Leader(s)
School of Computing, Science & Engineering	Professor Stanko Tomić

15.Programme(s) in which to be offered[vi]:

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

16.Pre-requisites *(between levels):* None	17.Co-requisites *(within a level):* None

18.Indicative learning hours (breakdown of hours required)[vii] 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[viii]			

19.Percentage of module taught by School(s) other than originating School: 0%

20.Aims of Module[ix]: (maximum of 5)

1. To develop a knowledge and systematic understanding in the area of the quantum mechanics of atoms, molecules and solids including the origin and limitations of the associated laws.
2. To develop expertise in analytical, numerical and computer based problem solving skills in the area of the quantum mechanics of atoms, molecules and solids.

21.Intended Learning Outcomes[x]

Knowledge and Understanding (maximum of 5)[xi]
On successful completion the student will be able to:

(1) Demonstrate an expert critical understanding of the laws and their origins in the area of quantum mechanics in relation to atomic physics.
(2) Demonstrate an expert critical understanding of the laws and their origins in the area of the quantum mechanics of molecules and solids
(3) Demonstrate an ability to specify problems using the laws of quantum mechanics in the relation to atomic physics and solve such problems using analytical and numerical means.
(4) Demonstrate an ability to specify problems using the laws of the quantum mechanics of molecules and solids and solve such problems using analytical and numerical means.

Transferable/Key Skills and other attributes (maximum of 5)
On completion the student will have had the opportunity to:

(5) Demonstrate problem solving skills.
(6) 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[xii]	Weighting %	Duration	Word count	Component pass required[xiii]	E Submission	Assessment organised by
Examination 1	1,2,5,6	50	2 hours		No	No	SID
					Choose an item.	Choose an item.	Choose an item.
Final assessment component (99) Examination 2	3,4,5,6	50	2 hours		No	No	SID

24. Is ethical approval for the module required?	No	25. Is ethical approval for an assessment component required?[xiv]	No

26.Learning, teaching and assessment strategies:

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

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:

Background and Motivation for the Quantum Mechanical Approach
The Schrödinger Equation
The formal Rules of Quantum Mechanics
Angular Momentum
Particle in a Central Potential - The Hydrogen Atom
Matrix Representation of Angular Momentum and Spin Matrices; Spin matrices
Time-independent Perturbation Theory
The Variational Principle
Time-dependent Perturbation Theory

Many Particle Systems The Helium Atom Phonons and Free Electrons Phonons in a 1D Crystal Electrons in a 1D crystal – Covalent bonding Crystal Lattices in Direct Space Crystal Lattices in Reciprocal Space Electrons in a Periodic Potential – The Origin of Band Gaps Semiconductors Semiconductor Devices Magnetism
28.Indicative texts and/or other learning materials/resources[xv]: 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/) 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 and 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 6th). See 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