Confirmation that this version of the module specification has been approved by the School Learning and Teaching Committee:

………19th June 2015………………………………………….

**MODULE SPECIFICATION**

1. Title of the module

CH533 Materials and Solid State Chemistry

1. School or partner institution which will be responsible for management of the module

School of Physical Sciences

1. Start date of the module

Revised specification for existing module, next running 2015-2016

1. The number of students expected to take the module

25

1. Modules to be withdrawn on the introduction of this proposed module and consultation with other relevant Schools and Faculties regarding the withdrawal

None

1. The level of the module (e.g. Level 4, Level 5, Level 6 or Postgraduate Level 7)

Level 5

1. The number of credits and the ECTS value which the module represents

15 (ECTS 7.5)

1. Which term(s) the module is to be taught in (or other teaching pattern)

Autumn and spring

1. Prerequisite and co-requisite modules

CH308, CH382 or PS381

1. The programmes of study to which the module contributes

Forensic Chemistry (BSc); Forensic Chemistry (MChem); Forensic Chemistry with year in Industry;

Chemistry (BSc); Chemistry (MChem) and Chemistry with year in Industry

This is not available as a wild module

1. The intended subject specific learning outcomes
   1. Crystal structures - An ability to describe the features of the most common crystalline structures.
   2. Bonding in the solid state - An ability to identify different bonding contributions in the solid state.
   3. How the structure and bonding determines the chemical properties of a compound – An ability to relate the crystalline structure with the bonding to predict materials properties.
   4. An ability to describe different defect structures in the solid state and how they effect the materials properties.
   5. An ability to interpret and draw phase diagrams.
2. The intended generic learning outcomes
   1. Problem-solving skills, an ability to formulate problems in precise terms and to identify key issues, and the confidence to try different approaches in order to make progress on challenging problems.
   2. Analytical skills – associated with the need to pay attention to detail and to develop an ability to manipulate precise and intricate ideas, to construct logical arguments and to use technical language correctly.
   3. Personal skills – the ability to work independently, to use initiative, to organise oneself to meet deadlines and to interact constructively with other people.
3. A synopsis of the curriculum
4. Solid State Chemistry lectures

1) Structures and Materials, Close-packed structures, Structures adopted by simple binary solids; e.g. CsCl- NaCl-, sphalerite and Wurtsite structure. Octahedral and tetrahedral holes in close-packed lattices

2) Bonding in Solids, ionic bonding and the ionic model, molecular solids, band theory, defects in solids.

3) Oxide structures. Structures of ionic solids, principally oxides, corundum, ReO3, perovskites, spinels.

4) Zeolites, structural features of Si-O bond chains and networks in silicates, al, aluminium and metal ions in aluminosilicates. Zeolite compositions and structures; sodalite, Zeolites A,X,Y and ZSM5; channels and cavities. Synthesis of zeolites. Applications of zeolites for ionic exchange, molecular absorption and catalysis.

5) Defects in solids, including point defects as well as long range

6) Non-stoichiometry, types of non-stoichiometry in solids.

7) Transport and reactivity in solids, diffusion and electrical transport in solids. Solid state reactions

8) Relate and predict materials properties based structure and bonding in the solid.

1. Phase Diagrams
2. The phase rule, number of phases, components degrees of freedom. Calculation of composition from phase diagrams.
3. One component systems
4. Two-component systems
5. Three-component systems
6. Indicative Reading List

(i) A.R. West*, Solid State Chemistry (1999)*, (ii) Smart and Moore*, Solid State Chemistry* (2012)

1. Learning and Teaching Methods, including the nature and number of contact hours and the total study hours which will be expected of students, and how these relate to achievement of the intended module learning outcomes

*Learning and Teaching Methods:*

* lectures given by a variety of teachers (24hrs); 3 practical lab classes of 6hrs (18 hrs); assignments (40hrs); personal study using textbooks, and other self-study material (68 hrs).
* The number of personal study hours, including assignments and write up of lab reports (68 hrs)
* Total number of study hours 150 hrs

*Achievement of module learning outcomes:*

* Lectures (11.1-5, 12.1)
* Practical lab classes (11.1,11.3,11.5, 12.1-12.3)
* Assignments (11.1-11.5; 12.1-12.3)
* Self-studies (11.1-11.5; 12.1-12.3)

1. Assessment methods and how these relate to testing achievement of the intended module learning outcomes

* 40% coursework: 2 assignments (15%), coursework involving problem solving (11.1-11.5, 12.1-12.3); 2 lab reports (25%), practical laboratory skills (11.1, 11.3, 11.5, 12.1-12.3).
* 60% final (written unseen, length 2 hours) exam (11.1-11.5, 12.1-12.3)

1. Implications for learning resources, including staff, library, IT and space

None

1. The School recognises and has embedded the expectations of current disability equality legislation, and supports students with a declared disability or special educational need in its teaching. Within this module we will make reasonable adjustments wherever necessary, including additional or substitute materials, teaching modes or assessment methods for students who have declared and discussed their learning support needs. Arrangements for students with declared disabilities will be made on an individual basis, in consultation with the University’s disability/dyslexia support service, and specialist support will be provided where needed.
2. Campus(es) where module will be delivered:

Canterbury campus