University of the West of England
BRISTOL

**CORPORATE AND ACADEMIC SERVICES**

# MODULE SPECIFICATION

| Part 1: Basic Data | | | | | | |
|---|---|---|---|---|---|---|
| Module Title | Medicinal Chemistry | | | | | |
| Module Code | USSKB5-15-2 | | Level | 2 | Version | 1 |
| Owning Faculty | Health and Applied Sciences | | Field | Biological, Biomedical and Analytical Sciences | | |
| Contributes towards | BSc Forensic Science, BSc Forensic Science (Chemistry), BSc Biomedical Science, BSc Biomedical Science (Clinical) | | | | | |
| UWE Credit Rating | 15 | ECTS Credit Rating | 7.5 | Module Type | Standard | |
| Pre-requisites | USSJRT-30-1 Chemistry in Context or USSKA4-30-1 Cell Biochemistry and Genetics | | Co-requisites | None | | |
| Excluded Combinations | USSKB7-15-2 Molecular Genetics, USSKB8-15-2 Forensic Biology for the Forensic Science (Biology) pathway only. | | Module Entry requirements | N/A | | |
| Valid From | September 2014 | | Valid to | current | | |

| **CAP Approval Date** | |
|---|---|

| Part 2: Learning and Teaching | |
|---|---|
| Learning Outcomes | On successful completion of this module students will be able to:<br>• apply chemical knowledge to rationalise drug design, structural modification and synthesis (components A1, B1);<br>• comment on chemical strategies used in drug development to control pharmacokinetics, formulation and delivery (component A1).<br>• carry out experimental techniques commonly used in drug synthesis (component B1)<br>• recognise and explain how physicochemical properties of drugs can be measured, and used to study and predict structure-activity relationships (components A1, B1)<br>• describe and explain the action and development of selected examples of medicines and drugs (component A1) |
| Syllabus Outline | <u>The general principles of medicinal chemistry</u>:<br><br>General classes of drugs and their medicinal activity. Types of drug target and the origins of drug-target interactions. Identification of the essential structural features (pharmacophore) for bioactivity. |

| | |
|---|---|
| | Examples of synthetic methods in medicinal chemistry to develop leads, to optimise drug-target binding interactions, to alter drug solubility/stability, to improve drug pharmacokinetics, to enhance drug delivery/formulation, to mass produce drugs and to control drug stereochemistry.<br><br>Relationships between chemical structure and physicochemical properties of a drug (structure-activity relationships, SARs), and their quantitative measurement (QSAR). Hydrophobicity and Hammett constants, Hansch analysis, Craig plots and Topliss decision trees.<br><br>Types of prodrug and the use of classical and non-classical bioisosteres. Applications to drug design and development in medicinal chemistry.<br><br>The use of X-ray crystal structure determination and spectroscopy to identify drug intermediates and to inform drug development.<br><br>Case Studies in Medicinal Chemistry:<br><br>To illustrate major classes of medicines and their chemical development and action, a selection of the following will be discussed;<br><br>The design and development of different types of antidepressant;<br><br>Anti-cancer drugs acting as alkylating and intercalating agents;<br><br>Antiulcer treatment - QSAR in the development of omeprazole or cimetidine;<br><br>Captopril, an antihypertensive agent – the development of a lead compound;<br><br>Development of the morphinans and methadone from morphine;<br><br>Structure and activity of the antibacterial penicillins. |
| Contact Hours | The contact hours (36) are distributed as follows:<br><br>21 hours of lectures,<br><br>3 hours of workshops,<br><br>12 hours of laboratory practicals. |
| Teaching and Learning Methods | The material will be delivered using a combination of lectures, workshops and laboratory work. Lectures will be augmented by directed reading in the recommended text and in selected publications from the scientific literature, e.g. Drug Discovery Today, Journal of Medicinal Chemistry. The topics selected for delivery by workshops and practical work will be designed to enhance problem solving skills and to provide experience of relevant laboratory techniques.<br><br>Technology enhanced learning will be embedded within teaching materials via links to supplementary electronic online resources of the textbook and other relevant information portals, e.g. http://www.chemspider.com Use will also be made of various in-house electronic resources and flash videos in chemistry for biologists available at http://calcscience.uwe.ac.uk. Student learning will be further supported through a variety of materials posted on the University's E-Learning Environment, Blackboard.<br><br>Independent learning will take the following forms with an approximate indication of time required for each:<br><br>• Essential reading to support acquisition of knowledge and completion of problem solving skills exercises relating to lectures, workshops and practical classes – 40 hours<br>• Preparation and submission of coursework 1 – 37 hours<br>• Revision and preparation for exams – 37 hours |

| | |
|---|---|
| Key Information Sets Information | Key Information Sets (KIS) are produced at programme level for all programmes that this module contributes to, which is a requirement set by HESA/HEFCE. KIS are comparable sets of standardised information about undergraduate courses allowing prospective students to compare and contrast between programmes they are |

**Key Information Set - Module data**

*Number of credits for this module* 15

| Hours to be allocated | Scheduled learning and teaching study hours | Independent study hours | Placement study hours | Allocated Hours |
|---|---|---|---|---|
| 150 | 36 | 114 | 0 | 150 |

The table below indicates as a percentage the total assessment of the module which constitutes a -

**Written Exam**: One unseen written exam
**Coursework**: One portfolio of workshop and laboratory worksheets

| Total assessment of the module: | |
|---|---|
| Written exam assessment percentage | 50% |
| Coursework assessment percentage | 50% |
| Practical exam assessment percentage | 0% |
| | 100% |

| | |
|---|---|
| Reading Strategy | All students will be encouraged to make full use of the print and electronic resources available to them through membership of the University. These include a range of electronic journals and a wide variety of resources available through web sites and information gateways. The University Library's web pages provide access to subject relevant resources and services, and to the library catalogue. Many resources can be accessed remotely. Students will be presented with opportunities within the curriculum to develop their information retrieval and evaluation skills in order to identify such resources effectively.<br><br>Any **essential reading** will be indicated clearly, along with the method for accessing it, e.g. students may be expected to purchase a set text, be given or sold a print study pack or be referred to texts that are available electronically, etc. This guidance will be available either in the module handbook, via the module information on Blackboard or through any other vehicle deemed appropriate by the module/programme leaders.<br><br>If **further reading** is expected, this will be indicated clearly. If specific texts are listed, a clear indication will be given regarding how to access them and, if appropriate, students will be given guidance on how to identify relevant sources for themselves, e.g. through use of bibliographical databases. |
| Indicative Reading List | The following book is recommended for purchase by students as it covers the majority of aspects of the course.<br><br>Patrick, G. L. (2013) *An Introduction to Medicinal Chemistry* 5th ed. Oxford: Oxford University Press. |

| | |
|---|---|
| | Students are also advised to consult related texts on the topic, of which the following are representative:<br><br>Thomas, G. (2007) *Medicinal Chemistry – an introduction*,2nd ed. Chichester: John Wiley.<br><br>Silverman, R. B. (2004) *The Organic Chemistry of Drug Design and Drug Action*,2nd ed. Oxford: Academic Press.<br><br>Students who wish to access chemistry texts to underpin their chemical knowledge are advised to consult some of the following in Frenchay library:<br><br>Volhardt, P, Schore, N., (2009) *Organic Chemistry - structure and function* 6th ed. New York: W.H. Freeman<br><br>Crow, J. Bradshaw, T. and Monk, P. (2006) *Chemistry for the Biosciences* . Oxford: Oxford University Press.<br><br>Lewis, R. and Evans, W. (2011) *Chemistry*, 4th ed. Basingstoke: Palgrave Macmillan,<br><br>Additional useful texts can be accessed at shelf marks 615.1 and 541.22 |

| **Part 3: Assessment** | |
|---|---|
| Assessment Strategy | Students will undertake practical work and workshops based on synthesis of selected drugs and the principles of drug development.<br><br>The assessed worksheets will contain questions and responses for students to complete during these timetabled sessions and further questions for students to research in their own time.<br><br>The examination will assess the students' knowledge acquired during lectures and workshops, and from their own directed, independent learning. |

| Identify final assessment component and element | | |
|---|---|---|
| **% weighting between components A and B** (Standard modules only) | **A:** **50** | **B**: **50** |
| | | |
| **First Sit** | | |
| **Component A** (controlled conditions)<br>**Description of each element** | **Element weighting**<br>**(as % of component)** | |
| 1. 3 hour written examination | 100% | |
| | | |
| **Component B**<br>**Description of each element** | **Element weighting**<br>**(as % of component)** | |
| 1. Portfolio of worksheets | 100% | |
| | | |

| **Resit (further attendance at taught classes is not required)** | |
|---|---|
| **Component A** (controlled conditions)<br>**Description of each element** | **Element weighting**<br>**(as % of component)** |

| | |
|---|---|
| 1. 3 hour written examination | 100% |
| 2. | |
| **Component B**<br>**Description of each element** | **Element weighting**<br>**(as % of component)** |
| 1. Portfolio of worksheets | 100% |
| 2. | |
| If a student is permitted an **EXCEPTIONAL RETAKE** of the module the assessment will be that indicated by the Module Description at the time that retake commences. | |