University of the West of England
BRISTOL

ACADEMIC SERVICES

MODULE SPECIFICATION

Part 1: Basic Data						
Module Title	Research and Diagnostic Methodologies					
Module Code	USSJYT-30-M		Level	M	Version	1
UWE Credit Rating	30	ECTS Credit Rating	15	WBL module?	No	
Owning Faculty	Health and Applied Sciences		Field	Applied Sciences		
Department	Biological Biomedical and Analytical Sciences		Module Type	Standard		
Contributes towards	MSc Biomedical Science and all associated named routes					
Pre-requisites	None		Co- requisites	None		
Excluded Combinations	None		Module Entry requirements	None		
First CAP Approval Date	2nd February 2016		Valid from	September 2016		
Revision CAP Approval Date			Revised with effect from			

Review Date	~ 5 years post approval for PSRB requirements

Part 2: Learning and Teaching	
Learning Outcomes	On successful completion of this module students will be able to: • show a detailed understanding of the theory that underpins a range of scientific methods (Components A & B1 & B2) • demonstrate an awareness of the use of a range of scientific methods in both research and diagnostic settings including the evaluation of their role and limitations (Component B2) • review critically the scientific literature (including national standard methods and standard operating proceedures) in relation to biomedical science methodological choices. (Component A) • demonstrate a critical awareness of the principles of good experimental design in biomedical research. (Component B2) • select and perform appropriate statistical techniques for the analysis of experimental data. (Component B1)
Syllabus Outline	Core technology relevant to all students reading for MSc in Biomedical Sciences. 1. *Molecular biology* (3h) (Isolation of nucleic acids, DNA extraction from bacteria, DNA extraction from animal cells, Isolation and purification of RNA, Restriction enzymes, Gel electrophoresis, DNA sequencing, Southern blotting, RFLP, In situ hybridisation, Recombinant DNA, Polymerase chain reaction, Reverse transcriptase PCR, Real-time PCR, DNA microarray); 2. *Electrophoresis (1h)* (Principles, Polyacrylamide, Agarose,

Capillary, Isoelectric focusing); 3. _Microscopy (2h)_ (Transmitted light microscopy, Dark field, Phase contrast, Fluorescence, Confocal, Inverted, Electron, Optical tweezers, Digital imaging and processing (empty magnification/image manipulation).

Students also learn methods that are relevant for their specialism. This are delivered as specialist methods such as 1. _Immunohistochemistry, immunocytochemistry, in-situ hybridisation (2h)_ (Cellular Pathology, Haematology, Applied Immunology); 2. _Immunoassays (2h)_ (Latex immunoassay, Immunonephelometry, Radioimmunoassay, ELISA - Haematology, Clinical Biochemistry, Applied Immunology); 3. _Flow cytometry_ (1h) (Cell cycle, DNA content analysis, T cell subset analysis & enumeration, Immunophenotyping – Leukaemia and lymphoma analysis, Stem cell enumeration, Use of biomarkers for diagnosis & prognosis (surface & internal biomarker staining), Cell sorting -stem cells, sperm (Haematology, Applied Immunology). 4. _Spectroscopy (2h)_ (Mass spectrometry, MALDI-TOF - Clinical Biochemistry, Haematology, Medical Bacteriology, Applied Immunology); 5. _Chromatography(1h)_ (High performance liquid chromatography, Gas-liquid chromatography, Two-dimensional - Clinical Biochemistry, Haematology); 6. _Point of care testing (2h)_ (Standards and guidelines, Advantages and limitations, Evaluating a POCT device, Use of POCT devices, Quality and POCT, Technical or analytical validation (limits of linearity, analytical specificity and sensitivity, accuracy, precision), Clinical evaluation and validation - Clinical Biochemistry, Medical Bacteriology, Haematology, Applied Immunology).

Principles of good experimental design. Methods for the assessment of data quality and method validation. Descriptive statistics. Inferential statistics and hypothesis testing. Statistical significance, variance, regression, covariance. Selecting the appropriate statistical method.

Effective literature searching strategies. Critical reading skills. Scientific writing skills. The peer review process as applied to research papers and grant applications.

Evidence based medicine. Introduction to bioethics. An understanding of how Ethics Committees work.

Contact Hours	6 contact hours per week for 12 weeks (semester 1) = 36 hours
Teaching and Learning Methods	The module will have a mixture of traditional lectures to cover the core scientific principles, supported by talks from researchers on the use of the core methods in the research sector. Coverage of the use of the scientific methods in the diagnostic sector will be supported by video presentations by diagnostic sector staff, and supported by visits to diagnostic laboratories where possible. The statistics teaching will be by computer-based workshops delivered by expert staff.
Key Information Sets Information	Not applicable for level M programmes/modules
Reading Strategy	At Masters level students are expected to demonstrate the ability to find information, assess its relevance and utilise it in their studies in an independent manner; however the programme team recognise that students entering the programme may be at different levels of the development of the skills required to undertake this successfully. Therefore module leaders will provide you with a starting point in terms of core readings and the lecture material will also give you a strong starting point. However it is in the area of further reading that you need to show the independence of skills and of knowledge development, so you will need to find the further readings yourself. However, the skills required to do this are

| | | covered during the early stages of the course, during induction week you will have a library induction session, and in the Research and Diagnostic Methodologies module (USSJYT-30-M) that you take during the first semester we will cover how to undertake a literature search and how to assess and use the material you find appropriately. The programme tutorials will provide opportunities for you to further develop these skills and to ask any questions that you have. Further support and guidance is available through the library which runs workshops that you can sign up to, and also has advice in its website.

Module leaders will give you a clear indication of any essential reading, and point you towards the appropriate textbooks and journals for their discipline. This will usually be in the form of a reading list in the module guide; the indicative list on this module specification is as it states indicative as the relevant available books and journals can change regularly – and the module specification is a document written only once when a module is modified and can last for many years. So it is important that you refer to the reading list for your specific year group as the definitive document.

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. . |
| • Indicative Reading List | **Selected Texts – Current Editions of:**
• Glencross, H., Ahmed, N. and Wang, Q.(eds) (2011) *Biomedical Science Practice: Experimental and Professional Skills*. Oxford: Oxford University Press
• Ahmed, N. (2011) *Clinical Biochemistry*. Oxford: Oxford University Press
• Moore, G., Knight G. and Blann, A. (2011) *Haematology* Oxford: Oxford University Press
• Ford, M.(ed) (2011) *Medical Microbiology* Oxford: Oxford University Press
• Hall, A. and Yates, A. (eds)(2011) *Immunology* Oxford: Oxford University Press
• Orchard, G and Nation, B. (eds)(2011) *Histopathology* Oxford: Oxford University Press
• Shambayati, B. (ed) (2011) *Cytopathology* Oxford: Oxford University Press
• Knight, R. (ed) (2011) *Transfusion and Transplantation Science* (Oxford: Oxford University Press
• Gibbs, R. and Heugh, S. (eds) (2011) *Biology of Disease* (Oxford: Oxford University Press
• Mepham, B, (2005) *Bioethics - and introduction for the biosciences*. Oxford: Oxford University Press
• Bland, M. (2000) *An introduction to medical statistics*. 3rd ed. Oxford: Oxford University Press
• Malmfors, B., Garnsworthy, P. and Grossman, M. (2004) *Writing and presenting scientific papers*. 2nd ed. Nottingham: Nottingham University Press.

Web sites:
• The National Center for Biotechnology Information (NCBI) advances science and health by providing access to biomedical and genomic information - http://www.ncbi.nlm.nih.gov/pubmed
• The Institute of Biomedical Science (IBMS) - http://www.ibms.org/
• http://www.bized.co.uk/reference/studyskills/index.htm
• Health Professions Council - http://www.hpc-uk.org/
• Human tissue authority - http://www.hta.gov.uk/
• Medicines and Healthcare products Regulatory Agency - http://www.mhra.gov.uk
• The Royal College of Pathologists' website - http://www.rcpath.org/ |

Part 3: Assessment	
Assessment Strategy	The MSc BMS Programme has a programme level assessment strategy (see Programme Specification appendix 1), and all modules have their assessments designed to relate to that document. For parity across all routes the specialist subject modules on the MSc BMS programme have a 50:50 weighting of course work to final exam – this module is one of the specialist modules. Therefore the coursework has been designed in line with the programme assessment strategy. The assessments are marked to the BBAS standard PG marking criteria, and students are full briefed on the assessment both in writing and through a tutorial session.

Identify final assessment component and element		***Component A1***	
		A:	**B**:
% weighting between components A and B (Standard modules only)		**50**	**50**

First Sit	
Component A (controlled conditions) **Description of each element**	**Element weighting** (as % of component)
1. Exam (3 hours)	100
Component B **Description of each element**	**Element weighting** (as % of component)
1. Data Interpretation exercise	60
2. Project proposal (1500 words)	40

Resit (further attendance at taught classes is not required)	
Component A (controlled conditions) **Description of each element**	**Element weighting** (as % of component)
1. Exam (3 hours)	100
Component B **Description of each element**	**Element weighting** (as % of component)
1. Data interpretation exercise	

If a student is permitted a retake of the module under the University Regulations and Procedures, the assessment will be that indicated by the Module Description at the time that retake commences.