MODULE SPECIFICATION

Part 1: Information			
Module Title	Advanced Specialist-Subject Studies		
Module Code	USSKFS-45-M	Level	Level 7
For implementation from	2021-22		
UWE Credit Rating	45	ECTS Credit Rating	22.5
Faculty	Faculty of Health & Applied Sciences	Field	
Department	HAS Dept of Applied Sciences		
Module Type:	Standard		
Pre-requisites	None		
Excluded Combinations	None		
Co-requisites	None		
Module Entry Requirements	None		
PSRB Requirements	None		

Part 2: Description

Educational Aims: To enable student to develop a depth of understanding within their chosen specialist subject area, whilst situating that discipline in the wider biomedical sciences.

Outline Syllabus: Students select one subject-specialist (SS) route from the six options the syllabuses of which are aligned to the co-taught UG lecture series.

SS1: Immunology -
Molecular immunology: The structure of antibodies and genetics of antibody diversity. Production of cytokines, modes of action, types of cytokine. T helper cell subpopulations. Role of cytokines in T and B cell activation, humoral and cell mediated immunity. Intracellular receptor signalling.

Cellular immunology: Cell-cell interactions. Receptors involved in cell activation pathways. Antigen presentation. Mucosal immunology. Microbial immunology and vaccination. Induction of tolerance; central and peripheral. Tolerance and autoimmunity. Autoimmune disease and allergy; induction and disease mechanisms. Transplant rejection and immunosuppression.

Applied immunology: Application of antibodies in immunodiagnostics and current technology. Antibody

engineering and use of monoclonal and other synthesized antibodies. Applications of antibodies and cytokines in the treatment of diseases. Chemotherapy.

SS2: Haematology -
Physical and chemical requirements for optimal haematopoiesis throughout life: content of the blood and bone marrow. Reference values. Ontogeny and sites of haematopoiesis. Regulation of haematopoiesis. Nutritional requirements.

The anaemias: Classification systems. Megaloblastic anaemias. Iron deficiency and related anaemias. Normal erythrocyte structure and function. Red cell survival disorders. Haemoglobinopathies and the thalassaemia syndromes. Red cell enzymopathies.

Haematological malignancy: Aetiology and the multi-hit hypothesis. Classification. Principles of investigation and diagnostic criteria. Pathophysiology. Theoretical basis of cytotoxic chemotherapy and stem cell transplantation.

Haemostasis: Structure and contribution to haemostatic function of blood vessels, platelets, coagulation proteins and fibrinolytic proteins. Functional inter-relationships between the vascular, platelet, coagulation and fibrinolytic systems. Naturally occurring inhibitors of coagulation and fibrinolysis. Haemorrhagic conditions. The hypercoagulable state.

Blood donation and Blood groups: Principles of the selection, collection, separation, storage and transportation of donated blood components for transfusion. The bacteriology, virology and parasitology of diseases which can be transmitted by transfusion. The major blood polymorphism's e.g. ABO, Rh, and selected other blood group systems. Blood group structure, function and relevance to transfusion. Compatibility of blood- in vitro antibody-antigen reactions for the selection of compatible blood. Optimisation of detection techniques for in vitro antibody-antigen reactions.

Immunohaematology and Transfusion therapy: Laboratory investigation of serological reactions to aid diagnosis of immunohaemolytic disease and immunological transfusion reactions. Strategies for the prophylaxis of immunohaemolytic disease. The appropriate use of blood components. Hypersensitivity responses to transfusion.

SS3: Medical Microbiology -
Detection of microbes: students will develop knowledge of the methods used in clinical laboratories to detect and diagnose infectious diseases. This includes standard culture and microscopy based methods, immunological diagnoses, infection control screening, the move towards automation and the increasing use of molecular technologies. Students will also develop an understanding of the importance of health and safety in the microbiology laboratory.

Taxonomy and classification: students will develop knowledge of the principles behind classification, the techniques used to classify microbes (bacteria, viruses, fungi and other parasites) and controversies that remain when attempting to classify microbes.

Epidemiology: students will develop knowledge of the principles and techniques used in epidemiology of infectious diseases.

The host-microbe balance: students will develop knowledge of the relationship between host and microbes (bacteria, viruses, fungi and other parasites) in both health and disease. This includes a knowledge of the principles and pathogenicity; the human immune response & microbial strategies for subverting the response; the concept of the normal microbiota; microbial virulence factors, including the routes by which microbes acquire these factors, and the genetic mechanisms by which they control expression of the factors; biofilms and their role in microbial infections.

The control of infectious diseases in human populations: students will develop knowledge of antimicrobial drugs; vaccination; environmental control of diseases, vectors and reservoirs; disinfection and sterilisation.

Infectious diseases of key body systems: students will develop a deeper knowledge of infections of selected body systems such as the neurological system, genital tract, the respiratory tract and the gastrointestinal tract: covering the epidemiology of infections that are associated with the system; pathogenic and virulence traits of the infecting microbes; prevention and treatment of infections of the system; i.e. the host-microbe balance aspects of different infections will be developed. Examples covered will be chosen to illustrate other fundamental microbiological principles such as zoonoses, nosocomial infections, opportunistic pathogens, environmentally acquired infections

and endogenous infections.

SS4 – Cellular Pathology -
Technical aspects of Cellular Pathology: preparative processes in Cellular Pathology; microscopy; the theory of stain action; immunocytochemistry; cytopathology; molecular techniques used and their application.

Principles of Cancer Biology: the hallmarks of cancer; its genetic basis; oncogenes and tumour suppressor genes; cell signalling in tumours; tumour progression; invasion and metastasis; the role of cancer stem cells. Cancer screening; diagnosis; grading and staging; existing therapeutic strategies; potential future therapies.

Tissues & Organs: Pathology & Investigation: a systematic overview of the structure and function of the major organs, their pathology, and associated neoplastic disease. (To include: liver; lung; skin; prostate; reproductive system; gastrointestinal tract; the urinary/renal system; breast; bone; skin; pancreas; neuroendocrine system). Non-neoplastic disease of the major organs requiring cellular pathological investigation; systemic disease such as amyloidosis and renal disease. The role of cellular pathology in research; quantitation; quality control.

SS5 – Medical Genetics -
Overview: scientific basis of medical genetics – human genome- structure and function; human genome mapping; modes of inheritance of genetic disorders; clinical applications – genetic assessment, prenatal diagnosis, treatment and prevention of disease.

Mechanisms of genetic modification; DNA damage and repair mechanisms, cell cycle, epigenetics, imprinting, clinical conditions related to genetic modification.

DNA analysis – indirect & direct mutant gene tracking; techniques for demonstration of DNA mutation/polymorphisms including PCR, MLPA, Sequencing, Southern blotting, microarray. Chromosome analysis – karyotyping, FISH, etc; heteromorphisms; mitochondrial chromosomes; chromosome aberrations.

Gametogenesis – meiosis; spermatogenesis; oogenesis; fertilisation; Lyonisation; sex determination and differentiation; genomic imprinting.

Inheritance modes of genetic disorders – autosomal and sex-linked; non-Mendelian inheritance – multifactorial – continuous and discontinuous; twin concordance, family correlation studies. Somatic cell disorders; mitochondrial disorders.

Clinical applications- genetic assessment, communication of advice, medical ethics; Prenatal diagnosis; population screening; prevention and treatment of genetic disease; gene therapy; Genetics of common diseases; Immunogenetics, cancer genetics, inborn errors of metabolism, RNA biology and alternative splicing, disorders of development.

SS6 – Clinical Biochemistry -
Philosophy of clinical biochemistry/clinical utility: under pins all current diagnostic clinical biochemistry, discussing the value of biochemical and molecular biological tests in the investigation of disease.

Enzymes: examples of specific clinically relevant enzymes. Tissue damage and relationship to diagnostic use of enzymes and isoenzymes.

Liver function/disease: review of fundamental liver biochemistry. Causes of acute and chronic liver disease. Liver function tests. Differential diagnosis of jaundice and other disorders.

Disorders of detoxification and excretory mechanisms: review of normal kidney functions. Tests of the glomerular function – renal clearance, GFR, serum creatinine and urea determinations and tests of tubular function. Renal calculi and their investigations.

Acid-base disorders: review of fundamental acid-base concepts. Metabolic and respiratory causes and clinical effects of acidosis and alkalosis. Disturbances to oxygen transport. Assessment of acid-base status; diagnosis and management of acid-base disorders.

Endocrinology disorders: disorders of the hypothalamic-pituitary-target organ axis, with particular reference to the thyroid and adrenal glands. Other disorders of endocrine control will be studied which involve other systems of the body, for example: abnormalities in calcium metabolism; abnormalities in control of electrolyte and fluid balance

Toxicology and drug therapy: treatment of cancer using cytotoxic drugs highlighting factors which affect treatment with chemical agents.

Plasma proteins in disease: the role of the plasma proteins in the investigation of disease. Topics studied include: clinical enzymology and applications in the diagnosis of coronary heart disease; paraproteins as an example of the use of proteins as tumour markers.

Molecular genetics in disease: the role of molecular genetics in the investigation and understanding of disease processes such as in-born-errors of metabolism and cancer.

SS based tutorials will guide the student through connecting the advanced academic skills and the lecture material together to develop masters level understanding of the students SS.

Advanced Academic Skills:
Students will undertake a series of tutorials and workshops looking at the underpinning theory of academic skills and then apply them to the work in their specialism and the wider programme context – work will be supported by activities in other compulsory modules in the programme

Critiquing primary papers and review articles
Dealing with controversy in biomedical science
Development of evidence-based practice – for example through evaluating the role of a method in the discipline being majored in, or reviewing a standard operating procedure or standard diagnostic practice
Application of concepts from other modules to the discipline being majored in – for example uncertainty of measurement, professional expectations and behaviour, introductory management
Development of presentation skills -posters, oral presentations, viva voce exams, lay-writing of science, on-line platform formats
Development of reflective practice skills – underpinning theory, learning-styles, using feedback etc.
Preparing for employment – science/academic CVs, norms of interview and selection processes within science, professional use of social media platforms

Teaching and Learning Methods: Delivery of this module is multi-stranded and includes:

Scheduled teaching:
Co-taught lectures with final year undergraduate cohort to provide strong foundations of up-to-date knowledge of specialist-subject.
MSc Conference week – a one-week intensive teaching period designed to mimic attendance at a scientific conference, includes attendance at Centre for Research in Bioscience (CRIB) Review Day (wherever possible – in years that this does not run additional course specific content will be delivered). Constitutes approximate 30 hours of scientific content delivery.
Academic skills focused tutorials and workshops – 20 hours introducing the underpinning theory and opportunity to practice of advanced academic skills.
Specialist Subject tutorials – 20 hours (mode of delivery will be dependent on staff availability – generally either 1 hour per week or 2 hours once a fortnight)
One-to-one guidance meetings with programme leader or other appropriate staff member

Substantial independent study is also required.

Part 3: Assessment

This module contains three assessments, two of which (the poster and the portfolio) are linked.

A portfolio of activities, which includes both scientific writing activities, professional style activities, and reflective practice activities; and a poster presentation and oral defence (which is a core skill for biomedical science masters graduates). Students will be expected to show how the feedback received on their first semester poster assessment in USSJYS-15-M has been used in the preparation of the poster for this module (if the student was unable to undertake the USSJYS-15-M an alternative activity will be substituted). There is also a discipline specific exam at the end of the taught content delivery.

Students also develop several transferable skills during this assessment including negotiation (they work with their tutors during the development of the portfolio of activities), critiquing of published literature, scientific writing etiquette, and editing documents to a high editorial standard.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Examination - Component A		20 %	Unseen exam in subject specialism (2 hours)
Poster - Component A		30 %	20 minute poster presentation and oral defence
Portfolio - Component B	✓	50 %	Portfolio of activities constructed across the duration of the module (5000 words)
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Examination - Component A		20 %	Unseen exam in subject specialism (2 hours)
Poster - Component A		30 %	20 minute poster presentation and oral defence
Portfolio - Component B	✓	50 %	Portfolio of activities constructed across the duration of the module (5000 words)

Part 4: Teaching and Learning Methods

Learning Outcomes

On successful completion of this module students will achieve the following learning outcomes:

Module Learning Outcomes	**Reference**
Demonstrate a depth of knowledge in aspects of their specialist subject with evidence of interaction with the published literature	MO1
Identify their own learning needs and areas of subject interest and plan and undertake activities to address these needs and interests	MO2
Develop their ability to link material at a programme level rather than in the silos of modules	MO3
Show an awareness of the importance of evidence and critiquing evidence to strengthen practice	MO4
Show development of their presentation skills and reflective practice skills	MO5

Contact Hours

Independent Study Hours:	
Independent study/self-guided study	307
Total Independent Study Hours:	307
Scheduled Learning and Teaching Hours:	
Face-to-face learning	143
Total Scheduled Learning and Teaching Hours:	143
Hours to be allocated	450
Allocated Hours	450

Reading List

The reading list for this module can be accessed via the following link:

	https://rl.talis.com/3/uwe/lists/49827E4B-1237-212F-1719-E4D5BCE3068D.html?lang=en-GB&login=1

Part 5: Contributes Towards
This module contributes towards the following programmes of study: Biomedical Science [Sep][FT][Frenchay][1yr] MSc 2021-22 Biomedical Science (Medical Microbiology) [Sep][FT][Frenchay][1yr] MSc 2021-22 Biomedical Science (Medical Genetics) [Sep][FT][Frenchay][1yr] MSc 2021-22 Biomedical Science (Immunology) [Sep][FT][Frenchay][1yr] MSc 2021-22 Biomedical Science (Haematology) [Sep][FT][Frenchay][1yr] MSc 2021-22 Biomedical Science (Clinical Biochemistry) [Sep][FT][Frenchay][1yr] MSc 2021-22 Biomedical Science (Cellular Pathology) [Sep][FT][Frenchay][1yr] MSc 2021-22