

# **Diploma/BSc (Hons) Biomedical Sciences - SC301**

## **BSc (Hons) Biomedical Sciences (Upgrading) - SC302**

### **1. Special Note**

Both Programmes are designed to be professional courses, like BSc (Hons) Medical Science Programme currently run by the Department of Medicine. Accordingly, the degree of flexibility will differ from most BSc (Hons) Programmes being run by the Faculty.

*The programme design has taken into account the international subject benchmark for Biomedical Sciences set by the UK Quality Assurance Agency in consultation with the IBMS.*

### **2. Objectives**

The work of biomedical scientists is essential to ensure the effective operation of health care system. The Diploma/BSc (Hons) Biomedical Sciences is a professional course designed to:

- meet the multidisciplinary needs of the Professional Biomedical Scientists who assist the Medical Profession by providing laboratory-based investigation of human health and diagnosis and management of disease;
- integrate the knowledge base of the various specialist disciplines to further their understanding of the diagnosis and management of a clinical disorder; and
- enable graduates with this degree to either pursue higher studies (MSc, MPhil/PhD) or seek employment locally and internationally.

### **3. General Entry Requirements**

As per General Entry Requirements for admission to the University for undergraduate degrees.

### **4. Programme Requirements**

Credit in five subjects (School Certificate) including three Science subjects. Mathematics will count as a Science subject.

#### **(a) Diploma/BSc (Hons) Biomedical Sciences - Part-Time**

GCE Advanced Level passes (or equivalent) in Chemistry and Mathematics and either Biology or Physics.

#### **(b) BSc (Hons) Biomedical Sciences (Upgrading Programme) - Part-Time**

GCE Advanced Level passes (or equivalent) in two subjects.

Diploma in Medical Laboratory Technology of the University of Mauritius with a minimum final overall of 50% for the Diploma in MLT.

At least two years post-diploma relevant recent work experience.

### **5. Programme Duration - Part Time**

	<b>Normal</b>	<b>Maximum</b>
Diploma in Biomedical Sciences	6 Semesters (3 years)	10 Semesters (5 years)
BSc (Hons) Biomedical Sciences	10 Semesters (5 years)	14 Semesters (7 years)
BSc (Hons) Biomedical Sciences (Upgrading)	4 Semesters (2 years)	6 Semesters (3 years)

## 6. General and Programme Requirements - Special Cases

Not applicable for the upgrading programme (SC302).

7. **Credits per Year:** Minimum 18, subject to regulation 5.

## 8. Minimum Credits Required for Awards

BSc (Hons) Biomedical Sciences:	100
BSc (Hons) Biomedical Sciences (Upgrading):	40

## 9. Specifications

Professional Training in the form of work training in Ministry of Health medical laboratories will form an essential part of the professional programmes and will be undertaken for 12h/week over all semesters (i.e. 180h per semester) on days where lectures/practicals are not scheduled. Details will be worked out with the Ministry of Health and Quality of Life.

## 10. Assessment

### Professional Training

Workplace skills (lab and professional) will be assessed by means of a concise student-prepared logbook and a report in the form of a structured questionnaire, summarising and rating the work training and experience and a list of all experimental techniques used. Both log book and report will be signed by the immediate work supervisor. These will have to be submitted to the MoH training co-ordinator and to the programme co-ordinator at the end of each semester. Students will need to submit a satisfactory log book (Grade S) and obtain a satisfactory report (Grade S) in order to be awarded a Diploma/BSc (Hons) Degree in Biomedical Sciences. Unsatisfactory reports and unsatisfactory logbooks will be awarded Grade U. Professional Training does not carry any credit.

### Assessment of Foundation Courses

The Foundation Courses in Biology and Physics will be based on both written examination and on continuous assessment. Grade S and Grade U will be awarded for these courses.

### Continuous and Written Assessment of Modules

Each module will carry 100 marks and will be assessed yearly as follows (unless otherwise specified):

- **Written Exams**

Each module, except where specified, will be assessed by **a 2 hr written exam paper**. Modules will be examined at the end of the year in which they are taught.

Modules to be assessed singly:

#### Diploma/BSc (Hons) Biomedical Sciences

##### Year 1

BMS 1121; BMS 1231; BMS 1141 and BMS 1221.

Year 2

BMS 2111; BMS 2211; BMS 2221 and BMS 2241.

Year 3

BMS 3231 and BMS 3211.

Year 4

BMS 4111 and BMS 4221.

Year 5

BMS 5111; BMS 5211; BMS 5121 and BMS 5221.

The following pairs of modules will be assessed jointly by **a 3 hr written exam paper:**

Year 1

BMS 1111 and BMS 1211  
BMS 1112 and BMS 1212  
BMS 1131 and BMS 1241

Year 2

BMS 2121 and BMS 2131  
BMS 2141 and BMS 2231

Year 3

BMS 3111 and BMS 3121  
BMS 3131 and BMS 3221

Year 4

BMS 4121 and BMS 4211  
BMS 4131 and BMS 4231

BSc (Hons) Biomedical Sciences (Upgrading)

The following pairs of modules will be assessed jointly by a 3 hr written exam paper:

Year 1

BMS 4131 and BMS 4231  
BMS 5131 and BMS 5231  
BMS 2141 and BMS 2231

Year 2

The following modules will be assessed singly by a 2 hr written exam paper.

BMS 5111; BMS 5221; BMS 5121 and BMS 3221.

- **Laboratory Work and Continuous Assessment**

- *Modules including a Practical Component*

There will be no practical exams. Laboratory work will be assessed on a continuous assessment basis and will carry a weighting of 30% of the total marks awarded for the respective modules involved.

Continuous assessment for the theory part of modules having a practical component may be in the form of assignments and should include at least one class test and will carry a weighting of 10% of total marks for the module.

The continuous assessment for laboratory work should be in the form of marks for practical reports and should include at least one formal Data Interpretation paper given as a class test in order to test skills acquired in Data Interpretation. Students must achieve an overall mark of **60%** in the continuous assessment for the practical component in order to pass modules including a practical component, which is indicated where appropriate.

- *Modules not including a practical component/Specialist Option Modules/Modules including demonstrations*

For the above modules continuous assessment may be in the form of assignments and should include at least one class test and will carry a weighting of up to 30% of total marks for the respective modules.

- **Assessment of Research Projects/Dissertations**

Project/Dissertations will carry a weighting of 10 credits towards degree award. They will be carried out normally in the area of specialisation.

## **11. Restrictions**

A student is required to repeat all modules in which s/he has obtained an E or F or G grade unless otherwise specified by Faculty Board.

**A student who repeats a module must submit new assignment(s), take part in class tests and re-write the examination.**

A student will not be allowed to repeat a module in which s/he has already achieved a D grade or above.

## **12. Modules of Special Nature**

### **Audit Modules**

Students who wish to follow specific module(s) or are advised to do so by the Department may audit same. Such Audit modules are not examinable but will appear in their transcript subject to satisfactory attendance (Grade S).

### 13. List of Modules - Diploma/BSc (Hons) Biomedical Sciences

(L = Lectures; P = Practical; NA = Not Applicable)

\* Module code name BMS is in line with subject benchmark statement for biomedical sciences, of the QAA, UK.

Code	Module Name	L/P	Credits
BMS 1111	Foundation Course in Biology I OR	30/30	-
BMS 1112	Foundation Course in Physics I	30/30	-
BMS 1121	Introduction to Human Anatomy and Physiology	45/0	3
BMS 1131	Basic Cell Biology	30/30	2+1
BMS 1141	Biomedical Techniques I	30/30	2+1
BMS 1211	Foundation Course in Biology II OR	30/30	-
BMS 1212	Foundation Course in Physics II	30/30	-
BMS 1221	Medical Microbiology I	30/30	2+1
BMS 1231	Basic Immunology	45/0	3
BMS 1241	Introduction to Basic and Clinical Biochemistry	30/30	2+1
BMS 2111	Histology and Histopathology I	30/30	2+1
BMS 2121	Haematology I	30/30	2+1
BMS 2131	Blood Group Serology & Transfusion Science I	30/30	2+1
BMS 2141	Biomedical Research Methods and Communication Skills	45/0	3
BMS 2211	Biomedical Techniques II	30/30	2+1
BMS 2221	Advanced Biochemistry	30/30	2+1
BMS 2231	Biostatistics and IT for the Biomedical Scientist	30/30	2+1
BMS 2241	Medical Microbiology II	30/30	2+1
BMS 3111	Histopathology II	30/30	2+1
BMS 3121	Parasitology	30/30	2+1
BMS 3131	Clinical Biochemistry I	30/30	2+1
BMS 3211	Specialist Option I	30/30	2+1
BMS 3221	Medical Physiology and Endocrinology	45/0	3
BMS 3231	Haematology II	30/30	2+1
BMS 3000	Research Dissertation		
BMS 4111	Clinical Biochemistry II	30/30	2+1
BMS 4121	Medical Bacteriology	30/30	2+1
BMS 4131	Molecular Cell Biology	45/0	3
BMS 4211	Medical Virology	30/30	2+1
BMS 4221	Blood Group Serology and Transfusion Science II	30/30	2+1
BMS 4231	Cellular Pathology	45/0	3
BMS 5000	Research Project/Dissertation	NA	10
BMS 5111	Molecular Diagnostics	30/30	3
BMS 5121	Biology of Disease	45/0	3
BMS 5211	Specialist Option II	30/30	3
BMS 5221	Professional Practice for the Biomedical Scientist	45/0	3

#### Modules specific to the BSc (Hons) Biomedical Sciences (Upgrading Programme)

BMS 5131	Recent Developments in Biomedical Sciences I	30/30	3
BMS 5231	Recent Developments in Biomedical Sciences II	30/30	3

#### 14. Programme Plan – Diploma/BSc (Hons) Biomedical Sciences

Professional training will be carried out as indicated above.

##### Semester 1

Code	Module Name
BMS 1111 or BMS 1112	Foundation Course in Biology I or Foundation Course in Physics I
BMS 1121	Introduction to Human Anatomy and Physiology
BMS 1131 BMS 1141	Basic Cell Biology Biomedical Techniques I

##### Semester 3

Code	Module Name
BMS 2111	Histology and Histopathology I
BMS 2121 BMS 2131	Haematology I Blood Group Serology & Transfusion Science I
BMS 2141	Biomedical Research Methods and Communication Skills

##### Semester 5

Code	Module Name
BMS 3111 BMS 3121	Histopathology II Parasitology
BMS 3131 BMS 3000	Clinical Biochemistry I Research Dissertation

##### Semester 7

Code	Module Name
BMS 4111 BMS 4121	Clinical Biochemistry II Medical Bacteriology
BMS 4131	Molecular Cell Biology

##### Semester 9

Code	Module Name
BMS 5111 BMS 5121	Molecular Diagnostics Biology of Disease
BMS 5000	Research Project

##### Semester 2

Code	Module Name
BMS 1211 or BMS 1212	Foundation Course in Biology II or Foundation Course in Physics II
BMS 1221	Medical Microbiology I
BMS 1231 BMS 1241	Basic Immunology Introduction to Basic and Clinical Biochemistry

##### Semester 4

Code	Module Name
BMS 2211	Biomedical Techniques II
BMS 2221 BMS 2231	Advanced Biochemistry Biostatistics and Information Technology for the Biomedical Scientist
BMS 2241	Medical Microbiology II

##### Semester 6

Code	Module Name
BMS 3211 BMS 3221	Specialist Option I Medical Physiology and Endocrinology
BMS 3231 BMS 3000	Haematology II Research Dissertation

##### Semester 8

Code	Module Name
BMS 4211 BMS 4221	Medical Virology Blood Group Serology and Transfusion Science II
BMS 4231	Cellular Pathology

##### Semester 10

Code	Module Name
BMS 5211 BMS 5221	Specialist Option II Professional Practice for the Biomedical Scientist
BMS 5000	Research Project

## 15. Programme Plan - BSc (Hons) Biomedical Sciences - Upgrading Programme

Professional training will be carried out as indicated above.

### Semester 1

Code	Module Name
BMS 4131	Molecular Cell Biology
BMS 5131	Recent Developments in Biomedical Sciences I
BMS 2141	Biomedical Research Methods and Communications Skills

### Semester 2

Code	Module Name
BMS 2231	Biostatistics and Information Technology for the Biomedical Scientist
BMS 4231	Cellular Pathology
BMS 5231	Recent Developments in Biomedical Sciences II

### Semester 3

Code	Module Name
BMS 5000	Research Project
BMS 5111	Molecular Diagnostics
BMS 5121	Biology of Disease

### Semester 4

Code	Module Name
BMS 5000	Research Project
BMS 5221	Professional Practice for the Biomedical Scientist
BMS 3221	Medical Physiology and Endocrinology

## 16. Outline Syllabus

This outline syllabus is not prescriptive and is intended to serve as a guide only.

### **BMS 1111/1211 - FOUNDATION COURSE IN BIOLOGY I/II**

This module will be equivalent in level to Biology A level and will be compulsory for students not holding A levels in Biology. The A level syllabus (core subjects + relevant electives) prevailing at the time the module is being taught will be adopted.

### **BMS 1112/1212 - FOUNDATION COURSE IN PHYSICS I/II**

This module will be equivalent in level to Physics A level and will be compulsory for students not holding A levels in Physics. The A level syllabus (core subjects + relevant electives) prevailing at the time the module is being taught will be adopted.

### **BMS 1121 - INTRODUCTION TO HUMAN ANATOMY AND PHYSIOLOGY**

Introduction to human anatomy: anatomical terminology and topography. The endocrine system. The central and peripheral nervous system. The gastrointestinal system: nutrition and digestion. Structure and function of circulatory system: heart, blood vessels, lymphatics, lymph nodes, spleen. Control of Heart Beat and the Cardiac cycle. Structure and function of kidneys: excretion and osmoregulation. Mechanism and control of breathing. Control of growth and reproduction in man. Support, movement and muscle contraction: major muscle groups, ultrastructure of skeletal muscle, contractile mechanisms, skeleton, hard connective tissue. Integument: structure and function of skin, buccal cavity, teeth. General principles and social aspects of human health and disease: diet, gaseous exchange, exercise, drugs, infectious diseases. Fundamentals of the immune system and immune responses. Immune regulation. Autoimmune diseases.

### **BMS 1131 - BASIC CELL BIOLOGY**

Comparison of prokaryotes and eukaryotes. Cell ultrastructure and function of cellular components. Cell and nuclear division. Genetic control and inheritance. Mendelian genetics. Mutations. Pedigree analysis, Quantitative genetics. Population genetics. Gene structure. Transcription and translation. Post-translational modifications. Applications of genetics: variation, genetic diversity, genetic engineering, mammalian cell biotechnology.

### **BMS 1141 - BIOMEDICAL TECHNIQUES I**

Review of basic concepts in physics which affect biomedical instrumentation: electricity, thermal studies, electromagnetic spectrum, radiation, optics. Instrument calibration. Data collection and display. Selected examples of the following illustrated by block diagrams outlining principles and elements: high-resistance pH meters, polarograph, oxygen electrode assembly, coulometers, spectrophotometer, fluorimeter, flame photometer, atomic absorption, gas-liquid chromatography, NMR, ESR, electrophoresis and radio-immunoassay. General principles of microscopy dark ground illumination, phase contrast, fluorescent microscopy. Use of warm stage, the hot box, object marker, eyepiece and stage micrometer. Principles of Laboratory Practice: Introduction to basic lab techniques and procedures. Units of measurement and accuracy. International system of units. Reporting and conversion of units. Balances and weighing. Physical and chemical units. Pipetting techniques. Centrifuges. Procedures for concentrating solutions. General lab supplies. Reagent preparation, grade and storage. Buffer solution and action.

### **BMS 1221 - MEDICAL MICROBIOLOGY I**

Microbial diversity and classification of microorganisms: diversity of bacteria, fungi, viruses and parasites and their habitats and modes of existence and taxonomy. Impact of microbes on human lives and the environment. Introduction to tools used to study the microbial world. Aseptic technique and sterilisation. Use of apparatus and equipment. Safety in a microbiological laboratory. Disinfection. Structure and morphology of bacteria. Bacterial growth and its environment. Cell culture techniques. Culture media. Preservation of cells in liquid nitrogen. Laminar flow safety hood – principle and use. General techniques in staining, quantification and identification of bacteria and fungi. Introduction to virology: virus structure and size. Replication of the RNA and DNA viruses. Retroviruses, e.g. HIV. Comparison between viruses and bacteria. Bacteriophage. Fundamentals of biotechnology.

### **BMS 1231 - BASIC IMMUNOLOGY**

Fundamentals of the immune system and immune responses. Tissues, cells and molecules of the immune system. Innate and adaptive immunity. Antibodies and antibody responses. Cell-mediated immunity. Antigen processing and presentation. Classical and alternative complement pathways. Major histocompatibility complex (MHC). Immune regulation.

### **BMS 1241 - INTRODUCTION TO BASIC AND CLINICAL BIOCHEMISTRY**

Physico-chemical principles of biochemistry: bonds, ionization and pH, acid/base behaviours, kinetics, bioenergetics. Introduction to the major classes of biomolecules: lipids, amino acids, proteins, carbohydrates, nucleotides and nucleic acids. Introduction to enzymology. Biochemical investigations in clinical diagnosis and treatment. Specimen collection, handling and general quality control procedures: blood, urine, faeces and other tissue and body fluids. Physiological factors affecting the composition of body fluids. Long term biological influences on body fluids.

### **BMS 2111 - HISTOLOGY AND HISTOPATHOLOGY I**

This module provides an introduction to histology and tissue preparation and staining. A detailed study of the structure and ultrastructure of the various types of cells of the body, including nervous tissue. The relationship of structure to function. Microscopic structure and functions of epithelial, connective, muscular and nervous tissues. Normal histology of skin, bone, cartilage, respiratory and cardiovascular system. Detailed study of structure of lung and heart, blood vessels and lymphatics and the lymphomyeloid system. Theory and practice of staining. Fixation. Decalcification. Paraffin wax processing. Manual and automatic tissue processors. Haematoxylin and Eosin staining. Normal histology of the digestive system. Detailed study of stomach, duodenum, ileum, jejunum, colon, rectum, liver and gall bladder and their microscopic examination using stained slides. Laboratory sessions including preparation and microscopic examination of stained slides of various normal tissues.

### **BMS 2121 - HAEMATOLOGY I**

Structure and function and production of blood cells. Bone marrow structure and function. Haematopoiesis and haematopoietic growth factors. Lymphopoiesis (B and T lymphocytes). Collection of blood: venous and capillary. Indications for use of wholeblood or plasma for haematological tests. Cleaning and sterilisation of glasswares and used slides. Different types of anticoagulants including their effect on blood cells morphology. Preparation and staining of blood and blood marrow films. Composition, preparation and uses of Romanowsky stain and different diluting fluids. Haemoglobin estimation by several methods. Packed cells

volume. Techniques for reticulocytes, eosinophil, erythrocytes, leukocyte and platelet counts. Differential leukocytes count. Normal haematological values. Erythrocyte sedimentation rate. Osmotic fragility. Preparation and identification of sickle cells and L.E cells. Use and preparation of Buffy coat. Bleeding time, coagulation time, quick one stage thromboplastin time. Preparation of brain thromboplastin.

### **BMS 2131 - BLOOD GROUP SEROLOGY & TRANSFUSION SCIENCE I**

History of blood transfusion. Functions of the blood transfusion service. Equipment and reagents in BGS: storage, calibration colour-coding, standardisation, preservation. Techniques in BGS: saline, albumin, enzyme. Preparation, storage and use of blood components. Absorption and elution. Reading and scoring of results. Simple genetics in BGS. Basic structure of the immunoglobulin molecule. Properties and different types of immunoglobulins. Antigen-antibody reactions and conditions affecting these. Factors affecting complete and incomplete antibodies. The direct antiglobulin test. Blood donations and blood collection: anticoagulants, preservatives and additives, blood fractionation, blood and blood products and their storage. Changes occurring during storage. Red cell survival. The ABO system: subgroups, inheritance. Preparation and standardization of ABO grouping reagents. The Rhesus system and Rhesus typing: the D antigen. Antibody detection tests. Principles of the agglutination test, complement fixation test, precipitin test and intradermal reaction including an elementary knowledge of the preparation of the antigens involved. Antenatal serology.

### **BMS 2141 - BIOMEDICAL RESEARCH METHODS AND COMMUNICATION SKILLS**

This module will cover the fundamentals of biomedical and clinical research and the basic principles of epidemiological surveys. Research tools in biomedical research will be explored. Ethical considerations in research, more specifically in biomedical and clinical research will also be addressed. An overview of research as a profession will be given. The module will also introduce basic skills in oral and written communication to enable the student to effectively communicate biological information coherently in continuous prose and by means of tables, diagrams, drawings and graphs. Essays, laboratory reports, analytical exercises, poster presentations, oral presentations, abstract writing and journal article reviews. Emphasis will also be placed in this module on analysis, evaluation and interpretation of experimental data and communication skills. Students will be trained to identify and bring together information to give a concise and coherent explanation or description and assess the validity of biological information, experiments, inferences and statements using knowledge gained in biostatistics and information technology. This module will also equip students with a knowledge of project design, experimental planning and project management, application for and sources of funding as well as a critical evaluation of published literature. Problem-based and case studies will form part of this module.

### **BMS 2211 - BIOMEDICAL TECHNIQUES II**

Photometry: nature of light, Beer's law. Study of selected examples of instruments. e.g. pH meters, spectrophotometers and others including their components and standardisation. Light scattering measurements: nephelometry and turbidimetry. Fluorimetry. Principles of immunochemical techniques. Fluorescent antibody methods. Automation in the clinical laboratory. Electrophoresis: principles and types of electrophoresis. Effect of buffer on electrophoretic migration. Electroendosmosis and endosmosis. Paper electrophoresis. Agarose gel electrophoresis. Cellulose acetate electrophoresis. Polyacrylamide gel electrophoresis. Starch gel electrophoresis. Isoelectric focusing. Limitations and errors. Problem solving. Chromatography: fundamental principles and types of chromatography. Uses of chromatography. Separation mechanisms. Ion-exchange chromatography. Steric exclusion chromatography. Adsorption chromatography. Partition chromatography. Affinity chromatography. Gas chromatography. High performance liquid chromatography.

### **BMS 2221 - ADVANCED BIOCHEMISTRY**

Introduction to enzyme catalysis and mechanisms of enzyme action. Enzyme inhibition. Further study of the major classes of biomolecules: lipids, amino acids, proteins, carbohydrates, nucleotides and nucleic acids. Principles of metabolism and metabolic regulation. Bioenergetics. ATP cycle. Carbohydrate metabolism. Lipid metabolism. Amino acid metabolism. Biochemistry of cell death. Biochemical aspects of cell signaling. Free radical in cell and organ function.

**BMS 2231 - BIostatistics and Information Technology for the Biomedical Scientist**

This module will involve a basic study of information technology essential to the biomedical scientist. Use of computer packages. Word processing. Spreadsheets. Accessing the internet. Data processing. Use of on-line retrieval systems (eg MEDLINE, the World-Wide Web). Use of statistical packages. Statistical methods in epidemiological surveys and data analysis. Health statistics. Research project design and management. This module will introduce the principles of statistics required for the biomedical scientist to record, manipulate numerical and non-numerical biological information and in addition select and use appropriate techniques and statistical considerations to carry out experimental activities. Use of biological facts and principles to construct hypotheses and make predictions.

**BMS 2241 - Medical Microbiology II**

Diversity of microbial pathogens: bacteria, fungi, helminthes, parasites and viruses. Their classification, structure and function. Role of the normal microbiota of humans. Modes of transmission of microorganisms. Pathogenesis of microbial diseases. Introduction to medical mycology. Nosocomial infections. Carcinogenic potential of micro-organisms. Isolation and identification of medically important bacteria. Treatment of various specimens for bacteriological examination. Bacterial counts and immunity. Pathogenicity and virulence factors. Endotoxins, exotoxins and invasion strategies. Immune response to infection. Simple serological tests: Widal, Brucella, Well Felix, Paul Bunnell. Common viral diseases. Classification and properties of human viruses. Main activities of clinical diagnostic microbiology laboratories. Laboratory methods for diagnosis of viral infections. Detection of virus and specific classes of antibodies. Transport media, collection and transport of pathological specimens. Principles of treatment of infections: anti-microbial and anti-viral therapy. Sensitivity testing, antibiotic assay, hospital infection control, monitoring of patient care. Point of care testing. Concepts in the epidemiology of infectious diseases. Vaccination and immunisation.

**BMS 3111 - Histopathology II**

Normal histology of the male and female reproductive systems. Detailed study of uterus, cervix, ovary, fallopian tube and testis. Normal histology of the lymphatic system. Detailed study of spleen, lymph nodes, thymus. Normal histology of the endocrine system. Detailed study of pituitary, pancreas, adrenal and thyroid. Normal histology of the urinary system and detailed study of kidney, bladder, ureter, urethra. Microtomy. Preparation and staining of frozen sections. Study of and specific staining techniques to demonstrate cytoplasmic granules in various cell types and tissues including paneth cells, pancreas, pituitary, mast cells, eosinophils, macrophages, etc. Study of and specific staining techniques to demonstrate extracellular substances such as amyloid and fibrin. Study of pigments in tissues. Study and demonstration of glycogen and various types of mucins: PAS stain to demonstrate glycogen and mucin, Bestcarmine stain to demonstrate glycogen specifically, Alcian Blue stain to demonstrate acid mucins. Various types of lipids found in tissue sections. Exfoliative cytology, cytological smears and Papanicolaov stain. Bacteria, fungi and spirochaetes in tissue sections. Gram's, AN and Grocott's stain. Laboratory sessions using various staining techniques to demonstrate the various cells and tissues studied in this module and their microscopic examination.

**BMS 3121 - Parasitology**

A comprehensive knowledge of the methods of examining stools, tissues, blood, body fluid and sputum for identification of parasites. Preservation of parasites. Concentration technique, culture, fixation, staining, clearing and mounting techniques and composition of reagents used in parasitology. Classification, geographical distribution, habitat, morphology, life-cycle, pathogenicity, diagnosis and prophylaxis of selected examples of the following classes of parasites: protozoa, nematodes, trematodes, cestodes, trypanosoma, helminthes. The importance of entomology will be addressed in relation to the role of insects in the transmission of various diseases. The man, saprophytes and parasites occasionally found in man where these are of importance in differential diagnosis. Special techniques, including serological tests will also be covered. The module will introduce students to the fundamentals of molecular parasitology.

**BMS 3131 - Clinical Biochemistry I**

Enzymes as analytical reagents. Principles of diagnostic enzymes with emphasis on specific enzymes. Enzymes in myocardial infarction. Isoenzymes. Metabolic disorders. Disorders of carbohydrate metabolism: diabetes mellitus, glycohaemoglobin, hypoglycaemia. Tolerance tests. Urinary sugars. Ketone bodies. Maldigestion, malabsorption and related disorders involving carbohydrates. Diagnostic tests for lipoprotein

disorders. Biochemical tests for gastric, pancreatic and intestinal function. Clinical presentation and lab diagnosis of gastric, pancreatic and intestinal diseases. Renal function and non-protein nitrogen metabolism. Urinary and faecal pigments. Porphyrins, haemoglobin and related compounds. Cerebrospinal fluid. Determination of glucose in body fluids.

#### **BMS 3211 - SPECIALIST OPTION I**

Students will be required to specialise in any one of the following three topics: (i) Chemical Pathology (Medical/Clinical Biochemistry), or (ii) Virology, or (iii) Bacteriology. After getting a clear understanding of the nature of the problem to be investigated, the student will then be expected to survey and critically evaluate the research previously reported in published literature and present a seminar on the chosen topic. Students will be required to attend seminars presented by other students and contribute in the form of questions/discussion. Students will also be required to prepare an extended review/dissertation of approximately 2000 words including careful reference to current literature. Students will only be expected to study topics, which fall within the expertise of academic staff of the Department or other staff teaching on the course.

#### **BMS 3221 - MEDICAL PHYSIOLOGY AND ENDOCRINOLOGY**

Hormone types, including protein and steroid hormones and control of hormone secretion. Molecular modes of actions of hormones. Function of specific hormones and endocrine organs in health and disease. Hormonal control of calcium homeostasis. Endocrine aspects of reproduction, pregnancy, infertility and menopause. Basic embryology. Hormone replacement therapy. Autoimmune endocrine diseases. Methods of determination of cortisol, aldosterone, 11-deoxycortisol, 17-hydroxyprogesterone, dehydroepiandrosterone sulphate, corticosteroids. Thyroid function. Methods of determination of thyroxine, T3, TBG, T3 uptake, FTI, TSH. Nutrition and health: aspects of nutrition and dietary requirements. Vitamins: molecular modes of action in health and disease. Essential trace elements.

#### **BMS 3231 - HAEMATOLOGY II**

Differential leukocyte count. Identification and function of normal and abnormal leukocytes and erythrocytes. Absolute values and indices. Anaemia: general aspects and investigation. Iron-deficiency anaemia, megaloblastic anaemia, haemolytic anaemia. Aplastic, siderocytic and sideroblastic anaemia. Polycythaemia. Haematological malignancies: including leukaemias. Blood cells cytochemistry and techniques. Haemostasis and thrombosis. Investigation of the haemostatic mechanism. Laboratory control of anticoagulant therapy. Use of radionuclides in haematology. Haemoglobinopathies and thalassaemias and their investigation.

#### **BMS 4111 - CLINICAL BIOCHEMISTRY II**

Electrolytes, blood gases, acid-base balance. Calcium and phosphate metabolism. Liver function and liver function tests. Biochemical aspects of pregnancy. Biochemical basis of various metabolic and other disorders including diabetes mellitus, obesity and cardiovascular disease. Examples of inborn errors and their investigation: familial hypercholesterolaemia and others.

#### **BMS 4121 - MEDICAL BACTERIOLOGY**

Aerobes and anaerobes. Further laboratory techniques in bacteriology. Chemotherapy and antibiosis. Mechanisms of acquired/intrinsic resistance to antimicrobial agents. Examination of specimens from various sources to identify microorganisms responsible for disease. Food bacteriology and water analysis. Food poisoning. Sexually transmitted diseases. Concepts in vaccine development and production.

#### **BMS 4131 - MOLECULAR CELL BIOLOGY**

This module will cover the molecular aspects of cellular structure and function and the study of genetics at the molecular level. General nature of cellular responses in a physiological perspective (e.g. cell division, differentiation, movement, metabolic adaptation) and how these responses are achieved at the molecular level (e.g. DNA synthesis/co-ordinated gene expression, cytoskeletal changes, changes in enzyme activity). The animal cell cycle and control of cell division. Membrane structure and membrane transport. Endocytosis and lysosomes. Interior membranes: endoplasmic reticulum, microbodies. Overview of general principles of signalling molecules and their receptors. Overview of general principles of intracellular signaling. Cell-cell recognition/adhesion and communication. Extracellular matrix. Molecular aspects of gene structure and expression. Gene expression as an example of a cellular response. DNA damage and repair. Molecular

mechanisms and control of: transcription, RNA processing and control, translation, post-translational processing and protein targeting. Secretory pathways and Golgi complex in modification and export. Protein structure/function relationship.

#### **BMS 4211 - MEDICAL VIROLOGY**

Molecular aspects of virology. Medical Virology. AIDS. Viruses and cancer. Laboratory techniques in virology. Preservation of viruses. Virus isolation and identification. Detection of viruses by electron microscopy. Sexually transmitted diseases. Concepts in vaccine development and production. Serology for the detection of viral antigens and antibodies. Specific IgM tests. ELISA test. Haemagglutination. Haemagglutination inhibition test. Complement fixation test. Immunofluorescent test. PAGE (polyacrylamide gel electrophoresis) and Western Blot.

#### **BMS 4221 - BLOOD GROUP SEROLOGY & TRANSFUSION SCIENCE II**

Principles of immunohaematology: identification of blood group antigens and antibodies. Genetics, inheritance, structure and role of red cell antigens. Basis of specificity. Antibody site. Antigen determinants. Comparison of Ig subclasses. The immune response: role of Bursa of Fabricius, thymus. Subsets. Autoreactive T cells. Immune tolerance. Thymic selection: role of apoptosis. Instructive and selective modes of response. Complement system: cascade and alternative pathway.

Other blood group systems: Kell, Kidd, Lewis, MNSS and others. Further studies on antibody detection and identification. Enzymes colloids, use of mono-specific reagents. Compatibility testing: selection of appropriate blood and blood components for transfusion and possible adverse effects. The incompatible X-Match. Haemolytic transfusion reactions. Blood collection: blood component therapy, sexually transmissible diseases. Autologous transfusion. Investigation of autoimmune haemolytic disease. Immune red cell destruction in vivo. Storage of cells at  $-80^{\circ}\text{C}$  and  $-196^{\circ}\text{C}$  and effects on antigens. The cell separator: blood components. Haemolytic disease of the newborn: treatment and prevention. The Human Leukocyte Antigens (HLA) and their role in tissue and organ matching for transplantation. Detection of HLA antibodies in Post-partum sera. Preparation, standardisation and quality control of human and non-human blood grouping reagents. Recent developments in transfusion science: safe blood supply, screening and haemovigilance.

#### **BMS 4231 - CELLULAR PATHOLOGY**

Introduction to pathology. Characteristics of disease. Nomenclature and classification of disease. Genetic and environmental causes of disease. Diagnostic pathology. Sublethal and lethal injury. Toxic and hypoxic injury. Agents causing injury. Apoptosis and necrosis. Abnormal tissue deposits. Acute inflammation: basic mechanisms and sequelae. Chronic inflammation. Healing and repair. Overview of: cardiovascular disease, urinary and reproductive system disease, respiratory disease, gastrointestinal and liver disease. Introduction to the molecular aspects of human diseases.

#### **BMS 5000 - RESEARCH PROJECT**

This will be a lab-based project equivalent to three modules. Students will be expected to select a particular, individual biomedical topic in one of the areas of specialization including Chemical Pathology (Medical/Clinical Biochemistry), Virology, Bacteriology, Blood Group Serology and Transfusion science, Histopathology, Parasitology and Haematology or other, as determined by the Ministry of Health and Quality of Life. The project is aimed at further developing the student's understanding of the principles of biomedical research, providing in depth knowledge and laboratory experience in one research area and further developing analytical, IT, reading and critical writing skills. The student will be required to submit a project report in the prescribed format and not exceeding **8000** words.

#### **BMS 5111 - MOLECULAR DIAGNOSTICS**

This module will explore advanced biomedical techniques and their applications in molecular diagnostics and related areas. Basic principles in cloning will be covered. Introduction to gene manipulation and genetic engineering including ethical aspects. PCR Technology. Immunofluorescence. Flow cytometry. DNA fingerprinting: applications including in forensics. DNA sequencing. Western Blotting. Northern blot. Southern blot. *In situ* hybridization, pre-natal diagnosis, mass screening, monoclonal antibodies as probes, detection of microbial diseases and multifactorial diseases. Advantages and disadvantages of diagnostic kits. Further study of diagnostic enzymes. Tumour markers. This module will include demonstrations.

### **BMS 5121 - BIOLOGY OF DISEASE**

Aspects of medical physiology. Introduction to the molecular aspects of human diseases. This module will involve a study of the pathology of diseases of various systems including cardiovascular, respiratory, blood, endocrine, urinogenital, immune system and gastrointestinal. Aspects of the pathophysiology of infection, developmental pathology and environmental pathology will also be covered.

### **BMS 5131/5231 - RECENT DEVELOPMENTS IN BIOMEDICAL SCIENCES I/II**

This module will involve a critical overview of latest developments in all major areas in the field of biomedical sciences. These include Chemical Pathology (Medical/Clinical Biochemistry), Virology, Bacteriology, Blood Group Serology and Transfusion science, Histopathology, Parasitology and Haematology or other, as determined by the Ministry of Health and Quality of Life. Students will need to choose **one** area of specialization determined by the Ministry of Health and Quality of Life and will be preferably the area in which they majored for the Diploma in Medical Laboratory Technology.

### **BMS 5211 - SPECIALIST OPTION II**

Students will be required to specialize in any one of the following three topics: (i) Blood Group Serology, Transfusion Science & Haematology or (ii) Histopathology or (iii) Parasitology. After getting a clear understanding of the nature of the problem to be investigated, the student will then be expected to survey and critically evaluate the research previously reported in published literature and present a seminar on the chosen topic. Students will be required to attend seminars presented by other students and contribute in the form of questions/discussion. Students will also be required to prepare an extended review/dissertation of approximately **2000 words** including careful reference to current literature. Students will only be expected to study topics which fall within the expertise of academic staff of the Department or other staff teaching on the course.

### **BMS 5221 - PROFESSIONAL PRACTICE FOR THE BIOMEDICAL SCIENTIST**

This module will be complementary with Professional training being undertaken. Good laboratory practice skills, laboratory safety, healthcare economics, management principles and practice, ethics and professionalism, health & safety policies, risk assessment. Professional Practice & Quality Control and Quality Assurance: Method evaluation and quality assurance. Analytical goals. Analytical performance. Clinical relevance of laboratory procedures. The predictive value of laboratory tests. Appropriate and optimal use of the laboratory. Goals and objectives. Test selection for monitoring disease. Characteristics of analytical methods. Setting quality goals for analytical performance. Recommendations for quality goals. Selecting an analytical method. Evaluating an analytical method. Control of pre-analytical variables. Control of analytical quality using stable control materials. Performance characteristics of a control procedure. Levey-Jennings control chart. Shewhart mean and range control charts. Control of analytical quality using patient data. Role of external quality assurance procedures. Identifying sources of analytical errors. Biomedical Skills and Public Health: application of biomedical skills to design and manage screening programmes.

### **CSE 1010e(1) - INTRODUCTION TO INFORMATION TECHNOLOGY**

IT and Computers; Stepping in the Computer; Input and Output Devices; Secondary Storage; Programming; Systems Software; Applications Software; Systems Development; Computer Networks; The Internet Computer Security; Software Utilities; Issues and Trends in IT.