Faculty of Science and Technology

PROGRAM LEVEL Bona Fide Educational Requirements (BFERs)

Faculty of Science and Technology – Cellular and Molecular Biology

BFERs	**Essential Requirements Rationale**
• Knowledge and skills that must be acquired or demonstrated in order for a student to successfully meet the learning objectives of the program. • Do not include references to Policy 517, accommodations or disability.	• Is there only one way in which the required skill/knowledge can be demonstrated? ***If NO***, state "there are many ways the skill/knowledge can be demonstrated". ***If YES***, it is important to state why this is the case and provide evidence that the requirement can only be demonstrated in the way specified. What is the evidence that this requirement is demonstrably necessary?

Knowledge

Demonstrate an understanding of major concepts in the discipline	There are many ways the skill/knowledge can be demonstrated
• Demonstrate a familiarity with evolutionary relationships between organisms at a molecular level • Demonstrate an understanding of structure and function of organisms from the molecular and cellular perspectives • Demonstrate understanding of concepts of metabolic pathways in the formation and use of biomolecules • Integrate classical genetics and molecular genetics with an understanding of the life of the cell • Demonstrate an understanding of the scientific method • Demonstrate an appreciation of current areas of active research in cellular and molecular biology	

Skills

Technical skills	There are many ways the skill/knowledge can be demonstrated
• Demonstrate good laboratory practices, including appropriate safety procedures • Carry out experiments demonstrating understanding of standard methods in cellular and molecular biology • Use computers appropriately to obtain, analyze and present information	
Research and problem solving	There are many ways the skill/knowledge can be demonstrated
• Critically evaluate and assess scientific publications • Demonstrate an appreciation for the power and limitations of current technologies and methods • Apply creativity, knowledge and skills to problem solving • Develop and execute good experimental design methodologies • Correctly interpret and evaluate experimental data and observations	
Communication and literacy	There are many ways the skill/knowledge can be demonstrated
• Present and discuss concepts clearly in verbal and written formats using scientific terminology • Interpret and use symbols, charts, equations, and numerical expressions in the fields of biology and chemistry • Report experiments accurately, clearly and concisely using appropriate formats • Correctly acknowledge sources of information in papers and presentations • Find, evaluate, interpret and use information from a variety of sources	
Teamwork	There are many ways the skill/knowledge can be demonstrated
• Show openness to and respect for the thoughts, opinions and contributions of others in a group	

• Work effectively within a team by sharing information and expertise, and by providing and accepting constructive feedback	
Professionalism	There are many ways the skill/knowledge can be demonstrated
• Apply acquired knowledge and skills to inform personal and professional decision making • Exercise independent thought and self-motivation for life-long learning • Assess, manage and weigh risks and benefits appropriately • Consider societal and ethical implications of scientific decisions	

Rational for BFERS

An advanced level of understanding of concepts in the field ensures broad foundational knowledge and understanding of current issues that informs scientific debate. The ability to apply knowledge and critically problem solve and to communicate results competently is essential as a graduate of a science programme. Scientists are expected to be able to analyze data and results critically and to apply that knowledge to ongoing problems. Science graduates must have the ability to liaise with a variety of audiences and present important concepts with a full understanding of the implications of scientific findings. Because science is a collaborative endeavor, graduates must be able to work effectively both individually and as a member of a team.

PROGRAM LEVEL Bona Fide Educational Requirements (BFERs)

Department ofChemistry

BFERs • Knowledge and skills that must be acquired or demonstrated in order for a student to successfully meet the learning objectives of the program. • Do not include references to Policy 517, accommodations or disability.	**Essential Requirements Rationale** • Is there only one way in which the required skill/knowledge can be demonstrated? ***If NO***, state "there are many ways the skill/knowledge can be demonstrated". ***If YES***, it is important to state why this is the case and provide evidence that the requirement can only be demonstrated in the way specified. What is the evidence that this requirement is demonstrably necessary?
Knowledge	
1. Demonstrate an understanding of the structure and function of molecular systems	This is essential to the understanding of chemistry but there are many ways to complete the requirement
2. Apply scientific thinking to experimental approaches and theoretical evaluations	Science graduates are expected to be able to solve problems using scientific thought processes. There are many ways to complete the requirement.
3. Demonstrate current and relevant discipline-specific knowledge, vocabulary and methodologies	Science graduate should be able to discuss their discipline. There are many ways to complete the requirement
4. Use scientific method to develop hypotheses, analyze scientific observations, reach conclusions supported by evidence	All scientists and science graduates must be able to do this. There are many ways to complete the requirement.
5. Exercise independent thought and self-motivation	Self-motivated employees are likely to be more successful in reaching goals. There are many ways to complete the requirement.
6. Demonstrate professionalism	The ability to act professionally is helpful to any prospective employee. There are many ways to complete the requirement.
7. Exhibit an understanding of and discuss science as a socially embedded endeavour	Science graduates should be able to contribute to society. There are many ways to complete the requirement.
Skills	
8. Communicate effectively: in writing, verbally, and visually	All university students need to be able to do this. There are many ways to complete the requirement.
9. Communicate to a diverse audience	This is increasingly important to the dissemination of scientific thought. There are many ways to complete the requirement.
10. Demonstrate quantitative & qualitative reasoning	This is the essence of what scientists do. There are many ways to complete the requirement.
11. Demonstrate Project Management Skills, including working effectively in project teams	Most employers want someone who works well with others. There are many ways to complete the requirement.
12. Retrieve and critically evaluate information	In an information age this is crucial. There are many ways to complete the requirement.
13. Apply problem-solving skills	This is a helpful skill for all people. There are many ways to complete the

	requirement.
14. Demonstrate technological competency	Knowledge of certain instrumentation and techniques will be expected in the workplace. There are many ways to complete the requirement.
15. Demonstrate laboratory skills	Certain lab skills are expected of a chemist in the workplace. There are many ways to complete the requirement.

Bachelor of Computer Information systems PROGRAM LEVEL Bona Fide Educational Requirements (BFERs)

Department of Computer Science & Information Systems

BFERs • Knowledge and skills that must be acquired or demonstrated in order for a student to successfully meet the learning objectives of the program. • Do not include references to Policy 517, accommodations or disability.	**Essential Requirements Rationale** • Is there only one way in which the required skill/knowledge can be demonstrated? ***If NO***, state "there are many ways the skill/knowledge can be demonstrated". ***If YES***, it is important to state why this is the case and provide evidence that the requirement can only be demonstrated in the way specified. What is the evidence that this requirement is demonstrably necessary?
Knowledge/Skills • Demonstrate knowledge of fundamental computer concepts and basic hardware. • Apply an understanding of hardware architecture and systems software. • Solve problems and develop solutions using a variety of tools, including structured and object-oriented programming languages. • Demonstrate an understanding of best practices in programming, including effective testing strategies. • Understand networks and data communications and be able to administer networks and implement network security policies. • Design and implement database applications to solve business problems. • Design and implement web-based application to solve business problems. • Complete systems analysis tasks using data, process and object modeling. • Develop proposals, deliver clear presentations of alternatives, facilitate the decision making process and make recommendations. • Understand and apply knowledge to web-based global environments, including distributed database, client-server, and e-commerce. • Compare, evaluate and recommend hardware and software alternatives. • Incorporate audit and security measures when designing	There are many ways the skill/knowledge can be demonstrated

applications. • Understand the main functional areas of an organization. • Facilitate and document business processes. • Identify windows of opportunity, research the market potential and evaluate the fit of the opportunity with goals. • Evaluate the financial performance and strategic position of a company. • Assist in financial planning, budgeting and costing decisions. • Understand the concepts involved in strategic analysis from both a technological and business perspective. • Based on a strategic plan, implement an appropriate course of action. • Perform a strategic analysis from both a technological and business perspective and recommend and implement an appropriate course of action. • Understand the project management process, including by assisting in the creation of an effective project plan, and by effectively participating in project activities. • Demonstrate an awareness of the concepts of international business.	
Workplace Skills	
• Demonstrate professional behaviour, including time management skills and self-initiative. • Work effectively in a team environment to achieve goals. • Communicate ideas and information clearly and effectively in formal documents, reports, oral presentations, and other appropriate media. • Apply ethical practices in a business and technology environment. • Adapt to change and modify professional approaches as necessary. • Apply analytical and critical thinking skills to solve problems. • Update skills and knowledge as necessary for on-going career performance through professional development.	There are many ways the skill/knowledge can be demonstrated.

PROGRAM LEVEL Bona Fide Educational Requirements (BFERs)

Department of Environmental Science

BFERs • Knowledge and skills that must be acquired or demonstrated in order for a student to successfully meet the learning objectives of the program. • Do not include references to Policy 517, accommodations or disability.	**Essential Requirements Rationale** • Is there only one way in which the required skill/knowledge can be demonstrated? ***If NO***, state "there are many ways the skill/knowledge can be demonstrated". ***If YES***, it is important to state why this is the case and provide evidence that the requirement can only be demonstrated in the way specified. What is the evidence that this requirement is demonstrably necessary?
Knowledge	
Demonstrate a broad knowledge of the environment and environmental issues.	There are many ways the skill/knowledge can be demonstrated.
Understand the multidisciplinary nature of environmental science.	There are many ways the skill/knowledge can be demonstrated.
Recognize the role and impact of human activities on the environment.	There are many ways the skill/knowledge can be demonstrated.
Identify the need for environmental protection and resource conservation.	There are many ways the skill/knowledge can be demonstrated.
Understand important environmental regulations as well as regulatory frameworks at the national and provincial levels.	There are many ways the skill/knowledge can be demonstrated.
Outline past, current and new approaches to environmental management.	There are many ways the skill/knowledge can be demonstrated.
Explain the influence that market and economic issues have on environmental affairs.	There are many ways the skill/knowledge can be demonstrated.
Understand environmental concerns related to ecosystem integrity, biodiversity, air quality, climate change, waste management, resource management and water management.	There are many ways the skill/knowledge can be demonstrated.
Understand the principles of effective field and laboratory practice, including appropriate safety measures.	There are many ways the skill/knowledge can be demonstrated.
Skills	
Apply environmental science skills to specific areas of environmental practice.	There are many ways the skill/knowledge can be demonstrated.
Stay current on theory and practice pertinent to environmental science.	There are many ways the skill/knowledge can be demonstrated.
Develop innovative solutions and ways to address unique and arising challenges related to environmental science.	There are many ways the skill/knowledge can be demonstrated.
Cultivate creative approaches to using environmental technology and develop new environmental technology applications.	There are many ways the skill/knowledge can be demonstrated.

Demonstrate the principles of effective field and laboratory practice, including appropriate safety measures.	There are many ways the skill/knowledge can be demonstrated.
Carry out relevant and appropriate literature research in the field of environmental science.	There are many ways the skill/knowledge can be demonstrated.
Possess relevant research skills to create data driven inquiries related to environmental science.	There are many ways the skill/knowledge can be demonstrated.
Collect reliable information or data from appropriate sources.	There are many ways the skill/knowledge can be demonstrated.
Act upon environmental concerns related to ecosystem integrity, biodiversity, air quality, climate change, waste management, resource management and water management.	There are many ways the skill/knowledge can be demonstrated.
Use appropriate terminology in conveying environmental science information.	There are many ways the skill/knowledge can be demonstrated.
Express environmental science information accurately, clearly and concisely.	There are many ways the skill/knowledge can be demonstrated.
Integrate relevant data and information from a variety of disciplines and sources in environmental science.	There are many ways the skill/knowledge can be demonstrated.
Interpret and present information in a manner that suits the target audience.	There are many ways the skill/knowledge can be demonstrated.
Use appropriate and respectful questioning and listening skills in interpersonal communications.	There are many ways the skill/knowledge can be demonstrated.
Prepare clear, well-formatted reports and other written communications that are appropriate to the field of environmental science.	There are many ways the skill/knowledge can be demonstrated.
Use contextually appropriate content and format in presentations to address presentation objectives as well as the needs of the target audience.	There are many ways the skill/knowledge can be demonstrated.
Articulate one's position clearly and convincingly to persuade others.	There are many ways the skill/knowledge can be demonstrated.
Provide and receive feedback appropriately.	There are many ways the skill/knowledge can be demonstrated.
Critically evaluate and assess scientific and technical publications in the field of environmental science.	There are many ways the skill/knowledge can be demonstrated.
Apply logical reasoning in the interpretation of information and data and assess relevance of the interpretation to the field of environmental science.	There are many ways the skill/knowledge can be demonstrated.
Make informed decisions in a timely manner and commit to a course of action that considers relevant information, options and implications.	There are many ways the skill/knowledge can be demonstrated.
Exercise independent thought in addressing environmental science issues.	There are many ways the skill/knowledge can be demonstrated.
Act in accordance with acceptable norms and standards in the environment sector.	There are many ways the skill/knowledge can be demonstrated.
Follow through to meet commitments and deadlines.	There are many ways the skill/knowledge can be demonstrated.
Apply quality assurance and scientific rigour in all environmental science related activities.	There are many ways the skill/knowledge can be demonstrated.
Exercise expertise to inform personal and professional decision making.	There are many ways the skill/knowledge can be demonstrated.
Develop systems and procedures to manage work and projects effectively.	There are many ways the skill/knowledge can be demonstrated.
Use appropriate technologies to manage work efficiently.	There are many ways the skill/knowledge can be demonstrated.

Manage multiple priorities through the selection of appropriate time and project management principles.	There are many ways the skill/knowledge can be demonstrated.
Coordinate resources in implementing work project plans to achieve desired results.	There are many ways the skill/knowledge can be demonstrated.
Collaborate effectively with others in groups and teams to achieve common goals.	There are many ways the skill/knowledge can be demonstrated.
Identify individual and/or team competencies that are required to accomplish group project objectives and deliverables.	There are many ways the skill/knowledge can be demonstrated.
Deal effectively with confrontational situations and facilitate solutions to barriers that affect group performance.	There are many ways the skill/knowledge can be demonstrated.
Build consensus and commitment.	There are many ways the skill/knowledge can be demonstrated.
Build effective relationships with stakeholders, demonstrating respect for differences and values.	There are many ways the skill/knowledge can be demonstrated.

PROGRAM LEVEL Bona Fide Educational Requirements (BFERs)

Faculty of Science and Technology – BSc General Science

BFERs • Knowledge and skills that must be acquired or demonstrated in order for a student to successfully meet the learning objectives of the program. • Do not include references to Policy 517, accommodations or disability.	**Essential Requirements Rationale** • Is there only one way in which the required skill/knowledge can be demonstrated? ***If NO***, state "there are many ways the skill/knowledge can be demonstrated". ***If YES***, it is important to state why this is the case and provide evidence that the requirement can only be demonstrated in the way specified. What is the evidence that this requirement is demonstrably necessary?
Knowledge	
Core scientific principles of the science disciplines studied.	There are many ways the skill/knowledge can be demonstrated.
Demonstrate an understanding of scientific thought and the scientific method	There are many ways the skill/knowledge can be demonstrated.
Demonstrate knowledge of data representation in computers and inter-networked systems and their disciplinary impacts	There are many ways the skill/knowledge can be demonstrated.
Use relevant terminology, knowledge and skills to explain/clarify concepts/theories related to chosen disciplines	There are many ways the skill/knowledge can be demonstrated.

Skills

In this chart, "independently" means without direction from another person, and "individually" means without help from another person.

Individually present and discuss concepts clearly in appropriate formats using the terminology of the discipline *In this chart, "independently" or "individually" means without help from another person.*	There are many ways the skill/knowledge can be demonstrated.
Individually comprehend information from a variety of sources	There are many ways the skill/knowledge can be demonstrated.
Individually compose clear and concise reports and scientific articles, using accepted standards for writing in the discipline, and acknowledging sources of information	There are many ways the skill/knowledge can be demonstrated.
Individually communicate knowledge of mathematics, science and/or technology (as appropriate to the chosen disciplines) to a non-specialist audience.	There are many ways the skill/knowledge can be demonstrated.
Individually interpret and evaluate data and observations	There are many ways the skill/knowledge can be demonstrated.
Take responsibility to identify and solve problems, distribute tasks, and cooperatively complete group projects	There are many ways the skill/knowledge can be demonstrated.
Contribute to a team by sharing information, interpretation, and expertise	There are many ways the skill/knowledge can be demonstrated.
Provide and receive feedback appropriately and respectfully	There are many ways the skill/knowledge can be demonstrated.
Critically evaluate and assess scientific studies	There are many ways the skill/knowledge can be demonstrated.
Individually find and interpret specialist literature and other information sources	There are many ways the skill/knowledge can be demonstrated.
Demonstrate an appreciation for the power and limitations of discipline-specific technologies, methods and standards	There are many ways the skill/knowledge can be demonstrated.
Use acquired knowledge and skills to solve problems and make decisions	There are many ways the skill/knowledge can be demonstrated.
Individually apply basic knowledge and skills to solve unfamiliar problems	There are many ways the skill/knowledge can be demonstrated.
Individually assess costs and benefits in decision making	There are many ways the skill/knowledge can be demonstrated.
Independently observe and record experimental data using appropriate methods and technologies	There are many ways the skill/knowledge can be demonstrated.
Independently document and report on experiments following good laboratory practices	There are many ways the skill/knowledge can be demonstrated.
Independently apply appropriate safety practices and procedures while setting up and performing experiments	We are legally obliged to teach students safe experimental practice. We must avoid harm to students in our courses, and work to prevent harm to anyone who might be affected by future experiments carried out by our graduates.

	There are many ways the skill/knowledge can be demonstrated.
Independently use tools and technology effectively to carry out experiments	There are many ways the skill/knowledge can be demonstrated.
Demonstrate fluency in computational thinking	There are many ways the skill/knowledge can be demonstrated.
Demonstrate skills using inter-networked systems	There are many ways the skill/knowledge can be demonstrated.
Integrate knowledge and skills from multiple (mathematics/science/ technology) disciplines in order to solve practical problems	There are many ways the skill/knowledge can be demonstrated.
Utilize a scientific and/or logical approach in analyzing information and performing tasks	There are many ways the skill/knowledge can be demonstrated.
Develop a professional ethic	There are many ways the skill/knowledge can be demonstrated.
Exercise independent thought and initiative in completing projects (ie. set goals and priorities, manage time, determine required information, find required information, carry out tasks, without guidance)	There are many ways the skill/knowledge can be demonstrated.
Discuss societal and ethical implications of scientific decisions	There are many ways the skill/knowledge can be demonstrated.

PROGRAM LEVEL Bona Fide Educational Requirements (BFERs)

Faculty of Science and Technology – Health Science

BFERs	**Essential Requirements Rationale**
• Knowledge and skills that must be acquired or demonstrated in order for a student to successfully meet the learning objectives of the program. • Do not include references to Policy 517, accommodations or disability.	• Is there only one way in which the required skill/knowledge can be demonstrated? ***If NO***, state "there are many ways the skill/knowledge can be demonstrated". ***If YES***, it is important to state why this is the case and provide evidence that the requirement can only be demonstrated in the way specified. What is the evidence that this requirement is demonstrably necessary?

Knowledge

Demonstrate an understanding of major concepts in the discipline • Demonstrate an understanding of evolution as a central theme in biology • Describe the structural and functional relationships within the human organism, including information flow, from the molecular through systemic levels • Describe the role of cause-and-effect in the major mechanisms that maintain homeostasis • Describe the major events in the human life cycle, from conception through growth, development, and aging	There are many ways the skill/knowledge can be demonstrated

Skills

Acquire competent research skills • Demonstrate an understanding of the principles of good laboratory practice, including appropriate safety measures • Demonstrate facility in learning and performing lab techniques • Carry out effective and comprehensive literature research • Demonstrate an understanding of the principles of the scientific method	There are many ways the skill/knowledge can be demonstrated
Apply knowledge and skills to problem solving • Objectively and critically evaluate and assess experimental design and scientific publications • Demonstrate an appreciation for the power and limitations of current technologies and methods • Apply logic and acquired scientific knowledge to solve problems, analyze information, and make predictions • Exercise independent thought • Contribute to the public understanding of science through communication of knowledge and expertise	There are many ways the skill/knowledge can be demonstrated
Demonstrate effective literacy and communication skills • Present and discuss scientific concepts clearly in verbal, visual, and written formats, using appropriate terminology • Interpret and use charts, symbols, equations, and numerical expressions • Use accepted standards in writing clear and concise lab reports and scientific articles, and in acknowledging sources of information • Evaluate, interpret and effectively use information from a variety of sources	There are many ways the skill/knowledge can be demonstrated

Work effectively with others • Provide and receive feedback appropriately • Contribute effectively to writing reports, and preparing and delivering group presentations • Take responsibility to identify and solve problems, distribute tasks, and cooperatively complete a group project	There are many ways the skill/knowledge can be demonstrated

Rational for BFERS

An advanced level of understanding of concepts in the field of study as outlined allows for broad foundational knowledge and understanding of current issues and informs scientific debate. The ability to apply knowledge and critically problem solve and to communicate results competently is essential as a graduate of a science programme. Scientists are expected to be able to analyze data and results critically and to apply that knowledge to ongoing problems. Science graduates must have the ability to liaise with a variety of audiences and present important concepts with a full understanding of the implications of scientific findings. Because science is a collaborative endeavor, graduates must be able to work effectively both individually and as a member of a team.

PROGRAM LEVEL Bona Fide Educational Requirements (BFERs)

Department of Mathematics and Physics

BFERs • Knowledge and skills that must be acquired or demonstrated in order for a student to successfully meet the learning objectives of the program. • Do not include references to Policy 517, accommodations or disability.	**Essential Requirements Rationale** • Is there only one way in which the required skill/knowledge can be demonstrated? ***If NO***, state "there are many ways the skill/knowledge can be demonstrated". ***If YES***, it is important to state why this is the case and provide evidence that the requirement can only be demonstrated in the way specified. What is the evidence that this requirement is demonstrably necessary?
Knowledge	
Demonstrate a conceptual understanding mathematical definitions and physical principles.	There are many ways the skill/knowledge can be demonstrated.
Use relevant terminology, knowledge and skills to explain/clarify concepts/theories related to mathematics and physics.	There are many ways the skill/knowledge can be demonstrated.
Demonstrate knowledge on data interpretation from graphs or tables.	There are many ways the skill/knowledge can be demonstrated.
Skills	
Individual ability to understand word problems, set the solution, and evaluate if the answer makes sense.	There are many ways the skill/knowledge can be demonstrated.
Individual ability to interpret and evaluate data presented in form of graphs and/or tables.	There are many ways the skill/knowledge can be demonstrated.
Individual ability to apply mathematical skills and abilities in order to: - add, subtract, multiply, and divide; - calculate ratios, percentages, and apply algebraic equations; - estimate quantities.	There are many ways the skill/knowledge can be demonstrated.
Individual ability to observe and record experimental data using appropriate methods and technologies.	There are many ways the skill/knowledge can be demonstrated.
Individual ability to apply basic knowledge and skills to solve unfamiliar problems	There are many ways the skill/knowledge can be demonstrated.