PHYSICS DEPARTMENT

I. UNDERGRADUATE PROGRAMME LEARNING OUTCOMES

In the course of Physics Programme, students will develop programme-specific skills. Students will work with critical understanding of both principal and specialist theories, principles and concepts so that on completing the programme they should be able to demonstrate to a large extent the undergraduate attributes outlined below:

A. Knowledge and Understanding

At the end of the programme students should be able to demonstrate knowledge and understanding of:
A1. The core theories and principles of the foundational modules in physics (classical mechanics, computational physics, electricity and magnetism, modern physics, waves and optics, and quantum mechanics) and the ability to integrate competently the knowledge and skills acquired in more advanced courses.
A2. How physics applies to phenomena in the world around them.
A3. The way observation, experiment and theory work together to continue to expand the frontiers of knowledge of the physical universe.

B. Cognitive/Intellectual skills/Application of Knowledge

At the end of the programme students should be able to:
B1. Apply basic mathematical tools commonly used in physics, including elementary probability theory, differential and integral calculus, vector calculus, ordinary differential equations, partial differential equations, Fourier series and transforms, abstract linear algebra, and functions of a complex variable.
B2. Apply the basic laws of physics in the areas of classical mechanics, Newtonian gravitation, special relativity, electromagnetism, geometrical and physical optics, quantum mechanics, thermodynamics and statistical mechanics. 2

B3. *Recognize how and when physics methods and principles can help address problems and then* apply those methods and principles to solve more complex problems in advanced classes.
B4. Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
B5. Critically assess their current state of knowledge and expertise, and develop, implement, and refine a plan to acquire new knowledge for specific scientific goals and in pursuit of new intellectual interests.

B. Communication/ICT/Numeracy/Analytic Techniques/Practical Skills

At the end of the programme students should be able to:

C1. Translate a physical description to a mathematical equation, and conversely, explain the physical meaning of the mathematics.
C2. Apply knowledge of mathematics, physics and modern computing tools in solving physical problems.
C3. Use classic experimental techniques and modern measurement technology, including analog electronics, computer data acquisition, laboratory test equipment, optics, lasers, and detectors.
C4. Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments including distinguishing statistical and systematic errors, propagating errors, in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.
C5. Use the appropriate tools and requisite media literacy to acquire, assess information on a topic, and analyze data and information from diverse sources, and be able to learn new things on one's own.
C6. Convert a physical situation articulated in a text to a mathematical formulation, and then analyze it quantitatively.
C7. Organize and carry out long, complex physics problems, articulate expectations for, and justify reasonableness of solutions.
C8. State strategy/model and assumptions, and demonstrate an awareness of what constitutes sufficient evidence or proof. 3

C9. Complete an experimental, computational or theoretical research project under the guidance of faculty and report on this project in writing and orally to an audience of peers and faculty.

C. General transferable skills

At the end of the programme students should be able to:

D1. Demonstrate proficiency in the collection, analysis and interpretation of data.
D2. Demonstrate the ability to present clear, logical and succinct arguments, including writing style and mathematical language, and speak using professional norms.
D3. Demonstrate the ability to collaborate effectively and participate effectively in multidisciplinary **and/or interdisciplinary teams.**
D4. Demonstrate knowledge of contemporary issues necessary to understand the impact of scientific **solutions in a global and societal context.**
D5. Demonstrate the ability to use scientific skill acquired in constructive community service or engagement that recognizes the potential impact on local and global issues, including environmental impact and sustainability.
D6. Demonstrate the ability to succeed in real-world employment or further professional training, and to engage in life-long learning.
D7. Demonstrate personal and professional integrity in all professional aspects, including acting in an ethical manner with a sense of honesty and responsibility and understanding of intellectual property issues in conducting scientific research.