

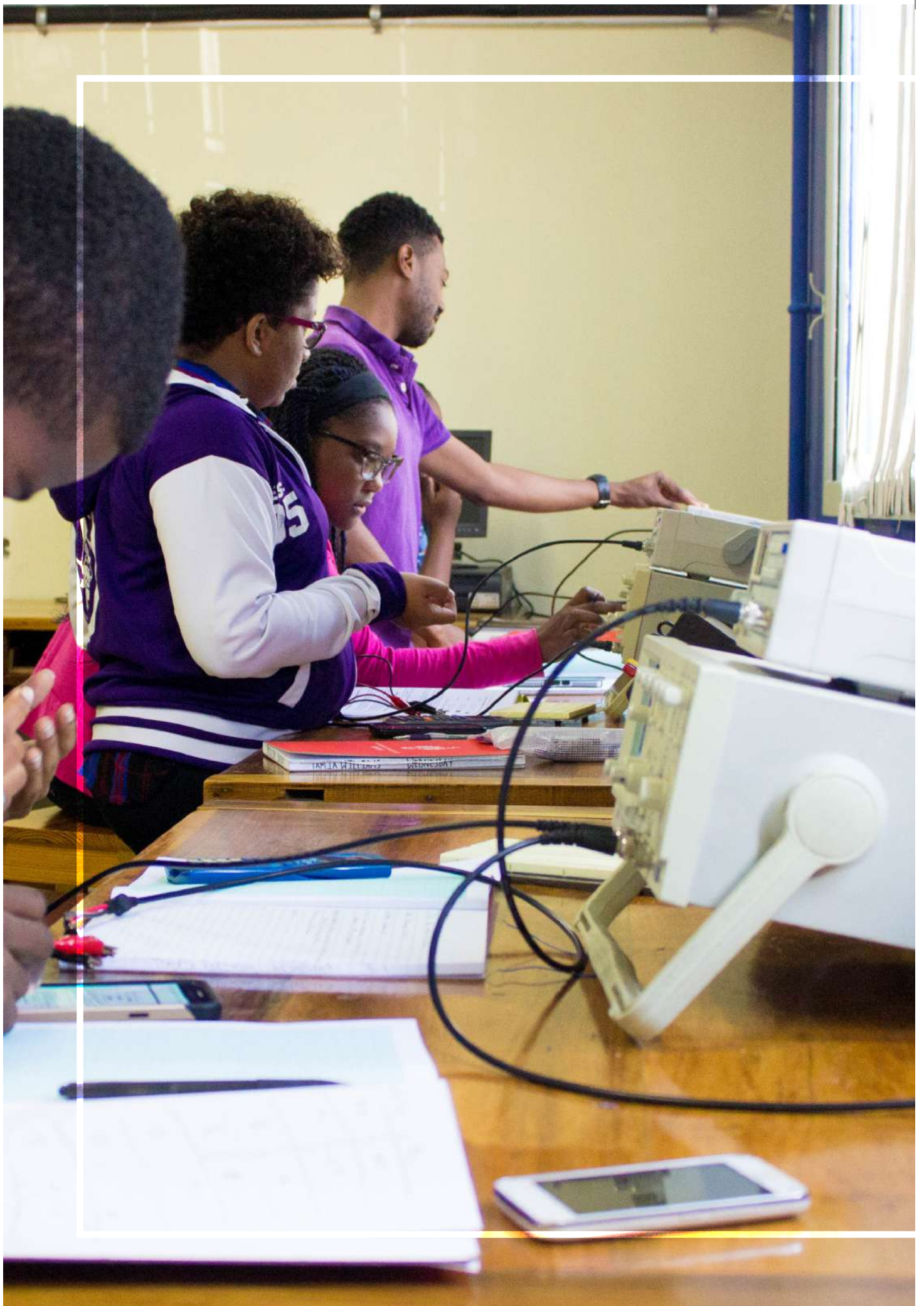


Know Your World

What can I do with a degree in **Physics**

THE UNIVERSITY OF THE WEST INDIES
Mona Campus





INTRODUCTION

Welcome to the Department of Physics. The aim of this guide is to provide a quick look at the undergraduate majors offered in the Department of Physics.

The Department currently offers Bachelor of Science Degrees with majors/minors in:

- Electronics
- Energy and Environmental Physics
- General Physics
- Materials Science
- Medical Physics

The Department also offers a Bachelor of Science in Electronics and Computer Science Degree.

QUESTIONS AND ANSWERS

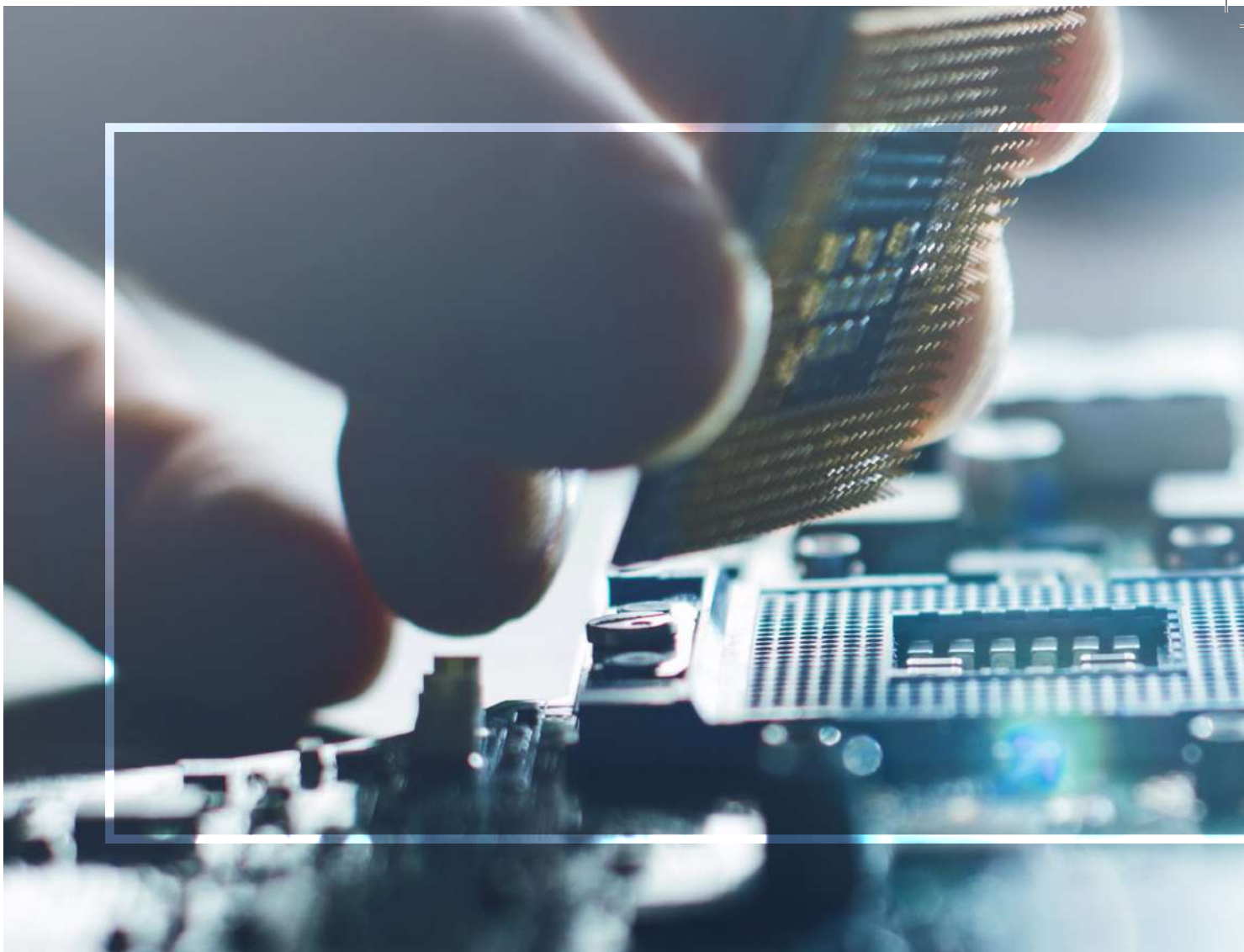
The guide presents a summary of each major and answers the questions:

1. What is the relevance of the major?
2. What does the major involve?
3. What job opportunities would be available?
4. Which organizations could I work with?
5. What research opportunities will I be able to pursue?

ALL YOU NEED TO START THIS JOURNEY

- For the four year programme you will need CSEC Physics **OR** CXC Physics OR GCE O'Level Physics or an equivalent level.
- For the three year programme you will need CAPE Physics (Units I & II) **OR** GCE A-Level Physics **OR** PHYS0411, PHYS0412, PHYS0421, PHYS0422 **OR** CXC Physics/CSEC Physics/GCE O-Level Physics and CAPE Mathematics (Units I & II)/GCE A-Level Mathematics/MATH0100, MATH011

FEEDBACK FROM GRADUATES OF THE DEPARTMENT



ELECTRONICS

Q1. What is the relevance of Electronics?

- Technology now comprises a great deal of our lives.
- Electronics plays a huge role in our lives today by providing us with cell-phones, laptops, telecommunications, highspeed internet, automated surveillance and monitoring systems
- There is no end of application of electronics to real-life applications, and its relevance to modern-day society continues to grow as technology is used to solve all kinds of problems.

Q2. What does the major involve?

- The Electronics major involves the study of electrical circuits and systems.
- A major in Electronics will provide a student with a vast knowledge base that makes them competent in a variety of fields including Telecommunications, Alternative and Renewable Energy Applications.

Students will learn:

- Introduction to Electronics - A look at the structure and function of basic circuit components, and analog and digital concepts.

- Electronics Design – How to design digital circuits, explore the behavior of various signals and systems, interface circuit designs for microcontrollers and much more.

Q3. What job opportunities would be available?

- Job opportunities would include: IT Systems Applications, Systems Installation and Maintenance, and Telecommunications.

Q4. Which organizations could I work with?

- Some local and regional organizations you could work with include: Jamaica Public Service Corporation (JPS Co.), The Jamaica Civil Aviation Authority, Financial Sector (IT Department), Manufacturing Industries.

Q5. What research opportunities will I be able to pursue?

- Some research areas currently being pursued in this area include: Digital Signal Processing, Image Processing, Wireless Communication, and Circuits & Instrumentation.



BSC IN ELECTRONICS AND COMPUTER SCIENCE

Q1. What is the relevance of the BSc in Electronics and Computer Science?

- This programme is geared towards producing professionals that are equally strong in the fields of Computer Science and Electronics.

Q2. What does the major involve?

- The Programme prepares students to develop, maintain and troubleshoot the hardware and software that drive today's advanced electronics systems. These skills will put them at the forefront of technology with opportunities for employment in diverse sectors. such as ICT, Manufacturing, Energy, Media and Financial Services.

Q3. What job opportunities would be available?

- Job opportunities would include: IT Systems Applications, Systems Installation and Maintenance, and Telecommunications.

Q4. Which organizations could I work with?

- Some local and regional organizations you could work with include: Jamaica Public Service Corporation (JPS Co.), The Jamaica Civil Aviation Authority, the Financial Sector (IT Department), Manufacturing Industries.

Q5. What research opportunities will I be able to pursue?

- Some research areas currently being pursued by the UWI Physics Department include: cellphone radiation and health, radionuclides in Jamaican foods, toxic and essential elements in food, soil, biological tissues, and radiation safety and protection.



MATERIALS SCIENCE

Q1. What is the relevance of Materials Science?

- Our lives are enhanced and restricted by our ability to use materials effectively. By materials we mean clothing, our cars, our homes, our appliances, our toys and just about everything.
- Currently, there are more than 300,000 known materials. Much of today's materials science research involves ceramics, metals, glasses, polymers, semiconductors, and biomaterials.
- Today, materials scientists are constantly testing the potential of materials to improve life and advance modern technology.
- Advancements in material science affect medicine, computer science, energy, consumer products, architecture, and transportation.
- Increased efficiency and evolution ultimately result in better products, made with new and improved materials.

Q2. What does the major involve?

- The Materials Science major involves the study of the properties and characteristics of materials.
- A foundation in Materials Science will enable students to satisfy their interest in the Physics of materials. In addition, it links Physics with other Biology as well as gives insight into the fascinating fields of alloy, polymers, ceramics, and other composites and nanotechnology development.

Students will learn:

- Fundamentals of materials – How materials develop their properties as a result of atomic configuration, types of bonds formed

between atoms, types of crystal structures, the mobility of electrons and the movement of atoms in a material under different conditions

- Physics of crystalline and non-crystalline materials – structure of materials in this form and the properties such as electrical, magnetic, optical, mechanical and thermal.
- Thermodynamics and kinetics of materials – Kinetics and equilibrium thermodynamics are combined to explain activated processes.

Q3. What job opportunities would be available?

Job opportunities would include: manufacturing industry (product/process development), patent examination, forensic science, quality assurance, electronics development among others.

Q4. Which organizations could I work with?

Some local and regional organizations you could work with include: Bureau of Standards Jamaica, forensic science laboratories, petroleum companies, plastic manufacturing (product development), bauxite industry

Q5. What research opportunities will I be able to pursue?

Some research areas currently being pursued in the UWI Physics Department include: development of glasses and bio-glass research for applications in telecommunications; fire and materials; development of solar cells; and semiconductor research.



ENERGY AND ENVIRONMENTAL PHYSICS

Q1. What is the relevance of the major?

- This major aims to equip and enhance critically thinking students to address shared global and regional challenges.
- Topics will explore the transition to carbon-free and climate-sensitive nations.
- As a result of increased carbon dioxide emissions, extreme weather conditions are becoming a growing source of concern in the Caribbean.
- Climatic and environmental applications within the field of renewable energy are essential for understanding the current and future trends in energy production.
- Nations investing in renewables will have a net decrease in carbon emissions and this will be beneficial from both environmental and economic perspectives.

Q2. What does the major involve?

- Knowledge of the physical laws governing the environment and energy.
- Explores major environmental variables and fluid dynamics principles.
- Practical use of environmental information particularly as it relates to alternative energy sources.
- Propel students into the burgeoning field of renewable energy with a solid foundation in applied and theoretical physics.

- Sound understanding of the major renewable energy systems, with a particular focus on the Caribbean region. Equilibrium thermodynamics are combined to explain activated processes, phase diagrams, nucleation and growth, and microstructural formation.

Q3. What job opportunities would be available?

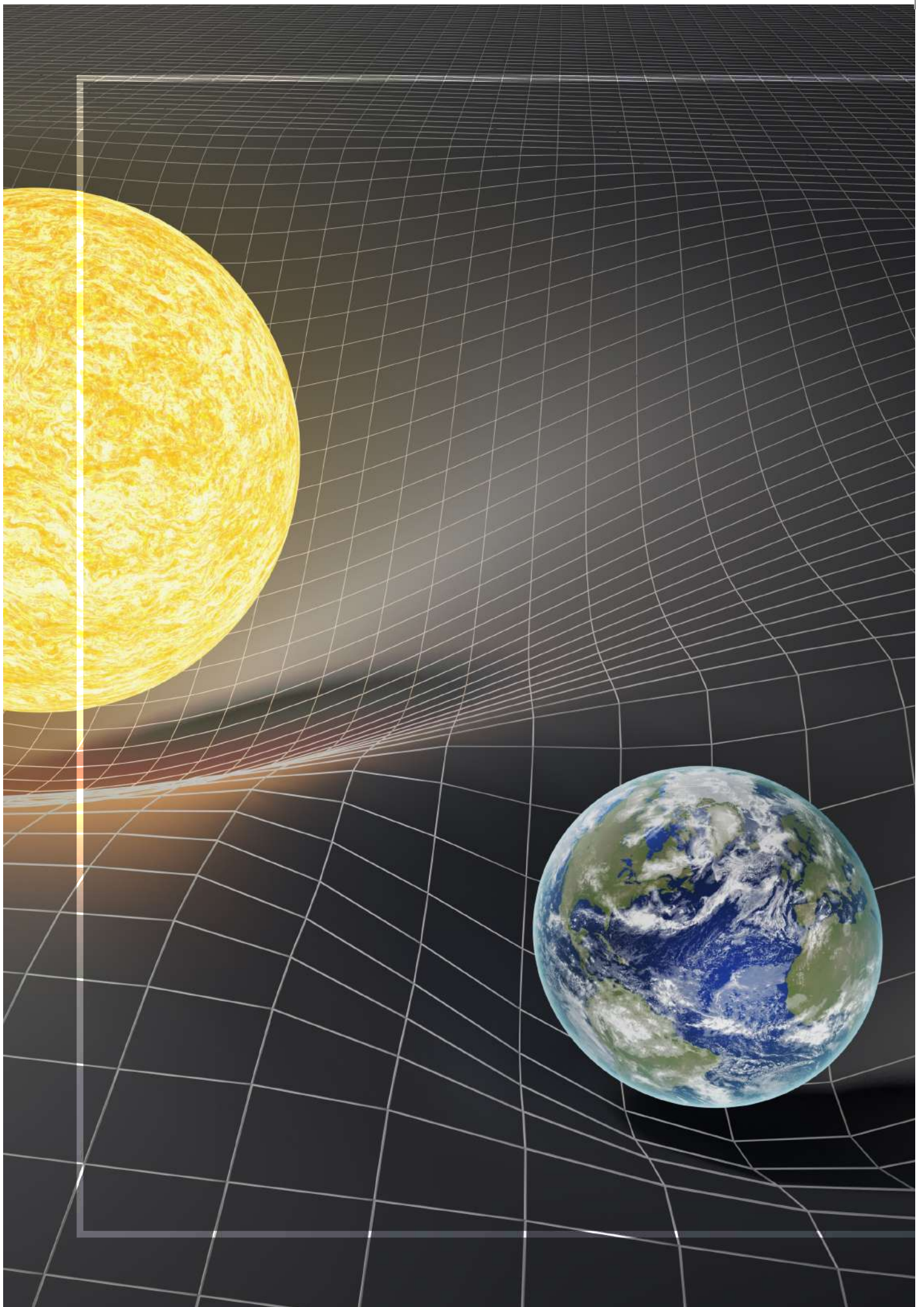
- Job opportunities include: climate modelling/research; environmental consulting; renewable energy auditing; renewable energy systems; smart grid development; energy systems modelling; energy project managing.

Q4. Which organizations could I work with?

- Some local and international sectors include: Jamaica Public Service Corporation (JPS Co.) and other regional utility companies; teaching and research institutions; environmental consultancies; global climate modelling centres; energy statistics bureau.

Q5. What research opportunities will I be able to pursue?

- Research opportunities at UWI include: climate modelling; smart grid development; energy systems analysis; optimization of renewable energy systems; energy integration and micro-grid technologies; energy resource modelling; investigation of major climate systems and parameters.



GENERAL PHYSICS

Q1. What is the relevance of General Physics?

- General Physics includes, instead of contains all the theory of the other majors and provides students with the foundations of Physics. General Physics also provides students with an in-depth look at Classical and Theoretical Physics, from the Theory of Mechanics to Quantum Theory.
- Theories taught under General Physics, form the foundation of all applied sciences.
- General Physics theories have given rise to modern-day applications in Fibre Optics, Astronomy and Cosmology, Nuclear Energy, Materials Science, Nanotechnology, GPS
- Quantum Mechanics and Nuclear Physics— How matter , force and energy behave and interact at the quantum level.
- Modern Physics— A look at general relativity and how mass, length and time behave in space.
- Astronomy and Cosmology—A look at celestial mechanics, the structure of heavenly bodies within the Universe.

Q2. What does the major involve?

- The General Physics major provides students with a familiarity for all the theoretical aspects of Physics that prepare them for specializations in any field of Physics.
- The major also equips students with a solid grasp of the applications of Mathematics in solving physical real-world problems.

Students will learn:

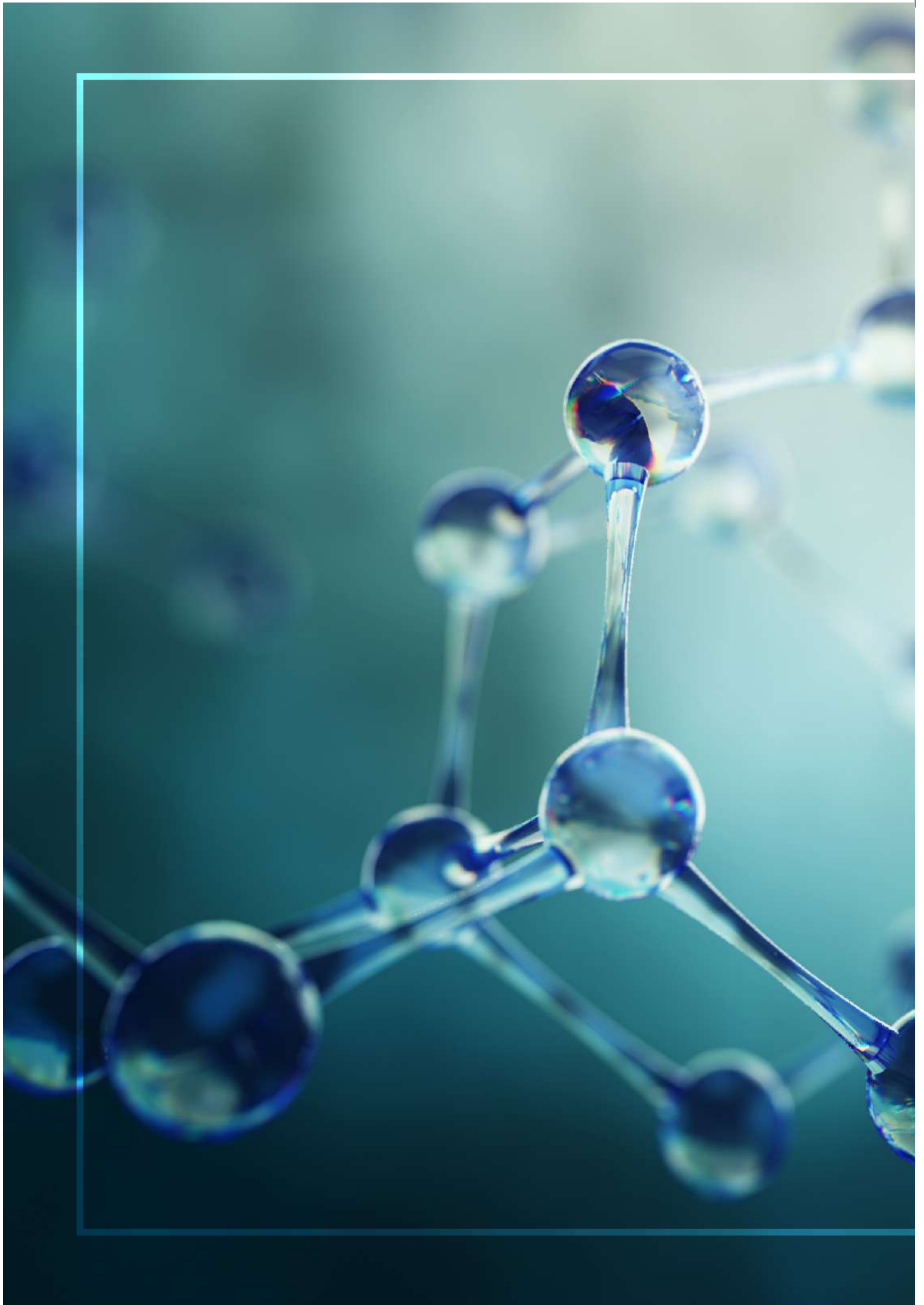
- Electromagnetism and Optics — How electricity and magnetism behave in matter, studying the electromagnetic nature of light. How electromagnetism occurs in dielectrics and different conducting media.

Q3. What job opportunities would be available?

- Possible jobs could include: Having a General Physics degree qualifies you for work in a variety of fields, depending on the courses you choose to do.
- Aeronautical Scientist, Climatology, Meteorology, Environmental Scientist, Geophysicist, Nuclear Scientist.

Q4. Which organizations could I work with?

- Some local and regional organizations you could work with include: Bureau of Standards Jamaica, forensic science laboratories, petroleum industries, plastic manufacturing (product development), Bauxite industry



MEDICAL PHYSICS

Q1. What is the relevance of Medical Physics?

- A specialized branch of applied Physics concerned with the application of Physics to the diagnosis and treatment of human disease.
- It is associated with medical electronics, bioengineering, and health physics.

Q2. What does the major involve?

- The major covers concepts such as physics of the human body, radiotherapy, use of radiation for applications such as Medicine and analyzing different substances, nuclear medicine, ultrasound and magnetic resonance imaging, health physics.

Students will learn:

- Application of ionizing radiation (e.g. Xray) and non-ionizing radiation (e.g. MRI and Ultrasound) in medical diagnostics and therapy.
- The interaction between electromagnetic radiation emitted from wireless devices and biological systems (e.g. the human body)
- Physics of the Human Body - An introduction to human anatomy, musculoskeletal and cardiovascular systems, electrical conduction system of the nerves, brain and heart.

- Biomedical Optics and Biomechanics - A look at image formation, optics, biomechanics, optical microscopy and spectroscopy.
- Practices in Medical Physics - Laboratory-based course that gives students hands-on experience with biophysical testing and instrumentation.

Q3. What job opportunities would be available?

- Possible jobs could include: Having a General Physics degree qualifies you for work in a variety of fields, depending on the courses you choose to do.
- Clinical Medical Physicist, Radiation Safety Officer, Researcher, Nuclear Scientist, Teacher

Q4. Which organizations could I work with?

- Hospitals, teaching and research institutions, medical diagnostic labs, radiotherapy facilities.

Q5. What research opportunities will I be able to pursue?

- Some research areas currently being pursued by the UWI Physics Department include: cellphone radiation and health, radionuclides in Jamaican foods, toxic and essential elements in food, soil, biological tissues, and radiation safety and protection.



FEEDBACK FROM GRADUATES OF THE DEPARTMENT

What do graduates have to say about this major?

I majored in General Physics with a minor in Mathematics at UWI.

Having a General Physics degree enabled me to learn as much about the different subfields of Physics. I learnt how extensive the application of Physics can be. During my time as an undergraduate, I was able to conduct student research in both Materials Science and Climate Studies.

With my BSc. In General Physics, I was able to go on to do a Masters in Climate Studies at the UWI. Now, I am currently pursuing a PhD in Atmospheric Science at university abroad.

Jhordanne Jones

Currently, I am pursuing a Master of Science in Mechanical Engineering, concentrating in Material Science, at Northeastern University in Boston Massachusetts. My thesis will seek to characterize the growth of metallic nano-rods on low temperature substrates.

Also, I work as a process engineer intern within the medical device industry. Essentially, my job entails the formulation of a manufacturing process which ensures that design specifications of the product are met.

Adrienne Williams



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