Science for Development at Honours Level

Prof. Carolina Odman\textsuperscript{1,2}, Prof. Chris Arendse\textsuperscript{2}

\textsuperscript{1}Inter-University Institute for Data Intensive Astronomy
\textsuperscript{2}University of the Western Cape
On January 30-31 2020, the first Science 4 Development workshop was jointly hosted by the International Science Council’s (ISC) Regional Office for Africa (ROA) and the International Astronomical Union’s (IAU) Office of Astronomy for Development (OAD), both supported by the Department of Science and Innovation and the National Research Foundation.

Proposal for a Science for Development course at Honours level at the University of the Western Cape.
BSc Hons Physical Science at UWC

2004 NRF names Materials and Applied Physics a Research Niche Area at UWC

2004 MANUS/MatSci: UWC, Uni Zululand, iThemba LABS

2007 First Lecturer in Astrophysics Dr. Catherine Cress

2010 First Research Chair in Astrophysics

2012 SKA hosting awarded to South Africa & Australia

2013 First Research Chair in Nuclear Physics
UWC Physics in 2021

- 8 Professors
- 4 Research Chairs
- 10 Lecturers & Senior lecturers

Materials Science and Solid State Physics
Applied and Fundamental Nuclear Physics
Nanotechnology
Physics Education
Astrophysics and Cosmology
UWC Graduate Attributes
Scholarship: A critical attitude towards knowledge:
Critical citizenship and the social good: A relationship and interaction with local and
global communities and the environment:
Lifelong learning: An attitude or stance towards themselves:

Inquiry-focused and knowledgeable
Critically and relevantly literate
Autonomous and collaborative
Ethically, Environmentally and Socially Aware and Active
Skilled Communicators
Interpersonal flexibility and confidence to engage across difference

Benchmark Statement for Physics in South Africa
public training programmes should be of relevance to its needs, lead to employment,
prepare for citizenship
over-emphasis on passing examinations as opposed to meaningful learning. Graduates
often lack the skill to integrate knowledge
disciplinary expertise is only one of a much larger set of components that determine
whether an individual will operate successfully on entering a profession
New BSc Hons Physical Science at UWC

Core Modules aimed at consolidating the foundations: Terms 1 & 2

Classical Mechanics
Quantum Mechanics
Mathematical methods for Physics
Statistical Physics and Thermodynamics
Electromagnetism
Computational Physics
Science for Development

Intro and Specialisation Modules aimed at tasting research: Terms 3 & 4

Solid State Physics
Nuclear and Particle Physics
Astronomy and Astrophysics
Physics Education

Research Module

Research Project
1. Introduction to development
   Definitions, Organisations, SDGs, Goals, targets and indicators
2. Science in development topics
   Environment and Energy
   People and Health
   Infrastructure, Governance and Economy
3. Data week
   Where to find development data?
   GIS and Earth Observation
   Open Science, FAIR principles, reproducibility
4. Beyond data
   Reading scientific papers
   Mathematical ideas in Economics and Social Science
   Mathematics of democracy
5. From Indicators to modelling and prediction
   PDEs and applications (e.g. climate)
   Stochastic Processes (e.g. traffic, cybersecurity)
   Time series analysis (e.g. econometrics, health)
6. Applied Statistics
   Evidence
   RCTs (e.g. in health and economics)
   Correlation and Causality
7. Machine Learning
   ML in Health
   ML in Language
   ML and People (e.g. Social Media)
8. Science Communication
   Introduction
   Language and Science
   Stakeholders of science
   Multi-disciplinarity
9. Science and Policy
   How it works
   IKS
   Sensitive topics (e.g. Religion)
10. Putting it all together
    Ethics
    Lateral thinking
    Scientific Intuition
At the end of the course, we want the students to be able to look out the window and see that it is the laminar air flow that makes the condensation above Table Mountain create lenticular clouds, then look at the traffic and see that one more lane may not help congestion as it doesn’t affect the viscosity of traffic as a fluid, then look at the side of the road and see the importance of green corridors in networking habitats for the maintenance of biodiversity in a built environment, then see that the proximity of housing in a township can be interpreted as a mean free path for pathogen propagation and then see the phase of the moon and Venus and visualize the ecliptic plane in 3D, then smell the ocean and think of how ocean spray contributes or not to the acidity of the top soil, etc. etc. That kind of broad scientific thinking is what the Science for Development course aims to achieve.

Thank you!

Contact: codman@uwc.ac.za
cjarendse@uwc.ac.za