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Space science curriculum design and research at NC A&T state university

Abebe Kebede*, Jyoti Nair and Galen Smith
NC A&T State University, 1601 East Market Street, Greensboro, North Carolina NC 27411, USA

Abstract. Recently, North Carolina Agricultural and Technical State University (NCAT) won one of the largest awards from NASA to develop curriculum and research capability in space science in partnership with NASA centres, National Institute of Aerospace, the North Carolina Space Grant, the American Astronomical Society and a number of institutions affiliated with NASA. The plan is to develop curricula and research platforms that prepare science, technology, engineering and mathematics (STEM) students to be employed by NASA. The research programme initially focuses on the study of space and atmospheric physics, and the development of a general capability in atmospheric/space science.

Keywords: Space science courses – curriculum development – capacity building – outreach – NASA

1. Introduction

The dream of exploring outer space is nature's gift to humanity. Beyond cultures, and language barriers people are fascinated by the beauty and complexity of the skies above them. Space travel and exploration inspires people to think beyond their immediate locality. They travel through space using their own imagination as their vehicle, always asking the most fundamental question of humanity, "are we alone?" Because of advances in space technology and the development of space vehicles the answers to this and related questions are slowly emerging. The need for reducing the weight of space vehicles leads to the design of small but high capacity computers. The development of computational

*email: gutaye@ncat.edu; abkebede@gmail.com

Table 1. The space science curriculum and NASA missions.

Programme of study	Space science content	Comments	NASA mission component
Physics-B.S.	35 credits of new space science material will be added the first year, another 9 credits the second year	Specialization tracks will have high admission standards, a research thesis, and summer experience.	Response to the NASA mission to inspire the next generation of explorers
Engineering Physics-B.S.	12 credits of new space science material will be added under maths & science, and 6 capstone design credits	The curriculum is being modified to achieve ABET/EAC accreditation under existing engineering science criteria. ABET guidelines require 1 year of maths and basic sciences and 1.5 years of engineering sciences and design.	–do–
Professional Physics -M.S.	The degree will include Upper-level Space sciences content: 15 credits	Programme requires 24 credits of Physics of which 9 must be from SP-SC MS specialization courses, – thesis required	Response to NASA missions: Sun-earth connection, solar system exploration, astronomical search for origins, structure and evolution of the universe
Applied Physics -M.S.	This degree will include upper-level space sciences content and engineering science content. This is expected to lead to PhD programmes in mechanical and electrical engineering	Programme requires 18 credits of physics of which 6 must be from SP-SC MS specialization and 6 of engineering science – thesis required	–do–

science can be traced to the need to calculate the orbit of man-made satellites. The study of human physiology in space leads to the discovery and development of new medicines for existing and potentially devastating diseases. However, the continued decline of the number of students majoring in STEM fields is becoming a threat to sustain the pace of human progress. A recent[1] workshop sponsored by the National Science foundation concluded that a lack of qualified and diverse workforce threatens the economic strength,

[1]Workshop on Preparing the STEM Workforce of the 21st Centuary (http://www.seas.gwu.edu/ stem/report.htm)

national security, and well-being of U.S. citizens. Our response to address the need for a qualified workforce includes the development of a road map for students through course offerings, and strong outreach programmes that include improved two-way partnerships with K12 community colleges, integrated student training that encompasses strong curriculum, hands-on and research experience. The mission and goals of this curriculum should be focussed on training the needed workforce.

2. The space science curriculum at NCAT

The general areas for which courses are being developed or enhanced, include introductory and advanced astronomy, astrophysics, cosmology and space science. The courses are chosen based on the students employment prospects. For example a student majoring in technology may take two or more courses in space technology. The student in agriculture may choose to take courses that reflect the benefit of space technology to agriculture. To illustrate these points we will look at the space science related activities within the physics programme at NCAT. We developed a strong collaboration with departments in engineering, technology and earth systems to ensure the students have access to a rich set of elective courses in aerospace, digital communication, remote sensing and electronics. The space science programme is based in the Department of Physics. Currently the department offers bachelor's and master's degrees in several subjects including, secondary education, engineering, physics, environmental geophysics and space science. The space science curriculum and NASA missions are shown in table 1.

References

Space science curriculum (sirius-c.ncat.edu/spacecurriculum/index.html)
Space technology curriculum (sirius-c.ncat.edu/PRESS/spacetech/index.html)