



AIMS CURRICULUM

INTRODUCTION

The mission of AIMS is to provide an excellent, advanced education to talented African students in order to develop independent thinkers, researchers and problem solvers who will contribute to Africa's scientific development. One of the key features of studying at AIMS is the highly enriching experience of students and lecturers eating and living together within a twenty four hour learning environment, and the consequent friendly and informal atmosphere, coupled with active and meaningful participation during the teaching sessions.

Each year AIMS take approximately forty students from about sixteen African countries with a complete mix of race, religion and gender. The academic year starts in August and end in June. By far the most common response to the question "What does your year at AIMS really mean to you?" is "the to meet, and live with, people from all over the African continent, and to meet, and get to know, the lecturers as individuals". We should not underestimate the value of this feeling that AIMS is an institute in which we are all learning and teaching together with the common goal of sharing our knowledge and experiences with each other.

TEACHING AND LEARNING STRATEGY

The teaching at AIMS is based on the principle of learning and understanding, rather than simply listening and writing, during classes; and on creating an atmosphere of increasing knowledge through small group discussions. This is achieved by formulating conjectures and assessing the evidence for them, and sometimes going down wrong paths and learning from these mistakes. The essential features of the classes at AIMS are that, in contrast to formal lecture courses, they are highly interactive; and time is allocated for class discussions. In this way, AIMS provides a climate of interactive teaching, where students are encouraged to learn together in a journey of questioning and discovery, and where lecturers respond to the needs of the class rather than to a pre-determined syllabus. AIMS teaching philosophy is to promote critical and creative thinking; to experience the excitement of learning from true understanding; and to avoid rote learning directed only towards assessment.

Students are helped and encouraged to develop their own ideas, both during and outside formal class times, and to absorb new ideas instead of being presented with the finished product. The teaching at AIMS is done through self-contained (modular) courses in which the advertised content is used as a guide, and lecturers are encouraged, and expected, to adapt daily to meet the needs of the students.

The challenge for the lecturers is to create a sense of enquiry in all students who come from very diverse backgrounds. Each student should develop, and succeed, from their own particular starting point. AIMS consider the journey undertaken to reach a conclusion to be as important as the conclusion itself.

LANGUAGE AND COMMUNICATION

All lectures are presented in English Language. AIMS regard communication skills as a crucial part of the training both in respect of the spoken language and the written language. As English is not the first language of many of the students, English Language classes, taught by the AIMS English Teacher, at various levels, are available and held regularly, particularly at the beginning of the academic year.

Each AIMS student is required to give two, fifteen-minute presentations on any mathematical topic, to the whole class during the year, with the help and advice of one of the lecturers. Sessions on scientific writing are also held – particularly during the third semester (essay phase).

THE AIMS MASTER'S IN MATHEMATICAL SCIENCES

Academics from the Universities of Cape Coast, Kwame Nkrumah University of Science and Technology and University of Ghana were closely involved in developing the AIMS course, ensuring it is well integrated with local postgraduate courses and research opportunities. The AIMS teaching and learning model is unique and emphasises the principles of creativity, innovation and flexibility. The course provides both a broad overview and in depth study of cutting-edge scientific topics and strong mathematical and computing research skills. The course is unique, offering students exposure to a range of topics, and allowing them to make an informed choice as to their future specialisation.

Courses are generally 3 weeks long. They are self-contained and very demanding. Each course consists of 30 hours contact time (10 per week). Additional tutorials and special lectures are often held in the evenings when students are completing their assignments. The curriculum runs over 3 phases over two semesters (described below):

First phase: Skills courses

Skills courses are designed to:

- Provide introductory and foundational material to the students;
- Train students in problem solving using a wide range of mathematical and computing methods;
- Provide a working knowledge of mathematics, physics and selected topics.



They are structured to achieve pre-defined outcomes, with little flexibility in their content. All courses are compulsory.

Second phase: Review courses

Review courses are fundamentally different and a wide range of topics are offered, which are more flexibly designed. Students are required to complete 11 courses selected from the 18 review courses offered (with at most two chosen from any three - week block). Choices offered are balanced as far as possible with respect to focus on mathematics, physics, computer science and interdisciplinary topics, such as biomathematics, financial mathematics, actuarial science and more. Students can select from the list of courses in consultation with the Academic Director who ensures coherence.

AIMS' understanding of the term Review Course is that they provide an overview and in depth study of topics from a major field of modern scientific work in the mathematical sciences and its applications. These are often relevant to African development.

Third phase: Research phase

During the eight and a half week long research phase students work on a research topic with a supervisor from a Ghanaian and/or international university. Students are not expected to do original work to achieve a passing grade, but the criterion for an outstanding research is broadly that it constitutes an original approach to the topic and may lead to publication, or form an outstanding introduction to the field useful to other students entering the area.

During this phase, targeted communication skills and computing classes may continue, at the supervisor's discretion. The purpose of the essay is:

- to give students the opportunity to work with an expert supervisor on a non-trivial project;
- to go through the process of independently reviewing, understanding and explaining scientific or mathematical material;
- to perform experiments — on a computer or otherwise — and report the results
- to write a scientific report.



ASSESSMENT AND EVALUATION

The academic assessment of students for the Master's in Mathematical Sciences is completed in the following ways:

- Continuous assessment through written assignments, tutorials, short test and presentations set by lecturers;
- The mark awarded for a given course is determined by the lecturer concerned in consultation with the tutors involved;
- During the skill phase, group work and individual growth are emphasised in a less formal context and for these courses, the mark obtained is a Good Pass (i.e. 70% and above) or a fail;
- During the review and research phases, marks obtained are classified as follows:
 1. Distinction: 85–100%
 2. Good Pass: 70–84%
 3. Pass: 60–69%
 4. Fail: less than 60%
- Each of the courses in the review phase is 3 credits, while the research project is 6 credits.
- The student is required to orally defend a written research essay to a panel of examiners. This panel includes the AIMS Director, the Academic Director, the Supervisor, Tutors and External Examiners;
- To obtain the AIMS Master's in Mathematical Sciences with distinction requires:
 - a Good Pass for the skill courses,
 - at least 6 Distinctions for the review phase,
 - a Distinction for the essay phase.
- In extraordinary circumstances where the quality of the essay is highly exceptional, fewer review distinctions may be required when awarding the degree with distinction.
- In order to successfully complete the AIMS MSc degree, a pass is required for each of the phases.
- External evaluation of each student's performance and all aspects of the programme is conducted by six senior academics representing the different mathematical sciences disciplines (including Physics). The outcome of the integrated assessment reported to each university for those students registered in their science faculties. The assessment and evaluation scheme



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INTEGRATED ASSESSMENT

A portfolio for each student is compiled, containing the grades achieved for each of the courses attended, observations on their presentations, all their assignments, completed exercises and their final essay. External evaluation of each student's performance and all aspects of the program is conducted by six senior academics representing the different mathematical sciences disciplines (including Physics).

The outcome of the integrated assessment is reported to each university for those students registered in their science faculties.

TEACHING ASSISTANTS

AIMS appoints between six and eight advanced postgraduate students as teaching assistants. Briefly, the duties of the teaching assistants are to provide assistance to the Academic Director and lecturers in matters concerning the academic programme and the assessment of students. Teaching assistants attend the lecture courses; arrange additional tutorials; assist with the marking of assignments; and assist the students with computing and essay writing. Teaching assistants also provide useful information to assist the Academic Manager and lecturers when writing references for the students. Teaching assistants are recruited via an announcement through AIMS' mailing lists. Academic achievement, ability to speak relevant languages, and familiarity with the AIMS teaching programme are criteria considered for selection.