

# **SUBJECT REVIEW REPORT**

**DEPARTMENT OF  
MATHEMATICAL SCIENCES**



**FACULTY OF APPLIED SCIENCES  
WAYAMBA UNIVERSITY OF SRI LANKA**

24<sup>th</sup> to 26<sup>th</sup> May 2006

**Review Team :**

Dr. U. Mampitiya, University of Kelaniya

Dr. B. M. S. G. Banneheka, University of Sri Jayewardenepura

Dr. P. A. Jayantha, University of Ruhuna

## CONTENTS

	<b>Page</b>
1. Purposes and the Aims of the Subject Review Process	02
2. Brief History of the University, Faculty and the Department	02
3. Aims and Learning Outcomes	04
3.1. Aims	04
3.2. Learning Outcomes	05
4. Findings of the Review Team	05
4.1. Curriculum Design, Content and Review	06
4.2. Teaching, Learning and Assessment Methods	07
4.3. Quality of Students including Student Progress and Achievements	08
4.4. Extent and Use of Student Feedback, Qualitative and Quantitative	09
4.5. Postgraduate Studies	09
4.6. Peer Observation	09
4.7. Skills Development	10
4.8. Academic Guidance and Counseling	10
5. Conclusions	11
6. Recommendations	11
7. Annex 1	13
8. Annex 2	14
9. Annex 3	15

## **Purposes and the aims of the subject review process**

Subject review evaluates the quality of the student learning experience at programme level. It is about management and assurance of quality at programme, rather than institutional level. Internal evaluation of the quality of education at subject level is normally part of a university's quality assurance scheme.

Key features are:

- Peer review by academic staff with significant experience as subject practitioners
- Completion of an analytical self-evaluation document covering programmes being reviewed
- Provision of documents such as: examples of student work, student handbooks, statistics covering student progress and achievement, external examiners' reports, minutes of subject committees
- Observation of teaching
- Discussions with subject staff to discuss statements made in the self-evaluation and supporting documents provided by staff delivering the subject
- Discussions with support and administrative staff concerning university quality assurance and resources matters. Discussions with students to obtain their views
- Observation on the quality of the learning experience in their programme of study

## **2. Brief History of the University, Faculty and the Department**

The Wayamba Campus of the Rajarata University of Sri Lanka was established on the recommendation of a Committee appointed by the then Minister of Education and Higher Education on 22nd December 1994 to report on the Affiliated University Colleges. On the recommendation of this Committee nine Affiliated University Colleges spread out in various provinces of the country were merged to form two National Universities, the Rajarata and Sabaragamuwa Universities of Sri Lanka on 07th November 1996.

The Affiliated University College of the North Western province which consisted of two academic sections namely; Home Science and Nutrition and the Agriculture, originally affiliated to the Universities of Kelaniya and Peradeniya respectively, were merged to form the Wayamba Campus and established in terms of the provision of the Sections 18 and 47 (1) of the University Act. No.16 of 1978 and Campus Board Ordinance No 3 of 1995. Two Faculties were emerged within the Wayamba Campus namely, the Faculty of Agricultural Sciences and the Faculty of Applied Sciences I, each with three Departments of Study.

The Faculty of Agricultural Sciences constituted the Departments of Plantation Management, Horticultural Sciences and Food Technology and Agricultural Engineering, while the Faculty of Applied Sciences I consisted of the Departments of Mathematical Sciences, Industrial Management and Computer Studies, Nutrition and Community Resources Management.

A committee appointed in 1999 made recommendations to upgrade the Wayamba Campus to a fully-fledged University. Based on the recommendations of this committee, the Wayamba University was established in August 1999 with four Faculties namely Faculty of Applied Sciences, Faculty of Business Studies and Finance, Faculty of Agriculture and Plantation Management and Faculty of Livestock, Fisheries and Nutrition.

The department under review, Department of Mathematical Sciences (DMS) is coming under Faculty of Applied Sciences (FAS). There are three other departments belonging to this faculty. They are Department of Computing and Information System, Department of Industrial Management and Department of Electronics.

**Vision of the University**

*Achieving excellence in higher education, research and technology and training for developing human resources to meet national and global needs.*

**Mission of the University**

*Develop innovative, skilled, trained man power and their capabilities to fulfill national and global needs through undergraduate and post graduate education, research and outreach programmes.*

**Faculty of Applied Sciences and Its Degree Programmes**

FAS operate on a semester based modular system. Its main programme is 3-year General Degree with an emphasis on two subject disciplines termed Major 1 and Major 2. Students get the opportunity to follow some course units outside two majors. All degree programmes are structured in to six semesters and the students are expected to accumulate up to 90 credits during this period.

For all students enrolled at the FAS there is a common programme in the first year. Each Department in the Faculty contributes towards this. At the end of first year, based on first and second semester performances, students are chosen into different degree programmes with Major 1 and Major 2. As some subjects can have only a limited enrolment there is a well defined algorithm in place to select students to such subjects.

At the end of the third year the students have the option of moving from 3-year General Degree programme to 4-year Joint Major Degree programme. Salient features in the fourth year are the project done in the first semester and the Industrial Training undergo during the entire second semester.

## **Department of Mathematical Sciences**

Department offers courses in 3 subject areas: Mathematics, Mathematical Modeling and Statistics. Students can choose two Majors from DMS. They are Mathematics & Mathematical Modeling, and Statistics.

Average size of an annual intake to FAS is 100 students. Each student has a workload of 30 credits in the first year. There is a significant contribution from DMS for the first year programme. It offers 12 credits worth of course units. Then in every subsequent year of General Degree programme under the two majors DMS offers course units worth 12 credits each.

The first semester of fourth year has a total of 18 credits worth of course units under each Major.

Currently FAS is in session and in the second week of second semester in the academic year 2004/2005. DMS is accommodating to 132 first year students, 38 Statistics Majors and 15 Mathematics/Mathematical Modeling Majors among second year students, and 33 Statistics Majors and 13 Mathematics/Mathematical Modeling Majors from third year students. Only 2 students are in the four year Joint Major programme.

### **3. Aims and Learning Outcomes**

#### **3.1. Aims**

- To provide the students with experience in research and development through the industrial training where the students would be able to experience how the knowledge acquired at universities is applied in a practical environment.
- To prepare students for employment in various areas of Applied Mathematics, as well as for graduate work in these fields.
- Gain experience in careful analysis of data
- Become able to convey their Mathematical and Statistical knowledge in a variety of settings, both orally and in writing.
- To provide balanced Mathematical & Statistical education within which students develop powers of reasoning and abstraction, sound Mathematical and Statistical skills and a logical approach to problem solving.
- To provide the graduates who are highly employable in a wide range of professional, technical and managerial carries.
- To provide an appropriate preparation in proceed to postgraduate study in Mathematics and Statistics.

- To give students the opportunity to study in depth, other disciplines related to the application of Mathematics and Statistics in a practical context

### **3.2. Learning Outcomes**

On graduation from the Department's Undergraduate Courses in Mathematics & Mathematical Modelling and Statistics the students should have the following:

- A sound understanding in a broad range of important areas of Mathematics
- An ability to use Mathematical tools in a range of applications.
- Experience in planning, executing and reporting a project.
- A deeper understanding of Statistics and its relevance to business practice from the course in Mathematics and Statistics with Management.
- An understanding of how Statistic can be applied to analyze the models in Financial Markets and Investment Decisions, Analyzing Problems in Life Insurance , General Insurance and Health Insurance, Calculation of Gravity, Pension, Leave Encashment, Banking etc. from the course in Actuarial Mathematics.
- Analyze data collected during a research project.
- Greater powers of self-organization.
- Developed computing skills which support a deeper understanding Statistical models and their practical implementation from the course in Mathematics with Statistics.
- Select, Construct and Interpret summery Statistics.
- Understand probabilistic reasoning and compute probabilities for simple problems.
- Use appropriate empirical and probability distributions to model data.
- Critical thinking with respect to quantitative analysis.

### **4. Findings of the Review Team**

The Review team visited the Department of Mathematical Sciences of Wayamba University on three days from 24 to 26 May 2006. The agenda for the visit is attached herewith (Annex 1). In this section we will summarize our findings in each of the eight aspects highlighted by the Committee on Quality Assurance as the most important areas for review at the subject level. Also we will give a judgment on each aspect based on the self evaluation report and the evidence we gathered during our visit.

This includes

- discussions with the Dean, Head of the Department, members of the academic and non-academic staff, and a group of undergraduate students
- peer observation of teaching and tutorial work (Annex 2)
- observation of the facilities in the Department/Faculty
- examining the student work (Annex 3) and other documents provided by the Department

We wish to note that the self-evaluation report we received prior to our visit was supplemented by a power point presentation with additional information by the Head of Department.

Each of the eight aspects, except Postgraduate Studies, was judged as good, satisfactory or unsatisfactory. In making these judgments we noted the strengths, good practices and weaknesses in each. Postgraduate aspect was not reviewed on the recommendations of Quality Assurance & Accreditation Council and assigned `Not Applicable` status.

#### **4.1. Curriculum Design, Content and Review**

The University's vision is to achieve excellence in higher education, research and technology and training for developing human resources to meet national and global needs. The Department aims to provide the students with experience in research and development through the industrial training where the students would be able to experience how the knowledge acquired at universities is applied in a practical environment. Also it aims to prepare students for employment in various areas of Applied Mathematics, as well as for graduate work in these fields. Even though there are not many technology based course units we found the aims of the Department are consistent with the vision of the University. Further there is an appropriate curriculum to meet the aims set by the Department. It was refreshing to observe that the Department has redesigned the curriculum by considering student requests as well as the needs of some other Departments.

The envisaged industrial training programme has failed to materialize as only a very few students follow it by going into the 4-year degree programme.

We have noted that there is a lack of flexibility for students to choose optional course units. During our discussion with students they showed their frustration over this. In fact with a manageable number of students (around 30 students following each subject) and more than enough human resources (according to the current faculty timetable each academic staff member has an average teaching time of 3 hours and 15 minutes per week) the Department is well equipped to offer many more optional course units.

To ease the transition from school to the FAS study programmes, and to cater to the varying background of incoming students, all first year students in the Faculty have to follow a common programme. This design would certainly strengthen the quality of programmes in FAS.

A comprehensive faculty handbook has been prepared by the Dean's office. However, the students, who are now in the second semester, are yet to receive it.

This aspect makes a significant contribution to the attainment of the stated aims by the Department. **Judgment - Good**

#### **4.2. Teaching, Learning and Assessment Methods**

Teaching and learning strategies are based on the presentation of basic material through lectures and then guiding students towards independent learning through tutorial classes mostly and computer lab sessions in limited cases.

We observed 3 teaching sessions and 2 tutorial sessions in all. All classes were conducted totally in English as expected. The quality of teaching was variable. Considering the limited experience of young instructors we saw some good work. Some classes could have been improved by better use of teaching skills. In almost all sessions the expected learning outcomes were not clearly explained. Lectures were planned but solely relied on whiteboards. Students sitting on the 10th row found reading the whiteboard extremely difficult due to poor quality of pens used. In some instances the pace was rather slow. Content was generally at an appropriate level.

All classes we observed started on time and there were no latecomers. We noticed the willingness of students to participate in the class. But the efforts made by instructors to engage the students were clearly insufficient.

A proper tutorial system is in place. There were weekly tutorial classes on fixed time slots in the time table. The approach of the tutors was to give the students opportunity to attempt exercises on their own first and then later explain how to solve them. Permanent academic staff members oversee the preparation of tutorial by tutors. However they play no role in tutorial classes.

Formal assessment takes place in each course unit. A limited continuous assessment component which includes mainly tutorials and a mid-semester test exists in each unit. The respective percentages for different parts are announced at the very first class of the semester. However a document with the course content, assessment method and other relevant details are not given to students.

Students need to qualify in order to sit for the final exam of any course unit. The eligibility criteria are based on the marks of tutorials and the mid-semester test. This is a good practice but there were student complains on lack of transparency in determining the eligibility. The documentary evidence suggested that the Department has a well defined algorithm in this regard.

The Department has been practicing moderation of question papers and second marking by external examiners. This has been strengthened by the following recent resolution passed at the Meeting No. 37 of the Faculty Board of Applied Sciences:

*The Board recognized that moderation of question papers and marking of answer scripts should be carried out with utmost care in order to maintain minimum standards and thereby earn recognition for the academic programmes conducted by the Faculty.*

*The Board having considered the practices adopted by the other Faculties of Science, decided that the following measures be adopted by the Departments in future:*

- (i) the setting and first marking of papers should continue to be carried out by a permanent member of the academic staff,*
- (ii) the moderation and second marking should essentially be carried out by a senior staff member competent in the relevant subject area and having at least several years of experience in setting and first marking of undergraduate examinations at a local or foreign university and not by the senior staff who did not possess such experience,*
- (iii) there should not be a symbolic but a substantial involvement of external examiners in moderation and second marking.*

Another good practice we noticed was that the mid-semester tests were prepared and graded by the respective lecturers. All observed question papers were in accordance with the content and learning outcomes. However unbalanced questions (STAT 2114 – Statistical Inference, and STAT 2224 – Applied Statistics and Data analysis) and some inconsistencies in marking were observed (STAT 2114 – Statistical Inference). In general, greater consistency is needed in preparing examination papers and in marking practices.

This aspect makes an acceptable contribution to the attainment of the stated aims, but significant improvement could be made. **Judgment – Good**

### **4.3. Quality of Students, including Student progress and achievements**

FAS attract students from all over the country. Even though the student population is predominantly Sinhalese, there is a representation of both Tamils and Muslims. Students who joined FAS during the most recent years had the lowest and highest z – scores .04881 – 1.1471, .05514 – 1.18812, and .7409 – 1.3647 respectively. This evidence suggests that the quality of students admitted to the program is improving. Also the punctuality of students in attending classes and the high percentage of students submitting homework assignment and getting eligible to sit for the final examination are good indicators of a progressive group of students. The significant percentages of classes awarded at the degree level shows that the student achievement level is very high.

However no proper mechanism exists to measure the overall student progress at any given time. Another observation we made was that there is no interaction of students with the academic staff outside the class time on subject related activities.

The department just started collecting information on whereabouts of its alumni. We were informed without proof that almost 100% of FAS graduates are employed. No proper data on employment information of graduates were provided. Hence we are unable to judge if the aims of the department have been actually met. **Judgment – Satisfactory**

#### **4.4. Extent of student feedback, Qualitative and Quantitative**

There is only one formal way of getting student feedback at this stage. FAS recommended common questionnaire for course unit evaluation is available. However conducting course evaluation is still voluntary. Head of Department has recently issued a directive to make this process compulsory for each course unit. There are no departmental or subject committees involving academic staff and students.

There was evidence to suggest that a new course unit was developed by the department considering student requests.

DMS has not taken any steps yet to get a feedback on the whole programme. Existence of such process would help the university to judge if the aims of the DMS are met.

**Judgment – Satisfactory**

#### **4.5. Postgraduate Studies**

At present DMS does not offer any postgraduate study programmes.

**Judgment – Unsatisfactory**

#### **4.6. Peer Observation**

Currently no formal peer observation procedure is available in the department covering teaching aspects of academic staff.

The self evaluation report says *‘There is no system of evaluating teaching of academic staff members of the department by another academic staff members who are incompetent in the specific field of study due to lack of resources’*.

As reviewers we feel that this statement is not acceptable. Most of the course units offered in DMS are undergraduate general degree level. Hence any academic staff member in that discipline should be competent enough to get involved in the process. It is very important to have well defined guidelines on peer observation of teaching so that both parties are aware of their roles.

The other two statements in self evaluation report under this aspect are:

*‘However staff members discussed the problems arising at the academic activities with the head and other senior academic staff members of the department’* and

*‘Tutorials are prepared in consultation with lecturers. Marking schemes are prepared with the guidance of the respective lecturer and answer scripts are randomly checked.’*

We found some evidence to support these claims. But they didn’t apply uniformly to all academic members (senior, junior and visiting staff).

DMS can make a significant improvement in this aspect. **Judgment – Unsatisfactory**

#### **4.7. Skills Development**

The first year common curriculum covering the following topics helps students to appreciate the type of skills they have to develop during the degree programme:

Introduction to computers and operating systems, basic electronics, principles of management, Computer programming, general physics, basic electronics, industrial technology, principles of accounting, English language proficiency course

There are two computer-based course units offered. However we didn't notice the DMS having any strategy for skills development as part of the curriculum. Even though the skills that DMS intends students to acquire are mentioned under learning outcomes there is no mechanism to judge if these are achieved at the end of the course.

This aspect makes some contribution to the attainment of the stated leaning outcomes. However there is scope for significant improvement. **Judgment – Satisfactory**

#### **4.8. Academic Guidance and Counseling**

The self evaluation report doesn't indicate the extent of academic guidance and counseling available to students. It describes the personal guidance and counseling available in the University.

One day Orientation program is held for students on their first day at the University. Introduction to the subjects in FAS is done during the Intensive English Program which is held in first two weeks. Other than these two events no formal academic guidance program is available for students during there stay in the university.

For each student, the most important stage of FAS degree program is the selection of two majors at the end of first year. There is no contribution from the DMS is to guide students in this task. They rely on the guidance of senior students in the faculty.

DMS does not have any strategy for providing effective academic guidance and counseling to students. But the tutorial system in place is commendable. There is evidence to support that students enhance their achievements due to this service.

As claimed in the self evaluation report Student Counseling service and Career Guidance Unit are available in the university.

**Judgment – Satisfactory**

## 5. Conclusions

Based on the observations made and evidence gathered during the Review team visit, the eight aspects were judged as follows:

<b>Aspect Reviewed</b>	<b>Judgment Given</b>
<b>1. Curriculum Design, Content and Review</b>	<b>Good</b>
<b>2. Teaching, Learning and Assessment Methods</b>	<b>Good</b>
<b>3. Quality of Students, Including Student progress and achievements</b>	<b>Satisfactory</b>
<b>4. Extent of student feedback, Qualitative and Quantitative</b>	<b>Satisfactory</b>
<b>5. Postgraduate Studies</b>	<b>Unsatisfactory</b>
<b>6. Peer Observation</b>	<b>Unsatisfactory</b>
<b>7. Skills Development</b>	<b>Satisfactory</b>
<b>8. Academic Guidance and Counselling</b>	<b>Satisfactory</b>

*The overall judgement is suspended.*

## 7. Recommendations

Based on the findings indicated above the review team wish to make the following specific recommendations:

- DMS should make use of abundant human resources it has and introduce more optional course units for the benefit of students. More involvement of permanent academic staff in tutorial work is recommended. (Lack of classroom facilities can be resolved to some extent if the FAS functions from 8am to 6pm on weekdays as other the universities in the country.)
- A proper structured orientation programme at the end of first year examinations, prior to selecting their majors, is absolutely necessary.
- FAS need to take steps to distribute printed material to students. This should include the faculty handbook, relevant course details for each unit at the first day of classes, a brief course guide for each unit.
- Two selection methods practiced in FAS, namely the calculation of Y-score and the criterion to determine eligibility to sit for the final examination, need to be more transparent for students.

- Peer observation of teaching needs to be implemented.
- Introduction of more computer based activities for STAT and MMOD course units is desirable.
- Introduction of good practices such as maintaining a record book on lectures and tutorial taken having regular departmental meetings to discuss important issues, displaying fixed office hours for students to come and meet would definitely help improving the quality of programmes offered by DMS. The contribution of all academic members of DMS towards this is very important.

# Annex 1

## Agenda of the Subject Review

### 23 May 2006 (Day prior to the Review)

1930 – Private meeting of Reviewers at the Kuliypitiya Rest House

### 24 May 2006 (Day 1)

0900 – 0930 – Welcome meeting with the Dean and Head of Department

0930 – 1000 – Discuss the Agenda of the Review

1000 – 1030 – Tea Break

1030 – 1130 – Department Presentation on the Self Evaluation Report by HoD.

1130 – 1230 – Discussion

1230 – 1400 – Lunch

1400 – 1430 – Observe Teaching MMOD 3224

1430 – 1530 – Observation of Department facilities  
Observation of Common facilities:  
Library and Computer Centre

1530 – 1630 – Meeting with Academic Staff of the Department

1630 – 1730 – Meeting with three student Groups

1730 – 1800 – Brief Meeting of Reviewers

### 25 May 2006 (Day 2)

0900 – 0930 – Observe Teaching MATH 1242

0930 – 1000 – Observe Teaching STAT 3234

1000 – 1200 – Observe Documents (Working Tea)

1200 – 1215 – Meeting with Non-Academic Staff of the Department

1215 – 1230 – Meeting with Temporary Academic Staff of the Department

1230 – 1330 – Lunch

1330 – 1430 – Discussion with the HoD

1430 – 1600 – Observe Documents

1600 – 1630 – Observe Tutorial MATH 1232

1630 – 1700 – Brief Meeting of Reviewers

### 26 May 2006 (Day 3)

0900 – 0930 – Meeting with the Vice-Chancellor (on his request)

0930 – 1000 – Observe Tutorial STAT 2224

1000 – 1030 – Academic Guidance and Counseling Core Aspect Meeting

1030 – 1100 – Reviewers Private Discussion (Working Tea)

1100 – 1200 – Meeting with HoD and Academic Staff for Reporting

1200 – 1300 – Lunch

1300 – Report Writing

## **Annex 2**

### **Observation of Teaching and Tutorial Classes**

All three Reviewers were present in each observation and kept different notes.

#### **Observation of Teaching**

MMOD 3224 - Numerical Methods  
Instructor: Mr. HASI Hapuarachchi  
Approximate Class Size: 09

MATH1242 - Differential Equations  
Instructor: Mr. LD Priyantha  
Approximate Class Size: 70

STAT 3234 - Credibility Theory and Loss Distribution  
Instructor: Mr. SSUR Fernando  
Approximate Class Size: 20

#### **Observation of Tutorials**

MATH 1232 - Analytic Geometry  
Instructor: Temporary Tutor  
Approximate Class Size: 18

STAT 2224 - Applied Statistics & Data Analysis  
Instructor: Temporary Tutor  
Approximate Class Size: 9

## **Annex 3**

### **Observation of Student Work: Assessment and Evaluation Forms**

Each Reviewer separately evaluated samples of student work covering the following Modules.

- (1) MMOD 3234 – Numerical Analysis
- (2) MMOD 2114 – Mathematical Modeling and Methods
- (3) MATH 2224 – Real Analysis
  
- (4) STAT 1112 – Introduction to Probability and Statistics I
- (5) STAT 2114 – Statistical Inference
- (6) STAT 2224 – Applied Statistics and Data Analysis
  
- (7) MMOD 3114- Mathematical Models
- (8) MATH 2114 – Matrices

----- //