SUBJECT REVIEW REPORT

DEPARTMENT OF MATHEMATICS AND STATISTICS

FACULTY OF SCIENCE

UNIVERSITY OF JAFFNA

27th to 29th April 2009

Review Team :

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1. SUBJECT REVIEW PROCESS

Subject review process involves evaluating the quality of education within a specific subject or discipline, focusing on the student learning experience and on student achievement. This subject review process evaluates the quality of the undergraduate program. It is understood that the final responsibility for quality and standards remains within the institution itself, since it alone has the powers to control and to change existing practices.

Subject review process at the Department of Mathematics and Statistics of the University of Jaffna was conducted following the guidelines provided in the Quality Assurance Handbook for Sri Lankan Universities, published by the CVCD and the University Grants Commission in July 2002. The quality of education was reviewed according to the aims and learning outcomes given in the self-evaluation report of the Department.

The following eight aspects of education were reviewed at the Departmental level:

- Curriculum design, content and review;
- Teaching, learning and assessment methods;
- Quality of students including student progress and achievements;
- Extent and use of student feedback (both qualitative and quantitative);
- Postgraduate studies;
- Peer observations;
- Skills development;
- Academic guidance and counseling.

The review team visited the department for three days from April 27 to 29, 2009. The agenda of the three-day visit was discussed with the Head of the Department and amended to suit the ground realities (see Annex 1). The information related to the above eight aspects were collected by:

- Discussions with the Dean, Head of the Department, members of the academic and non-academic staff (see Annexure 2 for list of persons that attended the meetings), undergraduates (special and general) and postgraduate students.
- Peer observation of the teaching process (six lectures and one practical session were observed – see Annexure 3)
- Observation of the facilities at the Department / Faculty / University (see Annexure 4) and
- Examination of the documents provided by the Department (see Annexure 5).
- Each of the eight aspects was judged as good/satisfactory/unsatisfactory, noting the strengths, good practices and weaknesses. Having considered the individual category judgments, an overall judgment is reported at the end of this report on the following scale: confidence/limited confidence/no confidence; in the academic program.

2. BRIEF HISTORY OF THE UNIVERSITY, FACULTY AND THE DEPARTMENT

University of Jaffna (UJ) was established in 1974 as a Campus of the University of Sri Lanka with two Faculties: Humanities(at Thirunelveli) and Science(at Vaddukodai). It became an independent University in 1978 when "Science" was shifted to Thirunelveli. Its first phase of development took place during 1975 and 1985 with new buildings coming up and starting of Faculty of Medicine, RAFA, Siddha Medicine Unit. Staff was recruited from Peradeniya and Colombo Universities as well, during this period. The decade

following was a darker side due to loss of Power and loosing of equipment due to the unfortunate situation prevailing in the country.

At present six Faculties are there: Agriculture, Arts, Management & Commerce, Medicine, Science and Graduate Studies and a Campus at Vavuniya, started in 1993 with Applied Science and Business Studies Faculties having the following seven academic units:

- ❖ Department of Siddha Medicine - 1985
- ❖ External Unit (Distance Learning Unit) - 1990
- ❖ Extra Mural Studies Unit - 1992
- ❖ Centre for Fisheries Development - 1991
- ❖ Sports Science Unit - 1998
- ❖ Health Studies Unit - 2000
- ❖ Workers Education (Human Recourse Advancement Unit) - 1991

Signing an MOU with the ADB for a development program took place in 2002. 6500 students are registered in total with 300 and 500 academic and non-academic staff serving them.

Vision of the University: To be a learning centre of excellence in teaching, research and scholarship.

The Department of Mathematics and Statistics is the oldest and the largest department of the University and conducts academic programmes in three subjects: Pure mathematics, Applied mathematics and Statistics. Though the Department has a large number of senior academic vacancies, it is managing to carry out the study programme successfully with available qualified staff; shortages in permanent staff are complemented by contract appointments. At present the Department has 11 permanent and 17 temporary members of staff. Approximately 550 students are registered with the Faculty of Science, of which around 350 undertake some studies in at least one of the three subjects offered by the Department (many study two or three). Of these approximately 15 students in each year are selected (at the end of level 2) to study for an Honours degree programme in Mathematics or Statistics.

3. AIMS AND LEARNING OUTCOMES

3.1 Aims

The Faculty of Science aims to produce physical science graduates who are conscious of their importance in building up a cohesive and socially harmonious nation by taking a scientific approach to problem solving, in research and in planning development goals, by providing quality education in science and its applications coupled with training in personal skills.

In addition to this the Department of Mathematics and Statistics seeks to give students an understanding of the nature of mathematics and an appreciation of its wide range of applications, especially in support of the other physical sciences. The Department aims to provide:

- a broad range of courses which are relevant to the modern workplace
- a solid foundation for further study in Mathematics and/or Statistics in honours degree courses.

3.2. Learning outcomes

For all students in the Faculty of Science to be able to:

- Contribute to, and pursue advanced learning and research relevant to, regional and national development
- Disseminate scientific knowledge including the scientific background of indigenous methods used by the local community and to promote science education
- Develop good interpersonal and communication skills, both written and verbal, for study and future employment
- Be self-motivated, creative and able to meet new challenges, and have received career guidance and been taught basic management skills
- Have an understanding of Sri Lankan history and culture, an awareness of the need for social harmony and the ability to work well with people from different background
- Become computer literate to the extent of being able to use email and the internet, and word-processor documents to a professional standard
- Develop English language skills to the level of being able to undertake studies in the English medium
- Develop knowledge of fundamental biology relevant to the physical sciences
- Acquire fundamental knowledge and understanding of theory and techniques in selected areas of mathematics
- Be able to understand, use and develop abstract concepts
- Develop problem solving skills and the ability to think logically and analytically
- Develop a sound understanding of and strong skills in the use of fundamental mathematics, including linear algebra and abstract algebra, set theory, real and complex analysis, geometry and topology
- Have the ability to apply the basic concepts involved in these subjects to other areas of study, especially applied mathematics, statistics and computer science
- The ability to use a broad range of mathematical methods, especially those which are needed to support other areas of the physical sciences
- Develop a thorough knowledge of the underlying tools and language of applied mathematics, including differential equations and matrices
- Have a sound understanding of fundamental classical mechanics including rotating bodies, planetary motion, oscillatory systems and particles systems
- Be aware of the power of computational mathematics and have experience of using computer packages as tools for investigation and understanding
- Have a sound knowledge of the theoretical foundation of statistics including probability, distribution theory and stochastic processes
- Develop the fundamental skills of Applied Statistics, including the design of experiments, sampling and data analysis, time series analysis, forecasting, inference and decision theory
- Be competent in analyzing statistical and mathematical problems arising in the scientific, industrial and financial sectors
- Develop a strong understanding of the core applied mathematical theory including fluid dynamics, Lagrangian and Hamiltonian mechanics, numerical methods, mathematical programming and optimization
- Appreciate the wide applicability of mathematics, including the use of modelling, analytical and numerical techniques

- To understand and present advanced mathematical ideas, including that gained through the use of independent learning and project work
- Have studied advanced mathematical statistics ideas and be able to apply these to real life problems
- Be able to model statistical problems using applied statistics techniques and have gained experience doing so through projects and practical work.

4. FINDINGS OF THE REVIEW TEAM

4.1. Curriculum Design, Content and Review

Strengths:
a. Provides a Strong theoretical foundation in statistics and mathematics
b. Pure Mathematics courses in the first two years are mandatory for Statistics special degree students
c. Combined Mathematics course provides core Mathematics courses for students who do not offer Pure Mathematics and Applied Mathematics.
d. Introduction of a project component for Statistics special degree
e. Decision to introduce Project component for mathematics in this year (2009)
f. English course has been made compulsory for all students
g. In conducting lectures etc, switching over to "English", commencing from "Tamil".
h. Introducing auxiliary and enhancement courses.
i. Provides opportunity for students to obtain a general degree with three subjects from mathematics department alone.
j. Curriculum was revised in 2004/2005 and the course unit system was introduced.
k. A thorough curriculum revision is initiated with the IRQUE project (Statistics and Mathematics)

Weaknesses:
a. Lectures being not conducted in English may result in poor communication skills.
b. There is little flexibility (few optional courses) for students offering special degree in Statistics.
c. In curriculum development and revision, the inputs from industry and the other universities were not visible.
d. Lacking of practical aspects for General Degree students.
e. Auxiliary subjects are not assigned a credit weight, and hence it does not reflect in the workload of the student.
f. Heavy work load for students who are following different subject combinations.
g. Attention given to produce "Applied Statisticians" is not seen.

4.2. Teaching, Learning and Assessment Methods.

Strengths:
a Availability of qualified academic staff in Pure Mathematics, Applied Mathematics and Statistics.
b Some printed lecture notes and handouts are provided by some lecturers
c. Discussions are encouraged by lecturers
d. Effective use of variety of assessment methods in the evaluation process.
e. External moderation of special degree papers

f. "Honours" level teaching (lectures and tutorials) is handled only by senior lecturers.
g. Second marking has guaranteed quality in assessment.
h. The well equipped computer laboratory enables to conduct computer based mathematics programs to the highest satisfaction of the students by providing flexible time periods. (moved from students feedback)
i. Display of final examination grades along with the final grades.
j. Training of "juniors" by "seniors" is a good practice.
k. It is a good practice for a group of students to attempt and discuss a difficult tutorial problem particularly in Mathematics.

Weaknesses:
a. It is felt that sufficient number of copies of recommended text books is not available.
b. Tutorial discussions are confined to whole class rather than smaller groups.
c. Software packages are not introduced in level 1 and level 2.
d. The students have expressed concern over the quality of teaching by junior staff.
e. Restricted working hours of the university is prohibiting the optimal and efficient use of computers by students and others.
f. Use of modern methods and techniques used is at a lower level.

4.3 Quality of Students including Student Progress and Achievements

Strengths:
a. Students selected for the two honours degree programmes have shown high standard in their performance.
b. Increasing trend in the number of students doing mathematics honours.
c. Majority of general science degree students successfully complete their degrees
d. All special degree students successfully complete their degrees(this may be due to good and motivated students being selected)
e. Some students follow postgraduate degrees in Sri Lanka and in foreign countries

Weaknesses
a. Quality of students may be affected by the current restricted working hours of the university.
b. The criteria for selection to Statistics special degree, namely pure mathematics as a compulsory subject, may prevent students opting for Statistics special degree. There is a decline in the number of students doing honours in statistics.
c. Although required by the country, Applied Statisticians are not being trained.
d. The department does not monitor and maintain records of the progress of the students who passed out.
e. No future plans to increase the number offering special degrees.

4.4. Extent and use of Student Feedback

Strengths:
a. Course/teacher evaluation form has been developed and is used to obtain the student-feedback.
b. A formal procedure has been established to process the students' responses.
c. The responses of the students for the evaluation form is summarized and displayed on the notice board, along with the lecturer's comments and observations.

d. Evidence to say that the student-feedback is used by the department to improve the teaching- learning process.
e. Students are represented in the Faculty Board.
f. Department has a friendly atmosphere that facilitates the students to give a informal feedback to the staff
g. Good dialogue between students and academic staff for development of courses.
h. Department meets regularly (11 times per year) to discuss matters related to both academic and administrative matters.
i. Invitation of temporary demonstrators to attend the departmental meetings is a good practice to improve the mutual understanding among the members of the department and to expedite the day-to day administrative functions in the department.

Weaknesses
a. Although students' feedback is obtained for the course and the teacher, no feedback is obtained regarding the degree program.
b. No student representation at the Department meetings.
c. No formal arrangements for students to discuss matters related to the program with the staff.

4.5. Postgraduate Studies

Strengths:
a. One staff member has been involved in the course development and teaching for PG programs of other disciplines.
b. Some staff members serve the Board of Study Physical Science and also as examiners for MPhil/PhD theses.

Weaknesses:
a No. PG programs in Mathematics and Statistics
b. Although a few individual staff members do their own research, there is no research culture in the department.
c. Department has not been able to initiate research and post graduate study programs based on the junior and temporary staff of the Department.
d. Lack of adequate experienced staff

4.6. Peer Observations

Strengths:
a. Informal discussions are held among teachers frequently. These discussions help in the development of the curriculum and the methods of delivery. This is an opportunity for teachers to learn from each other, especially with regard to teaching methodology each person is using.
b. Special degree exam papers are moderated by international examiners. This is an opportunity for teachers to maintain academic standards
c. Department is planning to establish a formal mechanism in that regard in the future.
d. Junior staff teaching performance is monitored and guided by the senior staff.

a. There is no formal mechanism at present to obtain observations of peers with regard to teaching activities of the Department

4.7. Skills Development

Strengths:
a. Skills to analyze, synthesize, recognition of patterns and skills in formulating and solving problems are provided
b. These skills could easily be translated into practical areas.
c. Introduction of auxiliary courses for the degree programs provides opportunities develop various skills.
d. Compulsory project and the thesis report for Statistics special students have provided good opportunity to develop the research and writing skills.
e. Use of "English" by special degree students will enhance their communication skills.
f. Use of Mathematical software would help in their future work

Weaknesses:
a. No apparent industry link observed by Review Team
b. Research skills, writing skills and communication skills of Mathematics special degree student's needs to develop.

4.8 Academic Guidance and Counseling

Strengths
a. University has a system for student counseling.
b. Department has orientation programs at all levels, thus providing general academic guidance to the students.
c. Course advisors in the department appointed by the faculty to provide advice to students on course selection and to guide students on academic and university related and/or administrative matters.
d. Psychological counseling available.
e. Some staff members are actively participating in helping the students in need.

Weaknesses:
a. Apparently student participation is not at 100% level when the counseling is needed by them.
b. Lack of sufficient counselors and especially female counselors. This may be due to the prevailing situation in this part of the country.
c. An Academic counselor is not assigned to a student from the time they enter the university.

Based on the observations made during the visit by the review team, the eight aspects were judged as follows:

Aspect Reviewed	Judgment Given
Curriculum Design, Content and Review	Good
Teaching, Learning and Assessment Methods	Good
Quality of Students including Student Progress and Achievements	Good
Extent and Use of Student feedback, Qualitative and Quantitative	Good
Postgraduate Studies	Unsatisfactory
Peer Observation	Good
Skills Development	Good
Academic Guidance and Counseling	Satisfactory

5. RECOMMENDATIONS

Based on our reading of the "Guidance on the Preparation of the Subject Review Report", discussions with academic/non-academic staff and students and the inspection of supporting documents, we wish to make the following recommendations.

1. Develop research activities using the junior and the temporary staff, and thus to establish a good research and postgraduate study environment.
2. The research collaborations with other universities in the country and abroad would help it to come out and establish a research culture.
3. The project component for mathematics degree should be 3 credits instead of 2 as it is planned.
4. Should introduce mathematics and statistics laboratories in the 1st and 2nd levels.
5. Currently the department produces statistics honours graduates with strong theoretical background. However, the pure mathematics being compulsory for Statistics special restricts the students opting special. Since the country needs practical statisticians with solid theoretical background, it is better to revise the curriculum to develop such graduates too.
6. Adequate numbers of copies of recommended textbooks should be available in the library
7. As the students have expressed their concerned about the quality of teaching of the junior staff, the department together with the staff development centre should develop a program to improve the quality of teaching. Moreover the lecturer in charge of course should monitor the quality of teaching.
8. A formal peer evaluation process is recommended to be started at the earliest.
9. As a complement to the student feedback the Department can have a formal meeting with a group of students from each subject. Two staff members who are not teachers for that subject can discuss the matters with the students.
10. The department should be provided with proper printing facilities other than the central printing facilities in the faculty.
11. The telephone communication facilities for the staff need to be improved.
12. The internet access to the students' need to be improved and expanded.

13. The department can, with the expertise it has in the area of statistics to analyze information related to quality of students entering, progressing and completing.
14. The auxiliary and enhancing courses should be assigned credit values and they should be included in the total no credit of the degree program. They could still be non GPA courses.

6. ANNEXES

Annex 1. AGENDA FOR THE REVIEW VISIT

Day 1

08.30 – 09.00	-	Private Meeting of Review Panel with QAA Council Representative.
09.00 – 09.30	-	Discuss the Agenda for Visit
09.30 - 10.00	-	Meeting with Vice- Chancellor/ Chairman, Internal QA Unit
10.00 – 10.30	-	Meeting with Dean/ Science (Working with Tea)
10.30 – 11.30	-	Department Presentation on the Self – Evaluation Report
11.30 – 12.30	-	Discussion
12.30 – 13.30	-	Lunch
13.30 – 14.30	-	Meeting with Academic Staff
14.30 – 15.15	-	Observing Departmental Facilities
15.15 – 15.30	-	Tea
15.30 – 16.30	-	Visit to Library and Computer Unit
16.30 – 17.30	-	Brief Meeting of Reviewers

Day 2

09.00 – 09.30	-	Observing Teaching – Lecture Statistics for Level 3G (Mrs.N.Satkunanathan) Applied Mathematics for Level 2G (Dr.S.Srisatkunarajah)
09.30 – 10.30	-	Observing Documents (Working with Tea)
10.30 – 11.00	-	Observing Teaching – Lecture Statistics for Level 2G (Dr.S.Arivlzakan) Pure Mathematics for Level 1G (Dr.R.Vigneswaran)
11.00 – 11.30	-	Meeting with Non – Academic Staff
11.30 – 12.30	-	Meeting with Special Degree Students
12.30 – 13.30	-	Lunch
13.30 – 14.30	-	Meeting with General Degree Students
14.30 – 15.00	-	Meeting with Student Counselor
15.00 – 16.00	-	Meeting of Reviewers (Working Tea)

Day 3

09.00 – 09.30	-	Observing Teaching Applied Mathematics for Level 2G (Mr.S.Prashanthan) Applied Mathematics for Level 3G (Mr.S.Selvarajah)
09.30 – 10.00	-	Tea
10.00 – 10.30	-	Observing Lectures Continuum Mechanics for Honours Degree (Dr.S.Srisatkunarajah) Pure Mathematics for Level 3G (Dr.R.Vigneswaran)
10.30 – 11.00	-	Reviewers Private Meeting
11.00 – 12.00	-	Meeting with Head and Staff for reporting
12.00 – 13.00	-	Lunch
13.00 – 16.00	-	Report Writing

Annex 2. LIST OF PARTICIPANTS

Dean, Faculty of Science
Professor R. Kumaravadivel
Members of the Academic Staff
Professor V.Tharmaratnam
Mr S.Yogarajah
Dr S.Srisatkunarajah
Dr R.Vigneswaran
Mr S.Selvarajan
Ms N. Satkunanathan
Dr S. Arivalzahan
Mr A.Laheetharan
Mr K.Kannan
Mr N.Ramaruban
Mr B.Kethesan
Mr N.Varathan
Mr R.Prasanthan

Discussions were also held with around 70 undergraduate students (General and Special).

Annex 3. OBSERVATION OF TEACHING PROCESS

Lecture - Applied Mathematics for Level 2G (Dr.S.Srisatkunarajah)
Lecture - Statistics for Level 2G (Dr.S.Arivlzakan)
Lecture - Pure Mathematics for Level 1G (Dr.R.Vigneswaran)
Lecture - Applied Mathematics for Level 2G (Mr.S.Prashanthan)
Lecture - Applied Mathematics for Level 3G (Mr.S.Selvarajah)

Annex4. FACILITIES OBSERVED

Department
Lecture Halls
Computer Laboratories
Computer Centre
Library

Annex 5. THE DOCUMENTS OBSERVED

1. Student Hand Book
2. Syllabi
3. Publications
4. Students' Feedback Forms and Analyzed Data
5. Past question papers
6. List of Examiners
7. External Degree Examinations
8. Lecture Notes and Handouts
9. Department Minutes