SUBJECT REVIEW REPORT

DEPARTMENT OF MICROBIOLOGY

FACULTY OF SCIENCE
UNIVERSITY OF KELANIYA

13th to 15th March 2007

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CONTENTS

1. SUBJECT REVIEW PROCESS

Higher education is a 'public good' and is of crucial importance to health, wealth and well being of the society and the economy. Universities must conscientiously exercise their responsibility for quality and standards. University accountability for quality and standards is a key factor in promoting and safeguarding public confidence in Sri Lankan higher education.

Subject review evaluates the quality of education within a specific subject or discipline. It is focused on the quality of student learning experience and on student achievement and is designed to evaluate the quality of both undergraduate and postgraduate programmes.

Subject review process is introduced by the Committee of Vice-Chancellors and Directors (CVCD) and the University Grants Commission (UGC). The Quality Assurance and Accreditation Council (QAAC) of the UGC is now conducting subject reviews and institutional reviews in Sri Lankan universities. The following Review Team has been appointed by the QAAC to perform the subject review of the Department of Microbiology, Faculty of Science, University of Kelaniya from 13th to 15th March 2007.

- Prof. (Ms.) Chandrani Wijeratne, University of Sri Jayawardenepura.
- Prof. (Ms.) Vasanthi Thevanesam, University of Peradeniya
- Prof. S. Mohanadas

Key features of the subject review process are preparation of a Self Evaluation Report (SER) by the department on the discipline they teach, and the evaluation of the student learning experience and on student achievement in the subject according to the aims and learning outcomes as stated in SER by the subject Review Team.

The Self Evaluation Report of the Department of Microbiology (DM), University of Kelaniya prepared in January 2007 was submitted to the members of the Review Team requested to perform the subject review. It contained 30 pages of Undergraduate Studies, 03 pages of Postgraduate Studies, 05 pages on Research & Development Activities with Industries in Sri Lanka, and half page of Conclusions. There were 11 pages of Appendix and the total pages are 50.

The Review Team evaluated the quality of education in the DM according to the aims and learning outcomes as claimed in their SER. The purpose of the visit was to consider and test the evidence provided by the DM.

At 8:30 am on the 13th March 2007 the Review Team arrived at the university and met the QA specialist of IRQUE (Improving Relevance and Quality of Undergraduate Education) project for half-an-hour to be familiarized with the subject review process. At 9:00 am the Review Team including QA specialist was invited for a welcome meeting by the Dean of the Faculty of Science for which Head, DM was also invited. Thereafter the Review Team met the Head, DM and senior staff members of the department. The agenda for the review process was finalized.

During the morning session Dr. D.L. Jayaratne, Head of the DM gave a presentation which comprehensively covered the progress made by the department on all aspects included in the SER in the presence of all members of the academic staff of the department. The review process was thereafter progressed by the Review Team according to the agenda (Annex 1).

The Review Team held meetings with the following groups and individuals.

- Head of DM
- Academic staff members
- Non-academic staff members

- Undergraduate students
- Postgraduate students
- Academic advisor, Student counselors, and Coordinators

The Review Team visited the following places for observation.

- Lecture Halls with teaching equipments
- Seminar Rooms with teaching equipments
- National Microbial Culture Collection Centre with laboratory & equipments
- Laboratories & equipments
- Research laboratories & equipments
- Department Computer laboratories
- University Computer Center
- Department Staff Rooms
- Undergraduate and postgraduate Library

Lecture halls and laboratories were visited again when the students were following lecturers and a practical respectively.

The Review Team went through the following documents (Annex 2).

1. Student Handbook 2005/2006
2. University of Kelaniya - Calender 2006
3. Syllabi 1990 – 2004/5
4. Student's Handbook of M.Sc programmes
5. Lecture guides, laboratory manuals and practical handouts
6. Tutorials and assignments
7. Industry/Institution visits reports
8. Special student's research project reports
9. Industrial training reports
10. Undergraduates employment record
11. Students feedback on teacher evaluation
12. Minutes of the staff-student committee meeting, appeals committee meeting and staff meetings
13. List of examiners
14. Question papers, marking schemes with the comments of the moderators
15. Answer scripts marked by the examiners
16. Student's practical record books & continuous assessment records
17. Course unit mark sheets
18. Internship and research project evaluation questionnaire
19. Peer review report for lecturers
20. Records of allocation of lectures, practical,& tutorials, computer laboratory logbook, names of student counselors & personal tutors and Alumni survey
21. Documents on students training programme & internship arrangement, academic support staff training, technical & technological aspects of bio-safety report, services to other institution, Indo-Sri Lanka collaboration programme, IRQUE project reports, water & waste water treatment, CCF report, etc.
22. Postgraduate thesis
23. Reports on Skills Development and Academic Guidance and Counseling (Annex 3 & 4). This was made available at the request of the members of the Review Team as it was not included in the SER.

The Review Team at the end of the 3-day-visit made judgments on each of the eight aspects namely (i) curriculum design, content and review (ii) teaching learning and assessment methods (iii) quality of students including student progress and achievement (iv) extent and use of student feedback, qualitative and quantitative (v) postgraduate studies (vi) peer observation (vii) skills development and (viii) academic guidance and counseling. On this day only stated whether each of these eight aspects is good or satisfactory or unsatisfactory.

2. BACKGROUND OF THE UNIVERSITY, FACULTY AND THE DEPARTMENT

The University of Kelaniya has its origin in the historic Vidyalankara Privena founded in 1875 as a centre of learning for Buddhist monks. With the establishment of modern Universities in Sri Lanka in the 1940s and 1950s, the Vidyalankara Pirivena became the Vidyalankara University in 1959 under the Universities Act No. 45 of 1958, later the Vidyalankara Campus of the University of Ceylon in 1972 and, ultimately, the University of Kelaniya in 1978. The University of Kelaniya is one of the main State Universities of Sri Lanka. Situated just outside the municipal limits of Colombo, in the ancient and historic city of Kelaniya, the University boasts two major campuses, seven locations, six faculties and four institutions.

The Faculty of Science started functioning in October 1967 with the intake of the first batch of students numbering 57. Formal approval for the Faculty was given by the Minister of Education in 1968.

The Mission of the Faculty of Science of the University of Kelaniya is *to produce highly motivated graduates and postgraduates capable of making a significant contribution towards national development and the well being of mankind, to conduct research and provide advice and consultancy services in various scientific discipline to foster a better understanding of the environment for sustainable use and conservation of natural resources*.

Presently, the Faculty of Science consists of eight departments including the DM. Academic disciplines offered by the Faculty of Science for the general degree include Botany, Biochemistry, Chemistry, Microbiology, Industrial Management, Pure Mathematics, Applied Mathematics, Information Technology, Molecular Biology and Plant Biotechnology, Operational research and Information, Physics, Statistics and computer Science, Computer studies, and Zoology.

The Faculty of Science of the University of Kelaniya was the first among the Sri Lankan Universities to initiate the change over from the traditional three subject (General) degree with end of year examinations to a more flexible Course Unit System, i.e. a modularized credit based system within a two-semester academic year with the end of semester examinations. It offers a variety of course pathways designed to provide maximum possible flexibility in the choice of subjects. Under this system students have the option of reading for a traditional three subject degree or for a degree consisting of two principal subjects and a selection of course units drawn from other subject areas. The B.Sc. (Special) degree courses, begun in1974, have also adopted the course unit system since as of 1986.

In 1980 the M.Sc. in Applied Microbiology programme was started under the Department of Botany. The late Professor I. Balasooriya gave the initiatives for the establishment of the DM in 1980 and Professor S Widanapathirana, was appointed as the first Professor of Microbiology in 1983. Although the DM was established in 1986 the academic programmes were commenced in 1990. This is the only department which offers Microbiology as a full subject for the B.Sc. Degree in the Sri Lankan University system.

3. AIMS AND LEARNING OUTCOMES (Extracted from the Self Evaluation Report)

3.1. Aims

The Microbiology courses for both undergraduate and postgraduate degree programmes have been developed to provide up-to-date information about microorganisms in an organized manner that facilitates learning and understanding. The curriculum focuses on the enormous diversity among the microorganisms, their taxonomy, their habitats, physiological and biochemical activities, their role in the natural environment, and their impacts on human, animal and plant populations, how microorganisms have evolved numerous strategies for carrying out essential life functions and how the activities of microorganisms have been exploited to contribute to the overall health and welfare of human beings, industries, agriculture and to the areas in medical, industrial, agricultural and environment biotechnology. It also provides an insight into how events at the molecular level are translated into activities of practical importance of microorganisms which then link with industrial, agricultural and medical biotechnology.

In this context, the DM aims to provide

- students with up-to-date curriculum that allows the development of an in-depth understanding of microorganisms acceptable to both national and international standards.
- students with a range of learning opportunities and practical experiences and industrial exposures in order to produce talented microbiology graduates employable in the private and public sector.
- opportunities to develop in student's appropriate practical skills required by professional practitioners of microbiology.
- opportunities to develop the student's awareness of the beneficial and detrimental impacts of microorganisms in industry, medicine, agriculture and the environment.

3.2. Learning Outcomes

B.Sc. (General) Degree Programmes

On successful completion of the undergraduate study program with Microbiology as a full subject, the student should have gained knowledge given under six key areas:

- the nature, the behavior, and the diversity of microorganisms,
- the interactions between microorganisms and their habitats,
- the adverse effects of microorganisms causing human, animal and plant diseases,
- the importance of microbial activity in traditional and modern biotechnology,
- industrial scale production methods which utilize microorganisms,
- the importance of working independently and as a member of a team in a microbiological laboratory locally and in the world outside.

B.Sc. (Special)

In addition to the above areas, the students following the B.Sc. (Special) degree programmes should gain knowledge and understanding in seven more course modules spread over 3 - 4

years which are aimed at giving theoretical knowledge in most of the applied aspects of Microbiology and hands on experience of all useful techniques in microbiology both in and out side the university.

The areas are

- Applied Microbiology, Taxonomy of bacteria and microorganisms and viruses
- Microbial Genetics, Microbial physiology and Biochemistry.
- Environmental and Agricultural Microbiology.
- Food Microbiology, Food Hygiene and Food technology.
- Medical & Veterinary Microbiology and Biotechnology.
- Internship in Microbiology through which the students are expected to obtain vocational training in relevant industries or institutions which provide an opportunity for students to demonstrate their laboratory skills in microbiology related industries/institutions and to develop generic skills needed to work in the real world of work. Such collaborations with the industries/institutions strengthen links between the department and industries/institutions allowing a close interaction among departmental staff, students and professionals/scientists in the industries/institutes.

Research Project

The special degree students are expected to carry out a research project as a part of their degree programme. The students should be able to demonstrate the knowledge and understanding of scientific methodology, designing of microbiological experiments, analyzing the results obtained in the research project, presenting the outcomes of the project in a scientific forum and compiling a written report of the research project in an appropriate scientific format.

Programme Details

The DM contributes to the B.Sc. General Degree and B.Sc. Special Degree programmes of the Faculty of Science offering Microbiology as one of the major subjects. All the course units of B. Sc. General Degree Programs are taught by the academic staff of the DM. Assistance of visiting academics from other universities and research institutes are obtained to conduct lectures in some sections of the Special Degree course units.

4. FINDINGS OF THE REVIEW TEAM

These will be presented under eight aspects given in the introduction. Each aspect will provide the evidence gathered during the visit, highlight strengths, weaknesses and good practices along with recommendation and suggestion where needed.

4.1. Curriculum Design, Content and Review

The curriculum of the DM is designed to cater for the 3 year B. Sc. (General) degree program and to the 4 year B. Sc. (Special) degree program. A credit valued course unit system is in operation since 1994. An academic year consists of two semesters, semester 1 and 2 and the duration of each semester is 15 weeks. After fifteen weeks of teaching there is a three weeks study leave period after which written examinations are held within a period of three weeks.

The examinations of laboratory course units are held during the last week of study period or during the study period.

At the commencement of the program in the first year, all the Biological students are provided with a copy of the Faculty Handbook which contains syllabi of subjects offered in the Biological Science stream. The Handbook also includes information with regard to course structure and evaluation criteria and syllabi of subjects offered in the biological stream. The syllabi of each subject provides information pertaining to that subject specifically on core, compulsory, elective and non-credit compulsory course units. Inclusion of a non credit compulsory course unit such as English for communication and further studies and an elective course unit on Industrial training can be considered as a improvement in curriculum.

After admission to the University, during the period of orientation, students have the opportunity to meet the academic adviser to clarify problems pertaining to the combination of subjects they would be following in the University. Provision of this information at the commencement of academic program and presence of an academic advisor to provide guidance to the new entrants in selecting their subject combination is a good practice. However, the Review Team felt that it would much easier to the students if this Handbook could be provided to them before they come for the orientation program, as one week seemed to be inadequate to select the course units that are most appropriate for them.

Design

The design of the curriculum is very much similar to any other undergraduate Microbiology curriculum available in a university. Curriculum content reveals the adequacy of the academic standards of the degree program which enable students to achieve the intended learning outcomes in the form of knowledge and understanding of the subject matter and development of interpersonal and transferable skills. All students admitted to the Biological Science Stream of the University of Kelaniya should follow five compulsory Biology course units in Basic Microbiology (BIOL 11012), Introductory Biochemistry (BIOL 11033), Genetics (BIOL 11022), Biochemistry Laboratory (BIOL11041) and Computer Literacy (BIOL 11062) during their first year. Provision of these introductory course units in the first year would be very supportive in learning more advanced course units in the curriculum of the Microbiology Degree Program. Students who met the reviewers specifically mentioned about the difficulties in the Microbial Taxonomy course unit (MIBI 12014), which is a core course unit provided in their first year.

Review Team feels that a use of novel teaching methodology may help to overcome the boredom in learning this course unit. In general, the curricula of the offered courses are well designed to provide adequate knowledge in fundamentals of Microbiology as well as competence in applied areas of Microbiology.

Content

The main contents of the curricular are as follows.

General Degree Program

- Basic Microbiology includes historical development of Microbiology, the principles of Taxonomy and basic physiological characteristics of microorganisms techniques used in the study of microorganisms and the fundamental aspects of Microbiology related to food, water, soil and waste water treatment.
- Introduction to Applied Microbiology, Taxonomy of bacteria and microorganisms and viruses

- Microbial Genetics, Microbial physiology and Biochemistry.
- Environmental and Agricultural Microbiology.
- Food Microbiology, Food Hygiene and Food technology.
- Medical & Veterinary Microbiology and Biotechnology.
- Internship in Microbiology is offered to the General Degree students as an elective course unit through which the students are expected to obtain vocational training in relevant industries or institutions**.** At the end of this internship the students are expected to submit a comprehensive report which will be subjected to evaluation as a part of their degree programme**.**

Most of the course units have sufficient practical components, while some are supported by field visits and assignments. Although undergraduates get adequate knowledge of the subject matter through lectures and practical units relevant to the subject, in the conventional method of teaching less opportunities are available to put that knowledge into practice. This deficiency has been overcome by providing an elective course unit entitled "Internship in Microbiology "(MIBI 32052), which offers vocational training to students in relevant industry or institute. Consequently, this program gives an opportunity to students to gain experience in the world of work and simultaneously develop some basic operational skills which is often lacking in the traditional course unit system. The inclusion of an elective unit such as the above requires the students to be away from the University for some period. Therefore, this type of internship may not be very practicable due to the rigid time table that exists in the system. Nevertheless the course provider seemed to have accomplished this task successfully during the last couple of years. The Review Team found that the students are also satisfied with the existing elective course units especially because it provides them an opportunity to learn certain new areas which are not covered in the Microbiology syllabus. Therefore it is good practice.

Given below are the course units pertaining to special degree program

- Bacterial Taxonomy, Physiology & Biochemistry and Virology
- Microbial Genetics and Bio-Informatics
- Microbial Technology and Environmental Microbiology
- Food Quality Assurance, Food Safety and Food technology
- Medical Microbiology and Immunology
- Microbiological aspects in Agriculture, Fisheries and Special topics
- Microbiological aspects in Agriculture, Fisheries and Special topics
- Research project

Most of the topics under the special degree program are comprehensive and provide specialized knowledge in the most important areas of Microbiology. In addition to specified lectures, the special degree students are required to carry out a research project in their final year and submit a report. This provides the students not only an opportunity to gain experience in designing experiments and analyzing results but also to improve their communication ability, both oral and written. The reviewers considered that the undergraduate curriculum could achieve the set learning outcomes of the programme.

Review

The SER indicates that the Microbiology curriculum, course unit structure and contents of course units have been designed and reviewed periodically incorporating new course units and appropriate amendments to existing course units. Thus it is evident that the curriculum has evolved during the last ten year period. In 2002 revisions had been carried out after the symposium titled "Trends & Challenges in the field of Microbiology in Sri Lanka Industries" which had enabled the introduction of the Internship in Microbiology to the curriculum. In its preparation and revisions, in addition to members of the academic staff of the DM, personnel engaged in the industries related to Microbiology and past students too had been involved. Involvement of personnel outside the university in the preparation of the curriculum is a good practice.

The Review Team is of the view that the aspect of Curriculum Design, Content and Review is judged as GOOD.

4.2. Teaching, Learning and Assessment Methods

Teaching and learning activities of the DM have been designed to meet the aims and objectives of the course so that the graduate will have the knowledge, comprehension abilities, and application skills of all components in the curriculum such as Microbial Taxonomy, Physiology, Biochemistry, Microbial Genetics, Molecular Biology, Microbial Biotechnology, Environmental, Medical, Food and Agricultural Microbiology. The details of teaching learning and assessment methods for each course unit and final evaluation of the student's performance have been provided to all students in their handbooks at the beginning of the degree programme. All teaching activities are conducted in the English medium. .

The DM utilizes the knowledge and skills of the academic staff of the department, services offered by the department to other institutes and its ongoing research activities and the expertise of other universities and research institutions and relevant industries. The academic staff members are trained on diverse sub-disciplines of Microbiology which enhances the teaching/training capability of the department. Academic activities of the DM are done through a combination of lectures, practical classes, tutorials, computer assisted learning, student's presentations and training programmes in the industries. Presentation on industry related assignments and research projects in level 3 and 4 provide an opportunity for student centered learning in the field of Applied Microbiology to both general and special degree students. Both conventional and modern teaching/learning methods are used. Students have opportunities to make presentations and tutorials are held on selected topics throughout the study programme. Practical classes are conducted under close supervision in groups of 8-10 for first and second year students. Special degree students are provided with facilities to individually carry out experiments.

Students are provided opportunities to follow relevant optional course units. Computer assisted learning programmes have also been made available. Self learning and development of soft skills is promoted through literature surveys, collection of information from different websites and making PowerPoint presentations Students following the special degree course in microbiology also have a supervised research project in the 4th year which is evaluated. Study guides and laboratory manuals have been prepared for level 1, level 2 and 3 course units

Level 3 students (general and special) follow an elective course unit, "Internship in Microbiology" (previously known as industrial placement or implant training) during which students work in one of the microbiology related industries/institutes in Sri Lanka to obtain

work place experience and collect relevant information related to a given topic and submit a report on which they are evaluated. Currently, this is of 6 weeks duration for General Degree students. Arrangements are being made to increase the duration of the placement to 12 weeks. Special degree students will be doing their 'internship' in the 4th year from 2007 which will be of 12 weeks duration.

Assessment Methods

The assessment methods approved by the Faculty of Science are used to evaluate the student's performance for respective course units as indicated in the Faculty Handbook-Microbiology syllabus. These include continuous assessments and end of course examinations.

Question papers of the end of semester examinations are reviewed by moderators approved by the faculty board to ensure the quality of questions. The question papers are either structured (Level1) or essay type (Level 2 and above). The marks allotted for each question are indicated in the question paper. Answer scripts are marked according to the University guidelines using a marking scheme prepared by the First Examiner and approved by the Second Examiner. Randomly selected answer scripts are marked by a second examiner at levels 1, 2 and 3. All answer scripts of level 4 are marked by the Moderator/Second Examiner (External). The Head of Department reviews the distribution of marks with the examiners concerned before the marks are entered into the computer database.

It is the view of the Review Team that the present status of Teaching, Learning and Assessment Methods adopted by the DM can be judged as GOOD.

4.3. Quality of Students, including Student Progress and Achievements

Student Profile

Based upon the results of the G. C. E. A/L examinations, those who fulfill the requirements of the University Grants Commission are eligible to enter the University of Kelaniya and register at the Faculty of Science. Selection procedure to follow microbiology as a subject is also based upon the admission criteria currently used by the University Grant Commission i.e. merit 40%, District basis 55% , under developed areas 05% .

According to the SER there is a heavy demand among students to follow Microbiology as a major subject in their B.Sc. degree programme. However, only a limited number of students (50) could be accommodated in this program due to limitation of facilities. Therefore, only those who have high Z scores are selected among the students who apply to follow the microbiology course pathways. The following table that was given in the SER shows the Z-Score of the students who have been selected to follow microbiology in the academic years 2002/2003 to 2005/2006. It shows that students with highest Z-score score among the biological science students have gained admission to the Microbiology programme.

Table 1: Z-Score average of students selected to follow Microbiology as a major subject

Year	Range of Z-Score	Mean Z-Score
2002/2003 A	1.3364 - 1.7976*	1.5670
2002/2003	1.3498 – 1.7883*	1.5690
2003/2004	1.5418 – 2.0815*	1.8116
2004/2005	1.0020 – 1.9053*	1.4536
2005/2006	0.9419 – 1.7953	1.3686

* Highest Z-Score among biological science students.

However selection for special degree programme for Microbiology is based on the performance of students during the first two years and conforms to the Faculty selections criteria for special degree programmes as stated in section 3.1.2. of SER.

Nevertheless the student group that the reviewers met stated that they preferred if more students are selected to do the Microbiology degree program based on their first and second year examination performance. But Review Team understood that due to limited facilities available, the present number of special students cannot be increased and also that such an increase may lead to a degradation of the quality of the special degree.

Progress and Achievements

According to the SER the students entering the University have satisfactory level of English language competency. Yet the Faculty has started to offer a general studies course unit titled 'GNST 14082 English for Biology' which is compulsory for all biological science students in their first year. An advanced English course unit titled 'ELTU 22032 English for Communication and Further Studies' is offered in the level two with intention of further improving the English competency. The aim of this course is to improve the communication and English Language proficiency of the students that would enable them to reach a standard equivalent a TOFEL score of 500. These are positive steps taken to improve the standard of English of students, which in turn would assist them in following teaching programs conducted entirely in English medium by the DM.

It was evident at the discussion the Review Team had with second and third year students that the level of English competency among the current students following the Microbiology course was very high. Most of them were able to express themselves very confidently and fluently in English. However some students preferred if the medium of instruction is Sinhala in level one as they find it difficult to follow some courses, especially the Taxonomy course unit in the English medium. Nevertheless reviewers found that English competency of students is improved by the end of the programme.

BIOL 11062 Computer Literacy course unit offered at Level 1 is a compulsory course unit and this assists the students to acquire IT skills required for computer assisted learning (CAL), to use internet and to mange a small data base. The computer facilities received through the IRQUE project are being utilized effectively to upgrade the computer literacy of all students both general and special. This was evident from the high quality presentations made by the students.

In the SER it was stated that students of both general and special degree programs have achieved good results. According to information provided by the Head of the DM with respect to GPA of the subject, in the years 2001 and 2002, 40-46 % of the students had received A $^{-}$ or above while 30 -33 % had received B $^{+}$ to B $^{-}$ range grading and 10 or less than 10% of students had received D and E grading. A more realistic analysis would have been possible if the GPA of students who offered Microbiology in the years 2001 and 2002 was given. During the last eight years about 400 students have graduated with microbiology as full subject. Of them eleven First and seventeen Upper Second Classes had been awarded. However on the basis of these results, student progress appears to be satisfactory. Apart from undergraduate students about 100 postgraduate students had been awarded Master's degree qualifications since the inception of the DM01.

Sarojinee Jayawardena Gold Medal and Sarojinee Jayawardena cash prize are two awards offered to students who qualify with First Class Honours for the Special Degree in Microbiology and highest class in B. Sc. General Degree respectively. These awards had been granted to several students who had reached the required standard as stipulated in the

by-laws. Such awards would definitely boost up the enthusiasm of students in the subject which would result in enhancing their performance as well. This is a good practice.

Employment record of graduates who had offered Microbiology as a subject is an indicator of their achievements. Most of the graduates have gained employment in Research Institutes, Agricultural sector organizations and in industries such as Food and Beverages and Water and wastewater treatment plants.

It is the view of the Review Team that the Quality of Students including Student Progress and Achievements can be judged as GOOD.

4.4. Extent and Use of Student Feedback, Qualitative and Quantitative

Students' feedback is obtained by DM at various forums about the quality of academic programmes, teaching and learning processes and the quality of other facilities. The DM adopted a method to get the students' feedback quantitatively by using an evaluation form (Questionnaire – Annex 5). The questionnaire is given to the students at the end of each course of lectures where major criteria used for evaluation are (i) learning experience, (ii) preparedness and organization of the lecturer, (iii) clarity (iv) interaction of the lecturer, (v) use of writing board & projectors, (vi) task orientation (vii) pace of lecturer, (ix) support of tutorials & mid term tests, and (x) overall grade. The Review Team found that a majority of students have expressed good (3) on a scale of weak (1) fair (2) good (3) and very good (4).

The questionnaire also has carried another page inviting comments on four issues: (1) What was the most satisfactory aspect of the lecture series? (2) What were the main weaknesses of the lecture series? (3) How to improve the lecture series? and (4) any other comments. Majority of the students made comments requesting for other facilities such as more tutorials, practicals, etc. The teachers observed these responses and comments made in the questionnaire and take steps to improve the quality of teaching and teaching environment. The findings were discussed with the Head or at departmental staff meetings for others to share the information for further improvement. The Review Team found that the good practices initiated in the quantitative students' feedback can be further strengthened if the responses of the students were statistically analyzed. It is also suggested that all the academics including the visiting faculties too to follow this good practice.

It was also revealed to the Review Team at the meetings with the staff that the DM acquires students' feedback qualitatively at the discussions in the laboratory sessions/tutorials where a close interaction is possible. Students also stated that they express their view at the Faculty Board meetings or to the Head of the Department or Dean of the Faculty on curriculum revision, selection criteria for special degree from time to time whenever necessity arises. At these occasions students' suggestions on all matters of quality of education were received by the authorities.

It is the view of the Review Team that the Extent and Use of Student Feedback by the members of the staff of the DM can be judged as GOOD.

4.5. Postgraduate Studies

The DM conducts two master degree programmes, Master of Science (M.Sc) in Applied Microbiology programme and M.Sc in Food & Nutrition. The M.Sc. in Applied Microbiology commenced in 1980 with the vision of dissemination of knowledge and research skills in the field of General & Applied Microbiology through science based graduates. The mission of the Food & Nutrition M.Sc. Degree programme is to develop

human resources and to expand and transfer knowledge for continuous improvement of the safety, quality and value of food and in general, the health of the community. The duration of each programme is two years of which the first year the students attend lectures, laboratory practical classes, field studies, and seminars. During their second year, each student conducts a research project on a selected topic under the supervision of a Senior Academic Member of the DM appointed as an Internal Supervisor. 43 students have registered for the MSc in Applied Microbiology of which 42 completed the course. All 28 who registered for the course in Food and Nutrition completed the course. The last new intake was in 2002. Review of the curriculum has been done in 2006 with a view to recommencing the 2 programmes in 2008.

Research Degrees

The DM also provides opportunities for the postgraduate students to read for Master's degrees and Doctoral degrees (PhD) by research. These progarmmes have been funded by University Grants Commission, National Science Foundation, Indo-Sri Lanka collaboration and Asian Development Bank at present. The Review Team noted that during the past 10 years there had been 3 completed M.Phil. degrees.

It is the view of the Review Team that the status of Postgraduate Studies of the DM can be judged as SATISFACTORY.

4.6. Peer Observation

The DM follows a procedure to observe the theory class teaching of an academic staff by another member of the department on mutual arrangement where one delivers the lecture and the other reviews (observe) the lecture. The reviewer gives his/her comment on a prescribed form called Peer Review Report (Annex 6) which comprises seven items viz. (i) punctuality, (ii) audio visual aids, (iii) teaching, (iv) student interaction/active participation (v) student responses/satisfaction, (vi) learning/teaching environment, and (vii) review's opinion. The reviewer comments on each of the seven items. The reviewer and lecturer thereafter take each item and attend to the comment(s) made by the reviewer.

This peer observation report could be obtained at least once a semester for a course of study for an academic and the progress has to be monitored. The peer observation process practiced by few academics may be extended to all the academics and part-time & visiting staff where the Head of Department should be very tactful in this very sensitive matter. Peer observation of practical classes is another matter to be attended in the future. The reports of the peer observation and students feedback have to be correlated to the Staff Development Programme required for an academic staff member.

The practices such as moderation of question papers, second marking of the answer scripts are carried out. Evaluation of the presentation, viva and research project seminar is also done by a group of academic staff. The comments made by the external moderator, second marking examiner and external member in viva and other presentation has to be taken up at staff meetings for further improvement in the quality of teaching and evaluating processes.

In the opinion of the Review Team Peer Observation could be judged as SATISFACTORY.

4.7. Skills Development

There are many opportunities for students to develop a variety of skills during the undergraduate programme. Practical (bench) skills in microbiology are taught through a well thought out and structured programme of practicals during the 3-4 year degree course. In

spite of resource restrictions, students are given the opportunity to attain hands on experience in basic microbiological techniques. Close supervision of practicals, continuous assessment and end semester practical examinations ensure that students attain the required bench skills.

The 'Internship" programs increases the students' opportunities to practice and develop microbiological skills in a 'real life' situation. In addition, this component of the programme provides an excellent medium for developing skills in relating to coworkers and supervisors outside the university environment. Through this programme, students are also presented with an opportunity of working on and improving their communication, management and problem solving skills.

Many opportunities are provided during the course (general and special degree) to develop and improve the IT skills of the student. Adequate facilities are made available to the student for practice of skills such as obtaining information through the Internet, preparing power point presentations, writing using the computer etc.

Special degree students in their 4^{th} year work on a research project which involves choice of subject, preparation of project proposal, experimental work and writing up the dissertation. All these activities greatly contribute to the developing of research skills of these students.

The Review Team judges the Skills Development at the DM as GOOD.

4.8. Academic Guidance and Counseling

Senior academic staff members of the DM have been appointed as Academic advisors (03) and student counselors (02). The Student Handbook and University Calendar are made available and are updated annually. Every student has the opportunity to meet the Academic advisor or any academic staff of the department to obtain advice regarding selection of subject combination and special degree. Freshers at the beginning of the university were given an orientation programme where the Dean of the Faculty, Director of the Student Counseling Unit, Student Counselors, Heads of departments and Academic Advisors addressed the new comers and gave appropriate guidance.

Whenever the students face personal problems they meet the student counselors or any members of the academic staff of the department to find out a solution. For professional counseling, students approach the Director of the university student counseling unit. The Director is a full time officer and a trained counselor. For health related problems, students approach the University Medical Officer. Whenever students encounter financial or accommodation problems, the Student Counselors direct the students to the welfare section of the university for assistance. The DM also organizes many welfare activities for the benefit of the students.

Regarding career development, the Career Guidance Unit conducts seminar with participation of prominent people from the industry to give guidance and views on how to select a career when the students graduate. This is further strengthened by the interaction of staff and students of the department with industry. The senior staff of the DM are involved very much with research and development activities of several industries. At the same time the DM also offers services to industries. This leads to a high level of personnel contact of staff of the department with their counter parts in industries and as a result special students of the department have good employment opportunities when they graduate. The Review Team noted that the general degree undergraduates too are given opportunities for industrial/internship training to enhance their practical training and employability.

The Review Team judges the Academic Guidance and Counseling as GOOD.

5. CONCLUSIONS

1. Curriculum Design, Content and Review

Strengths/Good Practices

- The curriculum has been designed to cover major aspects of Microbiology
- Elective course unit on Internship in Microbiology gives students a hands-on experience in industries related to Microbiology.
- Provision of information with regard to the course contents, options and assessment methods at begin of the program

Weaknesses

None

2. Teaching, Learning and Assessment Methods

Strengths/Good Practices

- Well constructed and comprehensive course
- Lectures available on web
- Introduction of the 'Internship in Microbiology'
- Laboratory manuals available for practicals
- Very adequate and well supervised practical instruction
- Though practicals are performed in groups of 6-8, individual students have opportunity for hands on bench work during the course.
- At Level 4, more individual learning strategies have been introduced and staff student interaction is greatly enhanced by the inclusion of the research project, seminars and small group discussions.

Weaknesses

None

3. Quality of Students, including Student Progress and Achievements

Strengths/Good Practices

- High demand among students to follow Microbiology as the major subject. Students having high Z-scores are selected to follow Microbiology.
- At the end of program the graduates have been able to find employment fitted by their qualification with out much delay. Most of the graduates have found employment within six months.
- Several students have been able to receive gold medals and cash prizes awarded annually by the DM. This increases the motivation of the students.
- Majority of the students who interacted with Review Team were able to express them very fluently in English.

Weaknesses

None

4. Extent and Use of Student Feedback

Strengths/Good Practices

- DM obtain students' feedback quantitatively by using an evaluation form (questionnaire)
- The findings of the student feedback were discussed with the Head or at departmental staff meetings.

Weaknesses

- Lack of statistical analysis of the responses of the students
- All the academics including the visiting faculties too to follow this good practice

5. Postgraduate Studies

Strengths/Good Practices

- 2 taught postgraduate courses.
- Good feed back from those who were interviewed
- 3 completed M.Phil degrees in past yen years.

Weaknesses

- No course since 2002
- Students took more than 2 years to complete

6. Peer Observation

Strengths/Good Practices

- Procedure to observe the theory class teaching of an academic staff by another member of the department
- Prescribed form called Peer Review Report.

Weaknesses

- Peer observation process not extended to all academics and part-time & visiting staff
- Peer observation not extended practical classes.

5.7 Skills Development

Strengths/Good Practices

- Many opportunities for developing bench skills
- Many opportunities to develop IT, presentation and writing skills
- Research project for Special Degree students good opportunity to develop research skills

Weaknesses

None

5.8 Academic Guidance and Counseling

Strengths/Good Practices

- Availability of updated students' Handbook and University Academic Calendar
- Organized student guiding and counseling system
- The Director of the Student Counseling Unit is a full time officer and a trained counselor.

Weaknesses

None

The judgment given for the eight aspects of the subject review are summarized below.

Aspect	Judgment
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	Satisfactory
Peer Observation	Satisfactory
Skill Development	Good
Academic Guidance and Counseling	Good

The overall judgment is suspended

Acknowledgements

The Review Team appreciates the excellent working arrangement made by the DM during the review visit. The staff members understand about the review process and displayed all necessary documents to assist our review. Whenever the Review Team needed more information or documents the Head of the DM and the academic staff provided the same. The non-academic staff too facilitated our process with the common objective towards the development of the department. The Review Team is grateful to all the categories of staff in the DM for the support given during our visit.

6. RECOMMENDATIONS

The Review Team would like to make the following recommendations in order to improve the quality of education in the DM.

- The DM may consider attracting more students to do postgraduate programmes leading to M.Phil and Ph.D. as the department has the necessary man power and infrastructure. Increased research culture would uplift the teaching and recognition of the department. In turn, this recognition would bring more research students to the department.
- Postgraduate students must be encouraged for greater interaction amongst themselves in the Faculty, University and with industry by the way of presentation, meetings and seminar on regular basis to share knowledge, idea and experience.
- It is recommended that peer observation be extended to all academic staff and for practical classes as well.
- The comments, suggestions and other feedback obtained from the moderators of the question papers and second examiner, both local and foreign need to be taken up for discussions at appropriate forums such as result boards, departmental meetings and curriculum review committee meeting.

7. ANNEXES

Annex 1. AGENDA FOR THE REVIEW VISIT

Day 1: 13th March 2007

0830 – 0900 Private meeting with QA Specialist
0900 – 0930 Meeting the Head of Dept and Dean
0930 – 1030 Discuss the agenda for the visit (working tea)
1030 – 1230 Presentation of self evaluation report with discussion
1230 – 1330 Lunch
1330 – 1430 Observing Departmental facilities
1430 – 1530 observing Documents (woring tea)
1530 – 1630 Meeting with Department academic staff
1630 – 1730 Meeting with undergraduate students
1730 – 1830 Meeting of Reviewers

Day 2: 14th March 2007

0900 – 1000 Observing Other Facilities (Library, Computer Centre, etc)
1000 – 1100 Meeting with Student Counselors, Academic Advisors and Personal Tutors
1100 – 1200 Meeting with technical staff and other non academic staff
1200 – 1230 Observing Students' Presentations
1230 – 1330 Lunch
1330 – 140 Meeting with Postgraduate Syudents
1430 – 1500 Meeting with Special Degree Students
1500 – 1530 Observing Documents
1530 – 1630 Meeting with Head and Staff for Reporting (Working tea)
1630 – 1730 Meeting of Reviewers

Day 3: 04th July 2007

08.30 – 09.00	Meeting of Review Panel
09.00 – 09.30	Observing Teaching – Lecture
09.30 – 10.00	Tea
10.00 – 11.00	Observing Teaching – Practical
11.00 – 12.00	Meeting with Special students
12.00 – 13.00	Meeting with General students
13.00 – 14.00	Lunch
14.00 – 14.30	Reviewers Discussion
14.30 – 15.30	Reviewers meeting with Academic staff
15.30	Report Writing

Annex 2. LIST OF DOCUMENTS OBSERVED BY THE REVIEW TEAM

Ref. 1: Syllabi 1990 – 2004/2005.

Ref. 2: Industry/Institution Visit Reports.

Ref. 3: Special Student's Research Project Reports.

Ref. 4: Lecture guides and Laboratory Manuals.

Ref. 5: Practical Handouts

Ref. 6: In-plant training reports.

Ref. 7: Syllabi of Biological Science Stream pages 74-90.

Ref. 8: Question papers, marking schemes and moderators comments.

Ref. 9: Marked answer scripts.

Ref. 10: Undergraduates Employment Records.

Ref. 11: Staff-Student Committee Meeting & Staff Meeting minutes.

Ref. 12: Teacher Evaluation feedback and Student Counselor's comments on Teacher Evaluation.

Ref. 13: Internship Evaluation Questioner.

Ref. 14: Peer evaluation records

Ref. 15: Student's Handbooks of M.Sc. in Applied Microbiology and M.Sc. in Food & Nutrition.

Ref. 16: CCF Reports.

Ref. 17: Training programme documents.

Ref. 18: Services to the other institutes documents.

Ref. 19: Technical and Technological Aspects of Biosafety, report submitted to the National sub committee on technical and technological aspects, National Biosafety Framework.

Ref.20: List of Examiners and Allocation of Lectures/Practical/Tutorials.

Ref.21: Academic Support Staff Training.

Ref. 22: Internship arrangements.

Ref. 23: Indo-Sri Lanka collaboration programme.

Ref. 24: Computer laboratory logbooks.

Ref. 25: Course unit marks sheets (Results).

Ref.26: IRQUE documents.

Ref.27: Records of Student counselors and personal tutors.

Ref. 28: Student's practical record books & continuous assessment records.

Ref. 29: Appeals committee minutes.

Ref. 30: Alumni survey records.

Ref. 31: Amendments to the postgraduate programmes.

Ref. 32: Postgraduate thesis.

Ref. 33: M. Phil and PhD thesis.

Ref. 34: Water & Waste water treatment documents.

Annex 3. SKILLS DEVELOPMENT

1.1. Subject Specific Skills

The students are given practical exposure for each and every theory course unit and are guided by comprehensive laboratory manuals and practical handouts prepared by the Academic Staff of the department. **(Ref. 4 & 5)**

MIBI 32062: Industrial Microbiology Laboratory course unit provides students with practical skills required to work safely in a microbiological laboratory, competency in a range of standard microbiological techniques, making appropriate observations, accurate recording of data, analysis and interpretation of results **(Ref. 1)**.

The curriculum revision carried out after the symposium held in 2002 titled 'Trends & challenges in the field of Microbiology in Sri Lankan industries' introduced MIBI 32052: Internship in microbiology course unit. The information gathered from the industry professionals, alumni members and students feedback have been considered for the introduction of this course unit. The course programme is coordinated by National Apprentice Industrial Training Authority (NAITA), the Government statuary body for the implementation of students training programmes in local industries **(Ref. 22)**.

Moreover, MIBI 32052 course unit provides students with a valuable opportunity to learn how to apply their knowledge and skills to a real workplace environment. The course unit also helps them to develop interpersonal skills, communication abilities, leadership properties, and to understand work-ethics that are some of the traits considered by the employers.

MIBI 43088: Research project. The students follow B.Sc. Special Degree course in Microbiology (Level 4) are required to carryout a research project under the supervision of one of the academic staff members or the academic staff member and a supervisor appointed by the department from other institution. The students are expected to submit dissertation after completion of the research project. This enables the students to gain experience on research in an area of their preference. It develops laboratory and transferable skills, analytical and presentation skills and encourages self-reliance **(Ref. 1 & 3)**.

1.2. Communication and ICT Skills

The two English course units; GNST 14082: English for Biology and ELTU 22032: English for communication and further studies are being taught to Level 1 and Level 2 students. Both are compulsory but not counted for GPA **(Ref. 1)**. These course units helps students to improve their communication skills and English language proficiency. Successful completion of these course units the students may be able to reach standard equivalent to a TOFEL score of 500.

BIOL 11062: Computer Literacy. The course unit offered at 'Level 1 first semester' is compulsory and counted for GPA **(Ref. 1)**. After completion of this course unit the students will acquire IT skills required for computer assisted learning, to use of the internet/email and to create and manage a small biological database.

Computer Aided Teaching and Learning (CAL): The students are provided computer facilities in the computer laboratory and the students from Level 1 second semester onwards are utilizing these facilities effectively. At present, CAL is embedded in the following course units, MIBI 12014; Virology, MIBI 21014; Microbial Genetics, MIBI 43026; Microbial Genetics and Bioinformatics. Moreover, from Level 3 the students are encouraged for self learning through literature surveys, collection of information from different websites and making PowerPoint presentations **(Ref. 1, 4 & 24)**.

An e-learning system has been developed using the open source software 'moodle' and is available to students. This system includes Lecture guides, course structures and computer animations and simulations. These activities enhance their ICT skills and learning process **(Ref. 1 & 24)**.

Annex 4. ACADEMIC GUIDANCE AND COUNSELING

1. Student Counsellors and Academic Coordinators of the department

All new students entering to the University are given an induction programme during which the students receive guidance on the selection procedures for different subject combinations in the degree programmes, prospectus, facilities and course units available in the department.

The students are assisted to familiarize with the departmental library and computer center through the Student Counselors, Academic Coordinators and Personal Tutors in the department during this period **(Ref. 27)**.

2. Student Counsellors of the University

The team of student counsellors, who are the members of the academic staff provide their services voluntarily for student welfare activities of the university. In addition to providing guidance and counselling, they organize many welfare activities for the benefit of students. This team is headed by the Chief Student Councellor, who is assisted by Senior Student Counsellors and Student Counsellors **(Ref. University of Kelaniya – Calendar 2006)**.

3. Student Counselling Unit (SCU) – Kalana Mithuru Sevana

The staff of the SCU consists of a Director and several Academic Counsellors who have experience and knowledge in psychological counseling. The aim of the unit is to help the students to gain greater awareness of their ability to cope with whatever the problems they might face in their university life. This aim is trying to achieve by personal counseling **(Ref. University of Kelaniya – Calendar 2006)**.

4. Career Guidance Unit (CGU)

CGU plays a key role in preparing the students for work place environment. Employers, nowadays, look for a range of interpersonal skills. The CGU attempts to develop these skills of the graduates by

- Empowering students to identify and work towards their future goals through the provision of appropriate information, guidance and advice, skill development, training and job placement services,
- Maintaining close links with employers, both of state and private sector and
- Providing a range of services and facilities to assist undergraduates in finding employment **(Ref. University of Kelaniya – Calendar 2006)**.

Annex 5. **QUESTIONNAIRE FOR TEACHER EVALUATION**

Course Unit:..... **Name of Teacher:**

The following questionnaire is designed to help the lecturer to determine the effectiveness of the lecture series. Your responses will be useful for the lecturer to conduct his lectures most effectively during forthcoming semesters. Your genuine responses are most valued for this purpose. Please do not write your name. Your answers would be strictly confidential- Approximate time expected for the completion of this questionnaire is 20 minutes.

1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree

Draw a circle **around your response** (number/word) which most accurately reflects your view on that item.

1. The learning objectives were clearly explained at the commencement of the course unit.	1 2 3 4
2. The lecturer came prepared for the class.	1 2 3 4
3. The lectures were well organized	1 2 3 4
4. The lecturer was very clear in his/her teaching and was easy to understand.	1 2 3 4
5. Lectures were clearly audible (heard).	1 2 3 4
6. The speed of lecturing was right for me.	1 2 3 4
7. Method of lecturing held my attention	1 2 3 4
8. Used the audio visual equipments when necessary	1 2 3 4
9. Used cases and/or examples to give practical insight.	1 2 3 4
10. Students were encouraged to ask questions.	1 2 3 4
11. Attempted to involve students in the learning process.	1 2 3 4
12. Additional activities outside the class were recommended.	1 2 3 4
13. Assignments have been helpful in understanding the subject matter.	1 2 3 4
14. Interest in the subject was stimulated.	1 2 3 4
15. New and useful knowledge was gained by following the course unit	1 2 3 4
16. Given the opportunity, I would like to take another course unit with the same lecturer.	1 2 3 4

Overall grade for the lecturer: Weak Fair Good Very Good

Any other comments related to teaching of this course unit:

Annex 6. ACADEMIC PROGRAM SESSION MONITORING

Student batch: **Academic year:** **Semester:** **Module:**

1. **Name of the Facilitator/ Instructor:**
2. **Topic:**
3. **Time:** **Venue:**
4. **Type of activity:**
   Lecture / Seminar / Small Group Discussion (SGD)/ Clinical case Review (CCR)
   Practical / Round up session / Poster presentation / Independent learning Time (ILT)

   OR any other (specify)
5. **Punctuality**
6. **Audio Visual aids -** OHP
   - Multimedia
   - Sound
   - Slides
   - Power supply
7. **Teaching -** Providing learning objective to students
   - Content in relation to objectives
   - Clarity of speech / language used
   - Capture of the attention of students
   - Encouragement for active participation of students
8. **Student interactions /active participation:**
9. **Student responses / satisfaction:**
10. **Learning / teaching environment:**
11. **Review's opinion:**

Name of the reviewer: **Signature:** **Date:**

Annex 7. RESEARCH PROJECT EVALUATION

UNIVERSITY OF KELANIYA - SRI LANKA

FACULTY OF SCIENCE

Bachelor of Science (Special) Degree Examination - 2006

Academic Year: 2004/2005

Department of Microbiology

MIBI 43088 - Research Project evaluation

1. Title of the thesis:

2 Name of the student:

3 Marks (Total - 100 marks):

ABASRACT (Marks out of 05) =

INTRODUCTION (Marks out of 10) =

MATERIALS & METHODS (Marks out of 05) =

RESULTS (Marks out of 25) =

DISCUSSION (Marks out of 30) =

Oral Presentation (marks out of 25) =

1. Comments (Separate sheet may be used, if the space is insufficient):

Examiner's signature:

Name:

Date: