SUBJECT REVIEW REPORT

DEPARTMENT OF CHEMISTRY

FACULTY OF SCIENCE
UNIVERSITY OF KELANIYA

26th to 28th June 2007

Review Team :
Prof. R. N. Pathirana, University of Ruhuna
Prof. W. D. W. Jayatilake, University of Sri Jayewardenepura
Prof. V. Karunaratne, University of Peradeniya

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1. SUBJECT REVIEW PROCESS

Introduction

University accountability for quality and standards is a key factor in promoting and safeguarding public confidence in Sri Lankan higher education. As higher education is a public good, universities must conscientiously exercise their responsibility for quality and standards. Subject Review evaluates the quality of education within a subject or discipline. It deals with eight aspects on the quality of student learning experience, their skills development and achievement for 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 (QAA) Council of the UGC is now conducting Subject Review and Institutional Review programmes in Sri Lankan universities. Prof. Colin Peiris, Quality Assurance Specialist of the QAA Council by a letter dated 19th May 2007 notified that the following team has been appointed to perform the Subject Review of the Department of Chemistry, University of Kelaniya from 26th to 28th June 2007.

Prof. R. N. Pathirana,University of Ruhuna.

Prof. W. D. W. Jayatilake, University of Sri Jayewardenepura

Prof. V. Karunaratne, University of Peradeniya

The important features of the Subject Review process are the preparation of Self Evaluation Report (SER) by the department concerned on the discipline(s)/programme(s) they offer, and the evaluation by the subject review team (Review Team) on the student learning experience and their achievement in the subject(s)/programme(s) according to the aims and learning outcomes stated in the SER.

Self Evaluation Report of the Department of Chemistry (DC), University of Kelaniya, prepared in 2007 was submitted to the members of the Review Team with the letter dated 19th May 2007 requesting the team to perform the Subject Review. It contained 05 pages on aims, learning outcomes and programme details, 04 pages on staff, student and facilities, 05 pages on curriculum design, content and review, 03 pages on teaching, learning and assessment methods, 02 pages on quality of students, 02 pages on student feedback, 01 page on postgraduate studies, 01 page on peer observation and skills development and 02 pages on academic guidance and counselling. The total pages are 26.

Review Visit

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

On 26th June 2007 at about 9.00 am the Review Team arrived at the University and met Dr. K.A.S. Pathiratne, Head of the DC along with Prof. S. Mohandas, consultant QAA and Prof. Colin Peiris, Quality Assurance Specialist of the QAA Council. The Review Team met the Dean on the 26th morning. Later, on 26th morning senior academic staff members were also present with the Head of the DC to welcome the members of the Review Team. The agenda for the review process was finalized. Thereafter, the Head of the DC gave a presentation which concisely covered the matters referred in the SER in the presence of all the members of the academic staff of the department. The review process was thereafter progressed according to the agenda.

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

- Dean of the Faculty of Science
- Head of the DC
- Academic staff members of the DC
- Non-academic staff members of the department
- Undergraduate students
- Post-graduate students
- Student Counsellors and Personal Tutors
- Academic Advisors of the Physical Sciences and Biological Sciences stream

The Review Team visited the following places of the DC for observation.

- Laboratories
- Department Library
- Postgraduate Library
- Faculty Library
- Computer Laboratory
- Lecture Halls
- Instrument rooms
- Glass-blowing facility

The Review Team also went through the following documents.

- University Handbook, Faculty Handbooks for Biological Sciences and Physical Sciences
- Copies of lecture and practical handouts
- Copies of tutorials
- Student feedback
- Marking schemes
- Answer scripts marked by examiners
- Comments sent by external moderators of examination papers
- Mark sheets with formulation of grades
- Minutes of the department academic staff meeting

Review Judgments and Outcomes

The Review Team at the end of the 3rd day of the visit, made judgments on each of the eight aspects namely

1. Curriculum design, content and review
2. Training, learning and assessment methods
3. Quality of students including student progress and achievement

4. The extent and use of student feedback, qualitative and quantitative
5. Postgraduate studies
6. Peer observation
7. Skills development, and
8. Academic guidance and counselling.

These eight aspects were judged as ***Good, Satisfactory or Unsatisfactory***.

A comprehensive subject review draft report is submitted by the Review Team to the department through the QAAC within one month duration of the review visit. This report clearly highlights the strengths and good practices found and describe any weaknesses identified giving evidence to support the judgments made. If any aspect is found to be ***Unsatisfactory***, action should be taken by the department concerned to remedy the problems identified within six months and report accordingly to the QAA Council. Finally the review report is published.

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

The University

The University of Kelaniya has its origin in the historic Vidyalankara Pirivena established by Rev. Ratmalana Dharmaloka in 1875 as a centre of learning for Buddhist monks. It was located in Peliyagoda in Kelaniya. With the establishment of modern Universities in Sri Lanka in the 1940s and 1950s, the Vidyalankara Pirivena became the Vidyalankara University of Ceylon in 1959, later the Vidyalankara Campus of the University of Sri Lanka in 1972 and finally, the University of Kelaniya in 1978.

University of Kelaniya is one of the major national universities. It is located just outside the municipal limits of Colombo, in the ancient and historic city of Kelaniya. It possesses six faculties and three affiliated institutions. The six Faculties are as follows.

1. Faculty of Commerce and Management Studies
2. Faculty of Humanities
3. Faculty of Medicine
4. Faculty of Science
5. Faculty of Social Sciences
6. Faculty of Graduate Studies

The Faculty of Medicine is located at Ragama while the other faculties are located in the main campus at Dalugama.

The three institutes affiliated to the University of Kelaniya are as follows.

1. Postgraduate Institute of Pali and Buddhist Studies
2. Postgraduate Institute of Archaeology
3. Gampaha Wickramarachchi Ayurveda Institute

The Post graduate Institutes of Pali and Buddhist Studies and Archaeology are located in Colombo while the Gampaha Wickramarachchi Ayurveda Institute is located in Yakkala.

In addition to the affiliated institutes there are three accredited institutes to University of Kelaniya as given below.

1. Naval and Maritime Academy of Sri Lanka Navy, Trincomalee
2. Junior Command and Staff College of Sri Lanka Air Force, Trincomalee
3. Staff College of Sri Lanka Army, Sapugakande

The university has an in-campus student population of about 8300 undergraduates, about 5400 postgraduates, about 700 in the institutes and about 45,000 off-campus students who are following degree programmes in the open and distant mode.

University of Kelaniya was one of the first universities to begin teaching Science in Sinhala and also first to restructure the traditional Arts Faculty into three separate Faculties of Humanities, Social Sciences and Commerce & Management Studies. It is also one of the first universities to introduce the credit based course unit structure for academic programmes. It also has several departments which are unique only to the University of Kelaniya. These include the Department of Industrial Management and Microbiology in the Faculty of Science. Departments of Linguistics, Fine Arts, Modern Languages and Hindi in the Faculty of Humanities; and the Departments of Mass Communication and Library & Information Sciences in the Faculty of Social Sciences.

The Faculty of Science

The Faculty of Science started functioning in October 1967 and the formal approval for the Faculty was given by the Minster of Education in 1968. Actual planning for the setting up of a Faculty of Science at the University of Kelaniya was done by Professor Milo Wolff, a Physicist who arrived in early 1966 through the auspices of the Asia Foundation. The Faculty was intended to be different in outlook and orientation form the conventional Faculties of Science then is existence. The rationale behind was to produce Science graduates with an expertise and training to cater for the industrialization efforts of Sri Lanka.

The Department of Mathematics headed by Dr. S. B. P. Wickramasuriya existed in the Faculty of Arts before the establishment of the Faculty of Science. With the establishment of the Faculty of Science in 1967, the Chairs in Chemistry, Physics and Zoology were filled. Professor Charles Dahanayaka who was the new appointee to the Chair in Physics became the first Dean of infant Faculty. The first batch of students numbering 57 was admitted in October 1967.

The Faculty was located in the main building known as the "Science Block". A new lecture theatre complex and an auditorium were constructed in 1992 to enable the faculty to increase the student intake from year to year. A new laboratory complex for the Department of Chemistry and three buildings for the Departments of Industrial Management, Microbiology and Zoology were constructed by 2003. The present annual intake of students to the Faculty is 510.

The Faculty of Science consists of eight departments viz. Botany, Chemistry, Industrial Management, Mathematics, Microbiology, Physics, Zoology and Statistics & Computer Science and offers the following six B. Sc. Degree Programmes.

- B.Sc (General) Degree Programme of 3 years duration
- B.Sc (Special) Degree Programme of 4 years duration
- B.Sc. Management & Information Technology (MIT) (General) Degree Programme of 3 years duration

- B.Sc. Management & Information Technology (MIT) (Special) Degree Programme of 4 years duration
- B.Sc. Environmental Conservation & Management (ENCM) (General) Degree Programme of 3 years duration
- B.Sc Environmental Conservation & Management (ENCM) (Special) Degree Programme of 4 years duration

The B. Sc. Degree can be obtained in two streams, viz. the Biological Science stream and the Physical Science stream. The subjects offered in the Biological Science stream are Botany, Chemistry, Computer Studies, Microbiology, Molecular Biology & Plant Biotechnology and Zoology and those offered in the Physical Science stream are Applied Mathematics, Chemistry, Computer Studies, Electronics, Physics, Pure Mathematics and Statistics & Computer Science, Information Technology and Management. Course units in Pure Mathematics are offered in the B.Sc. MIT Programme. Course units in Environmental Science, Zoology, Chemistry, Microbiology and Botany are offered in the B.Sc. ENCM Programme. In addition, the students of the Biological Science stream can offer auxiliary course units in Industrial Management, Physics, Pure Mathematics and Statistics & Computer Science and those in the Physical Science stream can offer auxiliary course units in Botany, Industrial Management and Zoology.

At present, the Faculty offers the following B. Sc. (Special) degree programmes.

- Botany
- Chemistry
- Mathematical Physics
- Mathematics
- Microbiology
- Molecular Biology & Plant Biotechnology
- Environmental Conservation & Management
- Industrial Management
- Management & Information Technology
- Physics
- Statistics & Computer Science
- Zoology

The above academic programmes of the Faculty operate on a credit based Course Unit System within a two-semester academic year with the end of semester examinations.

The Faculty of Science also offers several postgraduate degree programme and they are as follows.

- M.Sc. in Applied Microbiology
- M.Sc. in Aquaculture & Fisheries Management
- M.Sc. in Biodiversity & Integrated Environmental Management
- M.Sc. in Computer Science

- M.Sc. in Environmental & Industrial Chemistry
- MSc. in Food & Nutrition
- M.Sc. in Management & Information Technology

Moreover, the Faculty conducts four postgraduate diploma programmes, namely Postgraduate Diploma in Environmental Management, Postgraduate Diploma in Industrial and Business Management, Postgraduate Diploma in Management & Information Technology and Postgraduate Diploma in Teaching Mathematics.

The Faculty also has facilities to conduct research leading to M. Phil. and Ph. D. degrees.

The Department of Chemistry

The Department of Chemistry (DC) was established along with the inauguration of the Faculty of Science in September 1967. In that year the total number of students enrolled to follow Chemistry was 34 with 2 members in the academic staff and one laboratory. Today, the DC serves 606 B.Sc. (General) degree students. The DC also offers selected number of course units from the B.Sc. (General) degree for 50 students following the B.Sc. Degree in Environmental Conservation and Management. The B.Sc. (Special) degree programme in Chemistry is followed by 30 students of whom 18 are in the third year and 12 in the forth year (final year).

The information provided by the DC revealed that the students selected to the Chemistry Special Degree programme for the past five years earned much higher marks from the minimum average requirement laid by the Faculty which is B grade for all courses.

All the programmes in Chemistry are conducted according to the course unit system similar to other departments in the Faculty of Science and the academic year consists of two semesters, each of 15 weeks duration.

The teaching staff of the DC consists of two professors, one associate professor, six senior lecturers (Grade I), seven senior lecturers (Grade II), and three probationary lecturers. Details are given in Table 1.

Academic support staff comprises of 22 temporary demonstrators (teaching assistants) appointed yearly from the newly graduating Chemistry Special batch from University of Kelaniya and from other universities (Colombo, Peradeniya and Sri Jeyawardenapura) to conduct all practical classes.

Observation of departmental facilities was done on the first day (26th June 2007) of the review process. There are seven laboratories in the DC functioning at present. Two sets of laboratories are available in the main building to conduct practical classes. Organic and Inorganic Chemistry practical classes for first and second year B.Sc. (General and Environmental Conservation and Management) students are conducted in laboratories with the student capacities of 40 and 48. Physical and Analytical practical classes are conducted in the second set of two laboratories having student capacities of 35 each. Biochemical analysis is carried out in a separate Biochemistry laboratory with a capacity of 40 students. Special Degree practical classes are conducted in a smaller laboratory in the new building which has a student capacity of 18. This laboratory is well maintained.

Furthermore, the M.Sc. research projects are carried out in a laboratory with a student capacity of 16. In the new Chemistry building the first and the second floors contain laboratories which can accommodate 64 and 40 students respectively. The DC possesses a collection of modern instruments that are at the disposal of undergraduate and postgraduate

studies. These include two Capillary Column Chromatographs, one Packed Column Chromatograph, one High Performance Liquid Chromatograph, one Atomic Absorption Spectrometer, one Flame Photometer one UV Visible Spectrometer and a range of modern electro analytical instrumentation on voltammetry & potentiometry from Prince Applied Research and Auto-Lab, Netherlands. These instruments are housed in special air conditioned rooms and are mainly maintained by senior academic staff members and it was also noticed that there is no adequate number of technical staff to maintain them.

Table 1 – Academic Staff of the Department of Chemistry

Name	Designation	Educational Qualifications
1. Prof. N. E. Gunawardena	Professor of Chemistry	B. Sc, Ph. D
2. Prof. P. A. Paranagama	Professor	B. Sc, M. Phil, Ph.D.
3. Prof. S. Wimalasena	Associate Professor	B. Sc., M. Sc.
4. Dr. L. K. G. Wickramasinghe	Senior Lecturer Grade I	B. Sc., Ph. D.
5. Dr. K.A.S. Pathiratna	Senior Lecturer Grade I	B. Sc., M. Sc., Ph. D.
6. Dr. M.K.B. Weerasooriya	Senior Lecturer Grade I	B. Sc., Ph. D.
7. Dr. B.M. Jayawardena	Senior Lecturer Grade I	B. Sc., Ph. D.
8. Dr. N.A.K.P.J. Seneviratna	Senior Lecturer Grade I	B. Sc., Ph .D.
9. Dr. J.A. Liyanage	Senior Lecturer Grade I	B. Sc., Ph. D.
10. Dr. A.A.L. Ratnathilaka	Senior Lecturer Grade II	B. Sc. Dip., Ph.D.
11. Dr. C.K. Jayasuriya	Senior Lecturer Grade II	B. Sc., M. S., Ph. D.
12. Dr. D.S.M. de Silva	Senior Lecturer Grade II	B. Sc., Ph. D.
13. Dr. R.C.L. de Silva	Senior Lecturer Grade II	B. Sc., Ph. D.
14. Dr. W.A.P.J. Premaratna	Senior Lecturer Grade II	B. Sc., Ph. D.
15. Dr. M.P. Deeyamulla	Senior Lecturer Grade II	B. Sc., Ph. D.
16. Dr. S.R. Wickremarachchi	Senior Lecturer Grade II	B. Sc., Ph. D.
17. Mr. C.R. de Silva	Probationary Lecturer	B. Sc.
18. Mr. S. Skandaraja	Probationary Lecturer	B. Sc.
19. Mr. Sampath R.G.R	Probationary Lecturer	B. Sc.

Moreover, it was observed that some of the above instruments have been purchased through the grants received by the senior academic staff members who are actively engaged in research.

The lectures for first and second year undergraduates are conducted in lecture theatres of 300 and 200 seating capacities belonging to the Faculty of Science.

The DC has two small lecture theatres with approximately 40 and 60 seating capacities which are also used to conduct lectures for Chemistry Special and M.Sc. Degree programmes. The

above lecture theatres are equipped with black-white boards and over-head projectors. The larger lecture theatre (300 capacity) is equipped with multimedia and a sound system and the DC also has facilities such as multimedia and computer screen projections for conducting lectures.

The DC also has a full equipped Glass Blowing Centre for making glassware as well as for repair of damaged glassware. The activities in this centre are handled by a technical officer from the DC who has been trained at both the University of Glasgow and University of Edinburgh, UK and also he is the only trained glass blower at present in the country.

The DC has its own mini-library with 50 seating capacity possessing around 250 text books in Physical, Inorganic and Organic Chemistry and at present it is used by the special and the postgraduate students. The DC is currently developing its own library.

All the senior staff members of the DC have been provided with computer, e-mail, internet, printing and photocopying facilities. Special Degree and the Postgraduate research students have been provided with three computers with e-mail, internet and printing facilities located in a separate room. It was observed that the computer assisted teaching classes are conducted in this room presently.

According to the Self Evaluation Report (SER), the DC also gets the services of six technical officers and ten laboratory attendants. On the second day of the review process (27th June 2007) the Review Team had the opportunity of meeting most of the members of the non-academic staff and among 12 members who attended the discussion, there were 07 technical officers including the glass blower and 05 laboratory attendants. At this discussion it was revealed that only 07 lab attendants are serving the DC at the moment and 03 vacancies exist for this post and as a result they have been burdened with additional work in serving the 10 laboratories in the DC. It was also pointed out that the number of technical officers is not adequate and they were of the strong opinion that the cadre vacancies for the lab attendant post be filled for the smooth functioning of laboratories.

Moreover, they were of the opinion that the non-availability of a clerk in the departmental office is a drawback and as such the technical officers including the glass blower take turns in covering up the clerk's duties. The disadvantage of this arrangement that we noticed is that the glass blower too wastes his precious time working in the office rather than spending his time in more profitable activities in the glass blowing centre.

3. AIMS AND LEARNING OUTCOMES

The DC of the University of Kelaniya conducts the following courses and the Degree Programmes.

1. B.Sc. General Degree Chemistry Course, Chemistry as a subject for the General Degree Programme.
2. Chemistry course, for the Environment Conservation and Management Degree Programme.
3. B. Sc. Special Degree programme in Chemistry.
4. M.Sc. Industrial and Environmental Chemistry Programme.
5. M. Phil/ MD(ayur)/Ph.D. Degree Programme

3.1. Aims

The DC conducts the above programmes in order to achieve the following aims.

1. To provide students following B.Sc. General Degree and Environmental Conservation and Management Degree with a broad and balanced foundation of subject knowledge and develop practical skills that enable them to adapt to career in related areas or other multidisciplinary areas involving the subject.
2. To provide students following B.Sc. General Degree with higher level of knowledge and skills based on which they can pursue further studies in specialized areas or other multidisciplinary areas involving the subject or adapt to career in research.
3. To guide students following B.Sc. General Degree and Special Degree to develop knowledge in applied areas (Biochemistry and Environmental Chemistry) and recent advances in Chemistry so that they can serve in institutions and industry more effectively.
4. To guide students following undergraduate and postgraduate degrees in the department to develop range of transferable skills of value in Chemical and non-Chemical employments.
5. To offer greater degree of choice in subject areas in Chemistry within the modular teaching structure of the University enabling students following B.Sc. General Degree to develop there own interest and potentials.
6. To guide students following M. Sc. Degree to higher levels of knowledge in Industrial and Environmental Chemistry to guide develop research and skills in all postgraduate students *i.*e. M. Phil./MD(Ayur.)/Ph.D. in their respective specialized areas of the subject so that they can apply their knowledge and skills to solve problems in Chemistry and Chemistry related areas.
7. To provide opportunities and support to academic staff to improve their teaching and research skills in view of achieving higher standards.
8. To provide supportive structure and environment for gaining enthusiastic learning higher standards and good completion rate.
9. To provide effective organisation of teaching learning and assessments, review and quality assurance.

3.2. Learning Outcomes

According to the SER produced by the DC, on successful completion of any one of programmes mentioned above the following achievements 1 to 7 are expected. The specific achievements expected for different courses are given in sections 8- 12 below.

1. Students following B.Sc. (General, ENCM and Special) Degree have gained knowledge and understanding of essential facts, concepts, principles, theories and practical skills related to the subject.
2. Students following B.Sc. (General and Special) should have gained knowledge on the applied areas and advanced Chemistry commensurate to their respective levels.
3. Students following B.Sc. (ENCM) Degree should have gained higher knowledge and analytical skills in dealing with Chemistry-related problems in the environmental conservation.

4. Students following B.Sc. (Special) and M.Sc. Degree should have gained the ability to apply the fundamental knowledge and research skills to solve problems in Chemistry and Chemistry related areas and Industrial and Environmental Chemistry respectively.
5. Students following postgraduate degrees should have gained ability to apply subject knowledge and skills to carry out research at higher levels that enables them to solve subject related scientific problems in the country.
6. Students following undergraduate and postgraduate programmes should have developed personal and transferable skills such as the critical thinking, confidence, interpersonal skills, data handling and interpretation, planning, writing and communication skills, computational and data processing skills etc.
7. Students following B.Sc. (Special and Postgraduate) programmes should have developed their ability to be self-critical and independent in learning.
8. *On successful completion of the B.Sc. (General) programme, students should have the following specific knowledge and understanding* of the different states of matter, the principles of chemical analysis & characterisation of chemical compounds, quantum mechanics & description of the structure and properties of atoms and molecules, thermodynamics, kinetics, the mechanistic interpretation of chemical reactions, the techniques of structural investigation of elements and their compounds, relationships & trends within the periodic table and the structural features of chemical elements & their compounds.

   Structure and properties of organic and organometallic compounds, behaviour

   Functional groups in molecules, major synthesis pathways, the relationship between bulk properties and the properties of individual atoms and molecules including macromolecules.

   Additionally the above programme is supported with generic optional topics in Biology and Molecular Biology and coverage of commonly used techniques in bio molecular sciences to obtain knowledge and understanding.

   The structure and functions of bio molecules, key metabolic reactions in biosynthesis and biochemical processes, principles of biochemical analysis and their applications, key topics in modern molecular biology.

   The above programme is also rich in areas of Analytical Chemistry and environment chemistry to provide knowledge and skills to deal with the environmental problems.
9. *On successful completion of the B.Sc. (ENCM) Degree Programme students should have the following specific knowledge and understanding* of the fundamental knowledge in chemistry stated in section 1 above and analytical chemistry (theory and practicals) and environment chemistry (theory and practicals).
10. *On successful completion of the B. Sc. (Special) Degree Programme students have the following specific knowledge and understanding* of advanced specific topics in radiochemistry and crystallography, advanced reaction mechanisms, spectroscopic methods in organic compounds, heterocyclics, natural products, advanced synthetic methods, advanced thermodynamics, quantum mechanics and chemical kinetics, molecular symmetry, electrochemistry, photochemistry and computational chemistry, advanced topics in analytical, electrochemical, spectroscopic and chromatographic analysis, environmental chemistry, soil chemistry, aquatic and atmospheric chemistry, material chemistry, advanced topics in bio molecules, modern molecular biology,

immuno and neurochemistry, medicinal and food chemistry, The advanced techniques in separation, identification and synthesis of compounds, synthesis and analysis of compounds, chemical kinetics and molecular modelling, methods in isolation, identification and analysis of bio molecules, research techniques and instrumentation, chemical literature surveys and critical Analysis, preparation and presentation of literature,/research findings both in oral and written forms, production of thesis on the research project.

11. *On successful completion the M.Sc. (Industrial and Environment) Degree Programme, students should have the following specific knowledge and understanding* of principles of polymer & polymer related materials, food, herbal products & agro chemicals, earth resources, soil-, aquatic-, and atmospheric chemistry, environment technology & management, industry, environmental biotechnology, techniques in industrial & environmental analysis, management concepts in industry, research techniques & instrumentation, chemical literature surveys & critical analysis, preparation & presentation of literature/ research finding both in oral and written formats and production of thesis on a research project.
12. *On successful completion of the M. Phil./ MD(Ayur.)/Ph. D. programme, students should have the following specific knowledge and understanding* of research in food technology, natural products, atmospheric & aquatic chemistry, enzymology & molecular biology, chemical ecology, bio pesticides, chemical analysis of ayurvedic products and their preparation techniques, and instrumentation applicable to research literature survey and critical analysis, preparation & presentation of literature/research findings both in oral and written formats, production of thesis on research projects.

4. FINDINGS OF THE REVIEW TEAM

4.1. Curriculum Design, Content and Review

The academic year consists of two semesters, each of 15 weeks duration. The capacity of a study course is determined by the credit values assign to them. Fifteen-hour theory course in equivalent to one (1) credit and the credit weights of the courses vary from 1 credit to 4 credits (60 hours). For practical courses, 45 hours equivalent to 1 credit and the credit values for practical course varies from 1 credit to 3 credits. The credit value for the research project is 5.

The Department offers several types of courses depending on the requirement.

They are named as follow:

- Core (C): Essential course units for the subject
- Elective (E): Subject module out side the core of the subject and students have the choice of studying them.
- Auxiliary (A): Course units are offered to all students without any pre requisite to all students other than who follow the main subject
- Compulsory (C*): Essential course units for the Special Degree Programme

During the first year, students have to follow the compulsory (C*) Chemistry courses to cover required 10 credits as follows.

- Chemistry theory courses 8 credits
- Chemistry practical courses 2 credits

During the second year the DC offers the following courses leading to 21 credits.

- Chemistry theory courses 9 credits
- Chemistry practical course 2 credits
- Biochemistry theory courses 8 courses
- Biochemistry practical courses 2 credits

Based on the performances in the first two years, students are selected to follow the special degree course conducted by the DC. Others who were not selected to follow the special course have to continue their studies for a general degree, Chemistry as a subject.

It is very important to note that the DC offers a considerable number of Biochemistry courses for Bio-science students in addition to the normal Chemistry courses in the second year. That will definitely be an advantage for the Bio-science students entering to the Faculty.

During the third year the DC offers Chemistry and Biochemistry courses leading to 24 credits. These courses are mainly applied in nature. Physical Science students can take course leading to minimum of 5 credits and they can complete the requirement of 26 credits to claim Chemistry as a subject in the Degree Programme. If they wish they can take more courses in the third year.

Bioscience students who follow Chemistry as a subject in the third year can take core Chemistry courses leading to five more credits and also elective Biochemistry courses leading to maximum of 5 credits in addition to the Chemistry courses. In other words such Bioscience student has done Biochemistry courses leading to a total of (10 + 5 + 5 =) 20 credits in his second and the third years.

The possibility of naming of Biochemistry as a separate subject for Bioscience students who are doing Chemistry was raised at the meeting of reviewers with the students. According to the rules and regulations of the Faculty the minimum total credit requirement for any subject to be claimed as a subject is 24. This matter was discussed at the final meeting with the staff and they agreed to do it by introducing six more credits.

The total credits requirement for the Special Degree will be 126 and the student selected for the Special Degree have to complete courses leading to 66 credits in their third and the forth years. All these courses are Compulsory (C*) courses. This also includes some Biochemistry courses leading to 11 credits. Some of the courses taught in the third and fourth years are of applied nature (e.g. Material Chemistry, Environment Analytical Chemistry etc.), but it is doubtful whether all the learning outcomes stated under the Special Degree programme can be achieved by these courses.

The practical components for the programmes are in the acceptable levels. In order to achieve the objectives Dissertation based on the Research Project (5 credits) and a Seminar and Industrial training (2 credits) have been incorporated to the curriculum.

It can be seen that the DC has taken a considerable effort to develop the Biochemistry as a major subject along with the Chemistry. At the same time some courses that are highly applied in nature have also been introduced to the curriculum. The Review Team appreciates their contribution towards the development of the new B.Sc. programme on Environment Conservation and Management.

It is the view of the Review Team that the present status of Curriculum Design, Content and Review adopted by the DC can be judged as GOOD.

4.2. Teaching, Learning and Assessment Methods

It was observed by the Review Team that all lectures in undergraduate courses are conducted by senior academics in the DC. In most cases multi-media facilities were used together with the white board facilities. The Review Team had the opportunity to observe delivering of lectures for the students of the general degree programme (all three years) and special degree programme (3^{rd} & 4^{th} year).z The venue for the first year students was the large lecture theatre of the Faculty. The attendance was about 280 students. The lecture theatre appeared to be congested and the seats were not properly arranged. Further, the lecturer used both languages (Sinhala and English) simultaneously to explain certain important points to the majority of students who were Sinhalese. However, there were some Tamil speaking students in the class who were worried whether they missed any important subject content when the explanation was in Sinhala!

Demonstrators for the practical classes are appointed from the immediately passed-out special batch. They work under the supervision of a senior member of the academic staff who is in-charge of the practical class. It was observed that the situation regarding practical classes is good in many aspects. Learning environment was good. There were no complaints from students regarding the way practical classes are conducted. The quality of experiments is of good standard. Much effort has been taken to develop experiments which are of applied nature using modern instruments. Students are provided with well prepared hand-outs. The involvement of demonstrators in rectifying the mistakes done by students in the practical class such as mishandling of instruments was minimal. The reviewers feel that this shortcoming could easily be addressed by giving proper guidance to demonstrators. Further, it was also observed that the theory lectures based on some practices and instrumentations are scheduled after the practical courses. It is the view of the Review Team that is not a practice to be continued further. We feel that can be rectified easily by amending of the relevant time tables.

The examinations in the DC are carried out according to the semester based course unit system. Grade Point Average (GPA) system has been adopted for evaluation. Papers are set and moderated by the academic staff of the DC. In addition, the Special Degree papers are sent to other local universities for moderation.

Arrangements have been made to discuss the tutorials in small groups only for few courses such as CHEM 10114, CHEM 12032, CHEM 21012. However, the lecturer in charge discusses the tutorial at the normal lecture. The Review Team would like to recommend to the department to make an arrangement to conduct all tutorials in small groups of students assigning demonstrators and the other junior academic staff with the supervision of the lecturer in-charge.

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

4.3. Quality of Students including Student Progress and Achievements

The student enrolment in the Faculty of Science is around 500 per year and the admissions are solely determined by the University Grants Commission (UGC). Majority of the students possesses Z-scores in two ranges 1.26-1.50 and 1.51- 2.0 and students of mediocre calibre has been selected to the B.Sc. programme in the Faculty.

The information provided reveals that the DC has been able to attract good students from the Faculty who have scored higher averages than the minimum requirements. The majority of students selected to the B.Sc. degree programme in the Faculty are from the Western Province.

The documents supplied by the DC revealed that the performance of the students is monitored at all levels by way of tutorials, assignments and practical examinations at laboratory classes and formal end of semester examinations. Records of student performance are maintained by the DC as well as by the Faculty Office. The information provided disclosed that the General Degree students who deserted Chemistry as a subject has been low and it is in the ranges 12.6-14.7 % and 2.4-5.7 % from 1st year to 2nd year and 2nd year to 3rd year respectively. The SER indicates that during the academic year 2003/2004 the percentage of General Degree students continuing with the Chemistry course is 49.5 % while this percentage has increased to 77.8 % during the academic year 2004/2005 despite the fact that they have the opportunity to drop it at the end of the first semester of their third year. This is due to the fact that the current elective courses have become attractive to the students. The records available in the DC show that the performance of the Special Degree students at their third year examination has been good and they have secured an average of B grade for all subjects. During the past five years about 95 % of the students who entered the Chemistry Special Degree programme have completed the Special Degree whilst about 5 % of them have opted to B.Sc. General Degree.

Analysis of performance of B.Sc. General Degree students for each course unit over the past five years has been shown in the form of bar charts and this is praiseworthy. The overall performance of these students also have been analyzed and has shown a high percentage of students score A or B grades during the past 4 years. The achievements of Special Degree students have been good and there have been no failures during the past 6 years with 92.6 % of students obtaining classes (25.4 % First Classes, 49.0 % Second Class Upper Division passes and 18.2 % Second Class Lower Division passes).

The information provided by the DC does not give any indication about the waiting time of Chemistry graduates for their first job. However, π-charts provided show that over the past five years an average of 70.7 % General Degree graduates have been employed of whom a majority has found chemistry related jobs. Analysis over the last two years also reveals that the Special Degree graduates (14 %), follow postgraduate studies mostly in foreign countries and majority (35 %) of them has been engaged in Chemistry related jobs in Sri Lanka.

It is the view of the review team that the Quality of Students, Student Progress and Achievements of the DC can be judged as GOOD.

4.4. The Extent and use of Student Feedback, Qualitative & Qualitative

The DC obtains student feedback at various forums about the academic programmes and infrastructure facilities. The Review Team noticed that the senior academic staff members of the DC have allocated two hours per week to have discussions with students and the hours are displayed on the door of the respective staff members for student's attention. We observed that this is good practice.

The above can be considered as a good opportunity for the DC to get students' feedback about the quality of academic programmes, teaching methods and the quality of other facilities.

The method adapted by the DC to obtain quantitative student feedback on course units and teachers is by using an evaluation form (questionnaire).

Though the responses of the students had been obtained on this questionnaire, the results were not analyzed by the teachers. The Review Team strongly recommends that the data (student responses) obtained from the questionnaire be analyzed and the outcome be discussed with the Head of the department or at a departmental meeting for others to share the information to strengthen the academic programmes.

It is the view of the Review Team that the Extent and Use of Student Feedback by the DC can be judged as SATISFACTORY.

4.5. Postgraduate Studies

The DC has two postgraduate programmes:

(a) M. Sc. in Industrial and Environmental Chemistry

(b) M. Phil., M. D. (Ayur.) and Ph. D.

The M.Sc. programme in Industrial and Environmental Chemistry initiated in 2001 has not properly been established yet. The duration of the degree programme is longer than two years and the students expressed their dissatisfaction about the way it is being conducted. The staff must identify the obstacles that hinder the smooth conduct of this programme and develop strategies to iron them out.

Most of the senior academics are actively involved in research activities with postgraduate students which have resulted in many international and national research publications. At present there are 09 students following M.Phil. programmes. The students who read postgraduate degrees by research were happy about their learning environment, their achievements and progress. These students are funded by either local or foreign funding agencies. The DC possesses several equipments, chemicals and other infrastructural facilities for postgraduate studies.

The postgraduate students stated that there are several research fora at which they present their research findings or interact with other research students. These include seminars organized locally and also the annual proceedings of Institute of Chemistry or SLAAS. There has been a recent boost in research output from the DC which is evident from the publications appearing in peer-reviewed journals and the number of patents received. It is also encouraging that the younger academic staff has shown a serious commitment to research.

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

4.6. Peer Observation

It was observed that the importance of the Peer Observation process has been identified by the DC. However, they have not introduced it for lectures and practical classes so far. The practices such as moderation of question papers, second marking of answer scripts are been carried out internally and externally by the other academics. The minutes of the departmental meetings also show that the exchange of ideas among the staff on academic matters takes place on a regular basis and have been directed towards the development of academic activities of the department.

It is the view of the Review Team that the present status of the Peer Observation adopted by the members of the staff can be judged as SATISFACTORY.

4.7. Skill Development

The undergraduate curriculum is designed to incorporate all aspects of skill development and it has been done at various levels through course units from first to the fourth year courses. There are components in the curriculum that provide skills in communication, IT, organisation & team work, critical & logical thinking, problem solving & interactive learning skills. Chemistry Special students have programme of in-service-training to acquire industrial experience. The Chemistry Special students further develop their skills on experimental design, data collection and interpretation, research and scientific writing and presentations.

Special students are happy and content with the learning environment on skills development. General degree students however may lack value addition required by the employment sector. The DC should formulate a method to make the General Degree students become more competitive in the job market. The Special students should come forward to get actively involved in the activities of the Chemical Society to enhance their organisational skills.

It is the view of the Review Team that the state of Skills Development of the DC can be judged as SATISFACTORY.

4.8. Academic Guidance and Counselling

The faculty handbooks on course unit system and provides an insight into the university and syllabi of courses & rules and regulations of the Faculty of Science. When new students enter the Faculty, an introduction is given to the students on the chemistry courses available in the first year and the selection criteria for offering chemistry as a subject in three-year general degree and the four-year chemistry special degree. At the beginning of the first year each student is assigned with a staff member who will act as his/her personal academic advisor to discuss difficulties in academic and personal matters. Meeting between the personal advisor and the parents during the orientation programme is a good practice. In addition to the academic advisor in the DC, there is one academic advisor each for the physical and biological science streams.

Whenever students encounter personal problems they can meet the student counsellors or any staff member to this effect. In addition Health Centre of the university facilitates to attend health problems. The staff appears to play a proactive role in guidance and counselling by displaying their consultation hours on the office doors. In general a conducive environment exists for students to feel comfortable and well guided during their academic period.

It is the view of the Review Team that the present situation with regard to Academic Guidance and Counselling adopted by the DC can be considered as GOOD.

5. CONCLUSIONS

The judgments given for the eight aspects of the Subject Review are given 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 of use of student feedback	Satisfactory
Postgraduate studies	Satisfactory
Peer observation	Satisfactory
Skills development	Satisfactory
Academic guidance and student counselling	Good

The Review Team appreciates the working arrangement made by the department during the review visit. The Head of the department and the members of the staff provided required information and documents to facilitate our process. The Review Team is grateful to all the categories of the staff in the DC 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 DC.

1. It is recommended that the present process of monitoring practiced by the department be extended to actual peer observation of lectures and practical classes.
2. It is recommended that all staff members be encouraged to take student feedback through a questionnaire. The results need to be analysed and discussed with the Head of the department.
3. The DC may consider incorporating more details of the content of the course units into the student handbook published by the Faculty.
4. It is recommended that the theory courses that are relevant to the practical courses be completed before commencing the practicals.
5. The DC may consider introducing few course units on Biochemistry in order to upgrade the subject to a level of a separate subject offered by the department.
6. The facilities of the lecture theatres (specially the main lecture theatre) need to be improved. In the opinion of the Review Team, this has to be treated as an urgent matter.
7. More attention on the subject content delivered in “Mix language lecturing” is recommended. The DC may consider conducting the same lecture in separate languages at different times. Intensive English courses for students who are weak in English need to be arranged in consultation with the English Unit of the University.

8. Small group tutorial classes are recommended for all courses of first and the second year students rather than discussing the tutorials by the lecturer with the whole batch.
9. The problems of the minor staff need to be addressed. Non-availability of a clerk in the departmental office is a drawback. This has to be considered as an urgent matter. It is recommended that the glass blower not be used to cover up the duties of a clerk.
10. Present status of the M.Sc. Programme in Industrial and Environment Chemistry need to be rectified. Action has to be taken to complete the degree programme of students already registered for the course. The DC may consider conducting at least one smoothly running self-funded postgraduate degree programme.
11. Developing a strategy for skills development of General Degree students in order to improve their employment prospects is recommended.
12. The numbers of copies of the recommended textbooks in the library need to be increased.