SUBJECT REVIEW REPORT

DEPARTMENT OF CHEMISTRY

FACULTY OF SCIENCE
UNIVERSITY OF PERADENIYA

18th to 20th December 2006

Review Team :
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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 reviews and institutional reviews in Sri Lankan universities. Prof. Colin Peiris, Quality Assurance Specialist of the QAA Council by a letter dated 29th November 2006 notified that the following team has been appointed to perform the Subject Review of the Department of Chemistry, University of Peradeniya from 18th to 20th December 2006.

Prof. W.D.W. Jayatilake, University of Sri Jayewardenepura
Prof. S. Mohanadas, University of Jaffna
Prof. R.N. Pathirana, University of Ruhuna.

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, University of Peradeniya prepared in November 2006 was submitted to the members of the Review Team with the letter dated 29th November 2006 requesting the Team to perform the Subject Review. It contained 03 pages of aims, learning outcomes and programme details, 08 pages of staff, student and facilities, 04 pages of curriculum design, content and review, 04 pages of teaching, learning and assessment methods, 05 pages on quality of students, 02 pages on student feedback, 07 pages on postgraduate studies, 01 page on peer observation, 04 pages on skills development and 02 pages on academic guidance and counseling. The total pages are 45.

Review Visit

The Review Team evaluated the quality of education in the Department of Chemistry 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 department.

On 18th December 2006 at about 9.00 am the Review Team arrived at the university and met Prof. V. Karunaratne, Head of the Department of Chemistry along with the coordinator of IRQUE project. The Head of the Department of Chemistry was also covering up the duties of the Dean of the Faculty of Science on that day. (The Review

Team met the Dean on the 20th morning.) On 18th morning senior academic staff members were also present with the Head of the Department to welcome the members of the Review Team. The agenda for the review process was finalized. Thereafter, the Head of the Department 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 Department of Chemistry
- Academic staff members of the Department of Chemistry
- Non-academic staff members of the department
- Undergraduate students
- Post graduate students
- Academic Advisors, Student Counselors and Personal Tutors
- Chairman, Faculty Course Unit System Committee

The team visited the following places of the department for observation.

- Auditorium
- Laboratories
- Faculty Library
- Computer Laboratory
- Lecture Halls
- Instrument rooms

The Team also went through the following documents.

- Faculty handbook on course unit system
- Copies of lecture and practical handouts
- Copies of tutorials
- Student feedback
- Marking schemes
- Answer scripts marked by examiners
- 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

i. Curriculum design, content and review
ii. Training, learning and assessment methods
iii. Quality of students including student progress and achievement
iv. The extent and use of student feedback, qualitative and quantitative
v. Postgraduate studies
vi. Peer observation
vii. Skills development, and
viii. Academic guidance and counseling.

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

A comprehensive subject review draft report is submitted by the Team to the department through the QAAC within 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

Although there was a well developed system of primary and secondary education in Sri Lanka towards the end of the 19th century, there were hardly any opportunities available for the study of Arts and Sciences beyond the secondary school level. As a result of persistent demands the University College was established in 1913. The first university was established in July 1942 in Colombo. Mr. Robert Marrs who was the Principal of the University College was succeeded by Sir Ivor Jennings in 1940 who also become the Vice-chancellor of the new university. His main task was the establishment of the University in Peradeniya. Accordingly, the Faculty of Agriculture and Veterinary Science was moved to Peradeniya in 1949 followed by the Department of Law in 1950. The major move took place to the present site of natural beauty of Peradeniya in October 1952 when the staff and the students of Faculty of Arts and Oriental Studies, together with the Library and the University Administration were transferred to Peradeniya. The transfer of the Department of Dental Surgery to Peradeniya took place in 1954 whereas the Second Medical School started in June 1961 and the first batch of medical students was admitted in January 1962. The buildings of the second Faculty of Science in the country were made available at Peradeniya in 1961 and the admission of the first batch of students took place in the 1961/62 academic year. The Faculty of Engineering was transferred to Peradeniya in October 1964.

The Faculty of Science

The Faculty of Science in Colombo was allowed to establish a second Faculty in Peradeniya in order to cater to the increasing demand for science education in the country. As such, a part of the staff form the Colombo Faculty moved to Peradeniya Faculty at the early stages, while it built up the staff by direct recruitment as well. These two branches of the faculty functioned under common administration at each of the levels of department and faculty, with common curricula and examinations. In 1967 these two sections of the University of Ceylon which were situated in Colombo were constituted as a separate and independent university thereby establishing the second Faculty of Science at Peradeniya as the Faculty of Science, University of Ceylon, Peradeniya. The first batch of students in the academic year 1961/62 comprised 40 biological science and 76 physical science students.

Presently the Faculty of Science consists of the following eight academic departments. and Computer Unit and Science Education Unit.

1. Department of Botany
2. Department of Chemistry
3. Department of Geology
4. Department of Mathematics
5. Department of Molecular Biology & Biotechnology
6. Department of Physics
7. Department of Statistics and Computer Science
8. Department of Zoology

The annual intake of the Faculty annually is 400 and the total student enrolment stands at about 1600 undergraduates and 200 postgraduate students. The strength of academic and non-academic staff is 110 and 120 respectively. The Faculty conducts degree programmes leading to the B. Sc. General Degree (03 years duration), B. Sc. Special Degree (04 years duration) and B. Sc. Applied Science Degree (04 year duration). The courses in the degree programmes are conducted under a semester based course unit system and the medium of instruction is English.

The Postgraduate Institute of Science (PGIS) was established in 1996 at the premises of the Faculty of Science. Through the PGIS, the Faculty has the provision for students to pursue postgraduate studies and research leading to the degree of Master of Science (M.Sc.), Master of Philosophy (M.Phil.) and Doctor of Philosophy (Ph.D.). There are several Boards of Study under the PGIS.

The Department of Chemistry

The Department of Chemistry is centrally located in the campus and is one of the founder departments. It has been in existence from the inception of the university in 1962, and started offering Chemistry as a subject to the B. Sc. General Degree Programme and also commenced its B. Sc. Special Degree Programme in the same year. Prof. M. Sultanbawa who was entrusted with the responsibility of developing the department brought the research facility to a high level.

The total number of students following Chemistry as a subject in the three degree programmes (B. Sc. General Degree, B. Sc. Special Degree and B. Sc. Applied Science) is common for the first three years. Those students who read for Chemistry Special and Applied Sciences degrees are expected to follow the courses in the fourth year. Total number of students enrolled in the Faculty for the academic year 2006 is 1600, and 599 of them (37%) offer Chemistry as a subject.

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 details of the courses conducted by the Department are shown in Annex 1.

The teaching staff of the Department of Chemistry consists of twelve professors, three Senior Lecturers (Grade I), three Senior Lecturers (Grade II), five Probationary Lecturers, one Emeritus Professor and two Visiting Lecturers. Details are given in Table 1.

Table 1: Academic Staff of the Department of Chemistry

Name	Designation	Educational Qualifications
1. Prof. O. A. Ileperuma	Senior Professor and Dean/Faculty of Science	B.Sc, Ph.D
2. Prof. N. L. V. V. Karunarathna	Professor and Head of the Department	B.Sc, Ph.D
3. Prof. G. P. Wannigama	Emeritus Professor	B.Sc, Ph.D
4. Prof. R. P. Gunawardena	Senior Professor	B.Sc, Ph.D
5. Prof. N. S. Kumar	Senior Professor	B.Sc, Ph.D
6. Prof. V. Kumar	Senior Professor	B.Sc, Ph.D
7. Prof. D. T. B. Tennakoon	Senior Professor	B.Sc, Ph.D
8. Prof. H. M. N. Bandara	Professor	B.Sc, Ph.D
9. Prof. R. M. G. Rajapakse	Professor	B.Sc, Ph.D
10. Prof. H. M. D. N. Priyantha	Professor	B.Sc, Ph.D
11. Prof. B. M. R. Bandara	Professor	B.Sc, Ph.D
12. Prof. J. S. H. Q. Perera	Professor	B.Sc, Ph.D
13. Prof. A. Wickramasinghe	Professor	B.Sc, Ph.D
14. Prof. A. D. L. C. Perera	Associate Professor	B.Sc, Ph.D
15. Dr. A. N. Navaratne	Senior Lecturer Grade I	B.Sc, Ph.D
16. Dr. D. N. Karunarathna	Senior Lecturer Grade I	B.Sc, Ph.D
17. Dr. C. Vithana	Senior Lecturer Grade II	B.Sc, Ph.D
18. Dr. W. M. A. T. Bandara	Senior Lecturer Grade II	B.Sc, Ph.D
19. Dr. M. Y. U. Ganahenge	Senior Lecturer Grade II	B.Sc, Ph.D
20. Dr. N. Kottegoda	Senior Lecturer Grade II	B.Sc, Ph.D
21. Dr. M. I. Ranasinghe	Temp. Senior Lecturer	B.Sc, Ph.D
22. Dr. V. N. Senevirathna	Lecturer	B.Sc, Ph.D
23. Ms. A. Hewawasam	Probationary Lecturer	B.Sc
24. Mr. H. M. D. Bandara	Probationary Lecturer	B.Sc
25. Ms. N. Kandasamy	Probationary Lecturer	B.Sc

Academic support staff comprises of 15 Temporary Demonstrators and Assistant Lecturers appointed yearly from the newly graduating Chemistry Special batch and their responsibilities are assisting practical classes, tutorials (100 and 200 levels) and marking of quizzes, take home assignments and practical assessments.

The Department also gets the services of non-academic staff consisting of Technical Officers (10), Laboratory Attendants (14), Secretary (1) and Labourers (4). Six of the Technical Officers have received short-term training abroad whereas one Technical Officer has received one year training in the United Kingdom

Observation of departmental facilities was done on the first day (18th December 2006) of the review process. The first year undergraduate laboratories can accommodate upto 60 students per session. The 200 level undergraduate laboratory also has 60 bench spaces. There are two 300 level laboratories for final year (3rd year) General Degree students with a capacity of 48 students in the new building and 300 level Chemistry Special students with a capacity of 36 students in the old building. The laboratory for undergraduate research which has a capacity for 36 students is occupied by the 400 level Chemistry Special students and perform their final year research projects. Biochemistry laboratory provides space for 24 students reading for 400 level Biochemistry course.

There is also a laboratory located in the first floor especially for undergraduate and postgraduate research in the field of inorganic chemistry. The Computer Applications and Instrumentation lab is located in the new building.

During the visit to the laboratories, the Review Team observed that undergraduates (both General and Special) have satisfactory facilities to carry out their practical work. The equipments needed for final year research projects and postgraduate research are available in the department. It was noticed that several members are involved in active research and have purchased major equipment such as High Performance Liquid Chromatography (HPLC) 2 Nos.; preparatory and analytical), UV and visible spectrophotometers from the research grants they received. The department possesses a high quality NMR machine (300 MHz, Bruker) which serves the purposes of many researchers in the department as well as outside the department. In addition the Department possesses a powder X-ray Diffractometer and FT-IR facilities.

The Department of Chemistry has a computer laboratory with six computers with internet facility and only the Chemistry Special students are allowed to use this facility. The Computer Unit of the Faculty is located in the ground floor and provides computer and internet facilities to all undergraduates. The Review Team observed that the computer and the internet facilities provided to the senior members of the academic staff are satisfactory.

3. AIMS AND LEARNING OUTCOMES

At present the Department of Chemistry conducts the following undergraduate programmes.

B. Sc. General Degree	3 years
B. Sc. Special Degree	4 years
B. Sc. Applied Science Degree	4 years

In addition to this the Department involved in postgraduate studies at the Post-Graduate Institute of Science through the Board of Study in Chemical Sciences and offers the following degrees and certificate courses.

1. M.Sc. in Analytical Chemistry
2. M. Sc. in Chemical Ecology and Pesticide Chemistry
3. M. Sc. in Industrial Chemistry
4. M. Phil. in Chemistry
5. Ph. D. in Chemistry
6. Certificate Course in Advanced Organic Chemistry

3.1. Aims

The Department conducts the above programmes in order to

1. provide a wide range of courses of high standard within a stimulating and exiting intellectual environment rich in modern facilities, where the students are exposed to internationally recognized learning experiences.
2. suit the growing diversity of students' intellectual background and their desire for more flexible learning patterns.
3. provide students with appropriate educational experiences to allow them to seek employments within their chosen field.
4. produce graduates specially to satisfy the local, national and industrial needs.
5. attain recognition as a centre of excellence in teaching and research, and the education of students.
6. produce graduates with knowledge of the major themes of modern chemistry in order to prepare them for higher studies in different disciplines in chemistry in Sri Lanka and abroad.
7. develop the student's competence in a wide range of subject specialist skills.
8. emphasise the importance of acquiring general or transferable skills such as written and oral communication, presentational and Information Technology (IT) skills required for life long learning processes.
9. provide friendly, responsive and supportive departmental environment conducive to the enthusiastic learning, high standards and good completion rate.
10. provide the teaching staff opportunities to develop their teaching methods and embark on their own research interests.

3.2. Learning Outcomes

As stated in the Self Evaluation Report (SER), on successful completion of the B. Sc. General Degree and B. Sc. Applied Science programmes the student should

1. have a broad and comparative knowledge and a critical understanding of the principle theories, concepts, principles of chemistry, confidence in the use of mathematics, an in-depth knowledge of the three major branches of the subject.
2. have developed a range of cognitive/intellectual, practical and transferable skills.
3. be familiar and competent in a wide range of practical skills

4. be able to think logically and apply the scientific method.

As stated in the SER, on successful completion of the B.Sc. Special Degree programme, a student should have

1. demonstrated a broad and comparative knowledge and a critical understanding of the principle theories, concepts, principles and terminology in physical, organic, inorganic, analytical and biochemistry including a detailed knowledge of one area of research.
2. laid a strong foundation for further studies by learning how the knowledge and understanding can be applied to research since they already had direct experience of research.
3. developed competence in a wide range of written and oral communication, Information and Communication Technology (ICT) skills in support of specialized presentations to peers and other informed audiences.
4. developed their ability for critical self-directed learning, competence at gathering information and its subsequent evaluation or analysis.

4. FINDINGS OF THE REVIEW TEAM

4.1. Curriculum Design, Content and Review

The academic year consists of two semesters, each 15 weeks. The capacity of a study course is determined by the credit (cr) value assign to it. Fifteen hours theory course is equivalent to 1 credit and the credit weight of courses vary from 1 credit to 3 credits. For practical courses, 45 hour course is equivalent to 1credit and the practical courses have the values of 1 credit and 2 credits.

During the first year (100 level) students have to follow two leveling courses (each 45 lecture hours) which include fundamental aspects of Chemistry. At this stage there is no emphasis on subject areas as Inorganic, Organic or Physical. In addition to this students have to follow two practical courses (each 45 practical hours) throughout the year.

Therefore the total number of credits in the first year = 2 theory courses x 3 cr per theory course + 2 practical courses x 1 cr per practical course = 8 credits.

During the second year (200 level) Chemistry courses are specified as Inorganic, Organic or Physical. In order to claim Chemistry as a principal subject, students should offer *at least* 8 credits in Chemistry in the second year. Those who hope to enter to the Special Degree Programme at the end of the second year, have to offer 4 more credits in Chemistry in the 200 level.

Based on the performance in the first two years, a limited number of students are selected to follow the Special Degree Programme in Chemistry. At present this number is restricted approximately to 28 students. Others have to continue their studies for a General Degree with or without Chemistry as a principal subject. Those following

General Degree with Chemistry as a subject have an opportunity to follow a four year B.Sc. Applied Science in Chemistry.

In the third year General Degree Programme, students have to select limited number of courses out of 21 courses comprising 42 total credits offered by the Department. These courses are mainly based on advanced aspects of Chemistry with some practical courses. In addition to the traditional areas of Inorganic, Organic and Physical, they include some interdisciplinary courses such as Analytical Chemistry, Biological Chemistry and Environmental Chemistry. However, in the third year, at least 8 credits (including credits from compulsory courses) must be scored from these courses to claim Chemistry as a principal subject in the General Degree. Special Degree students must select suitable number of these courses (including compulsory courses) in order to complete the total 48 credits from Chemistry in the third and the fourth years.

In the fourth year Special Degree programme, the courses are focused on both advanced theory and applications in Chemistry. The total number of courses available will be 17 and that lead to the total 36 credits. Seminar and the Research project are among the compulsory courses in the forth year level.

Faculty handbook titled "Course Unit System (Rules and Regulations, Syllabi of Courses)" is published for every two academic years and copies are available for students at the beginning of the first year. It gives the course contents and the relevant references for all the courses available in the Faculty.

It was observed by the Review Team that fundamental courses in the first year and the subject courses in the second are design to cover many fundamentals of the subject. In the third year there are enough number of courses, both theoretical and applied in nature, from which the General Degree students have a good choice for selecting their courses.

The Department has paid a special attention to maintain a considerable number of compulsory practical hours even for General Degree students. That was highly appreciated by the Review Team. That practical component covers about 28 percent of the total credits required to claim Chemistry as a General Degree subject.

Introduction of the new degree programme in Applied Science was subjected to the special attention of the Review Team. All the course units given under this were highly applied in nature and the students have a higher degree of choice for selecting their topics. At the discussion with the students they highly appreciated the opportunity made available for them to follow this type of programme which runs in parallel with the other well established four year degree programmes in the University system such as Chemical Engineering and Material Science.

It was observed by the Review Team that the most of the courses in the Special Degree fourth year programme were compulsory courses. For some courses, the details of the content given in the handbook were insufficient. However, as a whole, the fourth year subject content covers a vast range of concepts on Theoretical and Applied Chemistry that meets with the present global needs of Chemical Sciences.

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

4.2. Teaching, Learning and Assessment Methods

It was observed that all lectures in Degree programmes are conducted by the senior academics in the Department. Multi-media facilities are rarely used for lectures; but it was observed that the properly constructed "chalk & board system" is still operating with extremely efficient manner! However, in most cases printed lecture materials are given to the students. The Review Team observed the delivery of four Chemistry lectures at different levels during the visit. It was the opinion of the Review Team that more training or at least a peer observation is required for the development of the teaching methodologies of some junior academics in the Department.

Demonstrations in the practical classes are done by the Demonstrators who are appointed from the most recently passed-out Chemistry special batch. They work under the supervision of a senior member of the academic staff who is in-charge of the practical class. The Review Team appreciates the active participation of Demonstrators for the smooth running of the activities of the Department.

The Review Team visited the Library of the Faculty of Science and had a lengthy discussion with the staff of the Library and also with the students. It was observed that the recommended textbooks are high used by the students. However, it was also observed that the general books that are not recommended by the staff are rarely barrowed by the students.

The Review Team had an opportunity to observe a seminar presentation of two students. It was the opinion of the Review Team that the students have taken every possible effort to do a good presentation using all available facilities. It was also observed that the lecturer in charge of the seminar presentation has well guided the students by proper understanding of their problems.

All lecture theaters and laboratories are in good conditions required to create a proper learning environment for students. No criticisms were made by the students regarding the learning environment of the Department. Most of the students in the second year showed their willingness to follow either four-year Special Degree or the four-year Applied Sciences programme.

The Computer Applications and Instrumentation lab is located in the new building. and the reviewers had the opportunity to watch several interesting practical programmes being carried out by 300 level undergraduates. It was noticed that these students were enjoying their practical work, and can be reported that the design of this programme is praiseworthy.

The Review Team had an opportunity to meet the non-academic staff (technical officers, laboratory attendants, and other minor staff) of the department. On meeting the members of the non-academic staff, the Review Team noticed that they work in harmony with both academic staff and students. On discussing about the cadre they were of the opinion that the post of Glassblower should be reintroduced into the cadre and the existing cadre vacancies in the Lab Attendant post be filled for the smooth functioning of laboratories.

It was observed that they have a very good relationship with the academic staff and students. However, they expressed their displeasure regarding the handling of their problems by the University administration such as filling the vacancies in the cadre.

The Department maintains a display area ("museum") for exhibits from various aspects of Chemistry and has been in a very attractive manner. This type of activity, the Review Team believes, show the enthusiasm and creativity of the staff to disseminate their knowledge to the students in more productive manner. The Review Team admires the attempt the Department has made to disseminate knowledge through this type of activity.

The Review Team observed that the major instruments in the Department are properly maintained by a trained technical staff with the support of the academics which is essential for smooth running of both undergraduate and postgraduate programmes.

The medium of instruction of all lectures and practical classes is English and the examination papers in the Department are also given only in English. It was the opinion of the staff that the three-month English intensive course conducted to the new entrants is sufficient for them to pursue studies in the English medium. This topic was discussed at length at the meeting with the students. It was observed that the students do not have objections for doing classes in the English medium, but they stressed that the time allocated for the English intensive course is insufficient in most instances as in certain years it had been reduced to three weeks. The students were of the opinion that the duration of the English intensive course should strictly be three months.

The Review Team carefully observed the examination system in the Department. For many lecture courses approximately about 40 % of the total marks are given to quizzes, mid-term tests and some homework. The final examination carries only about 60 % of the final marks. In general, the question papers are not moderated by the staff of the Department or by the external moderators. Further, no second marking mechanism is operated in the Department even for the end-semester examinations. However, the finalizing and standardization of final marks and grades of individual course examination are done by a panel of three staff members of the Department appointed by the Head. The final mark sheet is signed by all three members before it is submitted to the Dean.

Answering to a question raised by the Review Team regarding the moderation and second marking of the papers, the Head of the Department stated that the staff members of the Department have confidence to evaluate the students in a proper manner without the papers being moderated by a second examiner. However, the Review Team is of the opinion that the moderation of question papers and the second marking of the answer scripts should be practiced.

The students were not happy with the way the department normally handles the mid-term tests and quizzes. Although, the mid-term examinations are scheduled for the week following the mid-term vacation (one week), at instances it runs towards the end of the semester. Under these circumstances the students keep away from lectures in order to prepare for the examination. They also stated that the results of the mid-semester examinations get delayed in such instances and as a result they have no opportunity to correct their mistakes before the final examination. Students also pointed out that the notice given for quizzes are insufficient and sometimes they are given without prior notice. The students requested the Review Team to discuss this matter with the staff to improve this situation.

However, the Review Team admires the dedication of the staff for undertaking the burden of conducting mid-semester examinations which involve setting papers as well as

evaluation. The involvement of second examiner at the end-semester examination could be difficult due to additional responsibilities of the mid-semester examination.

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

4.3. Quality of Students including Student Progress and Achievements

The student enrolment in the Faculty of Science is around 400 per year and the admissions are solely determined by the University Grants Commission (UGC). The total number of students enrolled in faculty for the academic year 2006 is 1600 of which 599 (37%) are offering Chemistry as a subject. It was found from the documents provided to the Review Team that the average Z-score of Biological Science students selected to follow Chemistry Special Degree is higher than that of Physical Science students and the Z-score of a students has not reflected the chance of being selected for Chemistry Special Degree programme. However, the majority of students selected for the above programme is from the Kandy district.

From the discussions the Review Team had with the staff and available documents, it was revealed that the 100 level students are given a tutorial per week and temporary staff allocated discusses them under the guidance of a senior academics. The tutorials of 200, 300 and 400 level students are discussed by senior academics teaching respective courses. The evaluation of students' performance is determined through quizzes, mid semester examinations, other assignments, end-semester examinations etc. It was learnt that the students receive both marks and answer scripts of the mid semester papers to check their mistakes and those question papers are discussed in the lectures or tutorial classes subsequently to clarify their mistakes which the Review Team considers as a good practice. The Review Team observed that the above activities are carried out satisfactorily by the department.

The introduction of the Applied Sciences Degree programme in 2005 has improved the Chemistry Grade Point Average (GPA) of third year students who graduated in 2007 significantly and the average level reached is 2.7. Between 25-30 students are selected for 4 year Special Degree programme based on their performance at the 100 and 200 level examinations and as this is very competitive, the students should achieve a GPA of over 3.5. During the discussion with students it was observed that the majority of students selected to this programme is from Knady district. This can be attributed to the fact that the most students from Kandy district who get high Z-scores apply for science degree programme at the University of Peradeniya.

Generally the performance of students at the Special Degree programmes offered by the department during last three years is good and is better than that of the General Degree students who offer Chemistry. The average GPAs achieved by the 3rd and 4th year Chemistry Special students during previous two years are 3.55 and 3.44 respectively.

The information provided by the Department reveals that the percentage of students obtaining classes has been very high and except for the 2004 batch, the general trend is approximately 70-85% of the students obtaining a second class and 10-20% a first class.

The analysis provided by the Department showed that the waiting time of all Chemistry graduates for their first job is one to two years. The Special Degree students follow postgraduate studies mostly in foreign countries (USA, UK, Japan, etc). General Degree students find employment in various areas, while some opt for postgraduate studies. It was revealed that about 70% of the first batch of Applied Sciences students received jobs before their results were released.

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

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

The department obtains student feedback at various forums about the academic programmes and infrastructure facilities. The department acquires student feedback qualitatively at discussions at tutorial sessions and at practical classes where close interaction is possible between students and teachers. The tutors, demonstrators and young lecturers make a link between students and senior academics to obtain the students feedback qualitatively. Student representatives express their views at the faculty board meetings. However, the students feel that their suggestions are not addressed to their best satisfaction. Students expressed that the work load and evaluation processes are comparatively heavy for one credit courses and this view has been accepted by the department and the revision of the course unit system will be done accordingly.

The method adapted by the department to obtain quantitative student feedback on course units and teachers is by using an evaluation form (questionnaire). Major criteria used in the evaluation are (1) organization of the lecture series (2) clarity of the course material (3) student enthusiasm in the subject (4) interaction in the class room (5) clarity of the lecture (6) punctuality of the lecturer (7) availability of the lecturer outside the lecture class (8) release of results in time (9) work load of assignments and tutorials (10) overall effectiveness of the teacher. However only few lecturers practiced this exercise and the data obtained are not analyzed. Only the teachers concerned observe the comments made by the students to take steps to improve the quality of teaching/teaching material. The Review Team feels that good practices adopted by these few lecturers should be followed by all lecturers to get the questionnaire filled by the student soon after completion of a lecture series. 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 staff meeting for others to share the information to strengthen the academic programme. Students following Special Degree in Chemistry and four year Applied Science Degree programme in chemistry expressed happiness on the learning outcomes of the department.

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

4.5. Postgraduate Studies

The Department of Chemistry which is an arm of the Faculty of Science has established the Postgraduate Institute of Science (PGIS) in 1966 to further strengthen their postgraduate research culture. Through this institute the department is conducting both research based and course work based postgraduate degrees. The research based postgraduate degrees, M. Phil. / Ph. D. too consist of 04-06 credit taught courses in all disciplines of chemical sciences and a student who successfully completes this programme in organic chemistry being awarded a Certificate in Advanced Organic Chemistry. The course work based postgraduate degree in M. Sc. consists of 12 credit theory courses followed by 06 months of research project. The duration for M. Sc. is 18 months, M. Phil. is 2-3 years and Ph.D. is 3-5 years. The postgraduate degree programmes conducted by the department are

1. Analytical Chemistry (M. Sc.)
2. Industrial Chemistry (M. Sc.)
3. Chemistry (M, Phil. / Ph. D.)
4. Advanced Organic Chemistry (Certificate Course)

At present there are 02 students doing Ph.D., 08 students following M. Phil. and several students attending M. Sc. programmes. The research postgraduate students expressed happiness about their learning environment, their achievement and rate of completion. All the students are funded by either local or foreign funding agencies. The department possesses most of the required equipments, chemicals and other infrastructural facilities for postgraduate studies. Most of the senior academics are actively involved in research activities with postgraduate students which have resulted in many international and national research publications. 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 I. Chem. or SLAAS. Some postgraduate students carryout their studies at various research institutes, viz, Rice Research Institute, ITI and IFS as the academics have research collaborations with these institutes. Students stated that their research output will improve if accommodation facilities close to the faculty are provided.

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

4.6. Peer Observation

The evidence made available in the SER and during the review visit in the aspect of peer observation are mainly (1) the guidance provided by the senior academic staff to junior lecturers and demonstrators to conduct their duties in the laboratory classes or the lecture courses, (2) senior academic staff often participating as co-investigators with the junior academic staff to guide the junior staff to do research, write reports and publication in the capacity of advisor and mentor, (3) newly recruited academic staff members following a course on teaching methods conducted by the Staff Development Unit of the university.

It has been stated in the SER under the aspect of Teaching, Learning and Assessment Methods (section 4.1.7 page 20) and under the aspect of Peer Observation (section 8.1.1

page 39) that they monitor the quality of teaching of junior staff by senior academics. It shows that the staff identify the importance of peer observation. At the visit of the Review Team, Head of the Dept. enlightened the Team that even the very Senior Professor of Chemistry (on contract) visits the classes at random to guide the very junior academic staff.

Although the department identifies the importance of peer observation they do not adopt a proper procedure for peer observation of lectures and practical classes conducted by all categories of academic staff. In this regard, the Review Team would like to emphasize that according to the Quality Assurance Handbook for Sri Lankan Universities issued by CVCD and UGC, peer observation practices should include actual procedure for monitoring the quality of teaching, mechanism to share good practices and enhancing the quality of teaching.

It is the view of the Review Team that the present status of the Peer Observation adopted by the members of the staff is considered as UNSATISFACTORY.

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 100 Level to 300 and 400 Level courses. The students are provided with improved communication and IT skills, organisation and team work skills, critical and logical thinking skills, problem solving and interactive learning skills. The Applied Science and Chemistry Special students have additional opportunity of in-service-training to improve their job opportunity. The Chemistry Special students further develop their skills on experimental design, data collection and interpretation, research and scientific writing and presentations.

The introduction of the new 4 year Applied Science programme satisfied a section of students left out of Special Degree programmes to learn on research and scientific writing skills and in-service-training. However the balance students offering General Degree programme should also be cared with better interactive learning activities.

Special and Applied Science students are happy and contended with the learning environment on skills development. All section of 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 skills development of the Department can be judged as GOOD.

4.8. Academic Guidance and Counseling

The department has engaged one Academic Advisor, two Student Counselors and four Personal Tutors to give guidance and counseling to the students. The faculty handbook on course unit system and university website 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, four-year chemistry special degree and four-year applied science degree in chemistry. During 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. In addition the departmental web-site helps to improve the academic guidance by allowing students to access teaching related materials, announcements, tutorials & answers and continuous assessment of examination papers.

Whenever students encounter personal problems they can meet the student counselors or any staff member to this effect. In addition Health Centre of the university facilitates to attend health problems

However the Review Team found that the students need further guidance and counseling especially during the second and third year for general degree undergraduates. Special degree undergraduates too expressed necessity for improvement in the process of selection of topics for research and seminar projects. Students also expressed that there should be an organized method to schedule the dates for mid-semester and chemistry special degree examinations. It was also conveyed that many students are being admitted by filling the vacancies and these students miss the orientation programme, intensive English course and academic guidance & counseling. The Department may consider establishing an organized guidance and counseling system to address some of these matters. These issues can be discussed at fora such as departmental academic staff meeting, student counselors meeting with the chief student counselor & professional counselor and the departmental heads meeting with the dean of the faculty.

It is the view of the Review Team that the present situation with regard to Academic Guidance and Counseling adopted by the Department can be considered as SATISFACTORY.

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 achievement	Good
Extent of use of student feedback, qualitative and quantitative	Satisfactory
Postgraduate studies	Good
Peer observation	Unsatisfactory
Skills development	Good
Academic guidance and student counseling	Satisfactory

The overall judgment is suspended

The Review Team appreciates the excellent working arrangement made by the department during the review visit. The Head of the Department and the members of the staff provided all the required information and documents to facilitate the review process with the common objective towards the development of the department. The Team is grateful to all the categories of the staff in the department for the support given during the visit.

6. RECOMMENDATIONS

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

1. It is expected that the academic staff members of the Department perceive that the peer observation process to be helpful in enhancing the teaching quality. 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 strongly recommended that action be taken to revert back to the earlier practice of moderation of question papers and second marking of answer scripts in spite of the problems encountered in the semester based course unit system.
3. It is recommended that the students learning environment (hostel facilities for postgraduate students, display of time-table for all the examinations, greater interaction between students and staff) be further improved to enhance quality of education.
4. It is recommended that the English intensive course be conducted for a period of three months, so that at the end of the course students would be able to follow the courses in English medium with a minimum language barrier.
5. The Department may consider scheduling the mid-term examinations during the week following the mid-term vacation.
6. It is recommended that all the staff members be encouraged to obtain student feedback through a questionnaire, and the results be analyzed and discussed with the Head of the Department.
7. The number of copies of the recommended textbooks in the library needs to be increased.
8. The Department may consider developing an improved strategy to provide effective academic guidance and counseling to students. A “practical system” for Student counseling and academic guidance, especially for general degree students, need to be introduced, and they should be encouraged to enjoy the opportunities available in the Career Guidance Unit of the University.
9. The Department may consider providing a choice to fourth year students to select their research topics of their interest. This could be achieved by giving them a choice to select one topic out of few proposed by the department.

7. ANNEXES

Appendix 1: Course Units offered by the Department of Chemistry

100 Level – Chemistry					
Course Numbers	**Course Title**	**No. of Credits**	**Pre-requisites**	**Compulsory**	
				General Degree	**Special Degree**
CH 101	Principles of Chemistry I	3		✓	✓
CH 102	Principles of Chemistry II	3	CH 101	✓	✓
CH 108	Elementary Chemistry Laboratory	1		✓	✓
CH 109	Inorganic Chemistry Laboratory	1	CH 108	✓	✓
	TOTAL	**8**			

200 Level – Chemistry					
Course Numbers	**Course Title**	**No. of Credits**	**Pre-requisites**	**Compulsory**	
				General Degree	**Special Degree**
CH 211	Inorganic Chemistry I	2	CH101, CH 102	✓	✓
CH 212	Inorganic Chemistry II	1	CH 211		✓
CH 221	Organic Chemistry I	2	CH 101, CH 102	✓	✓
CH 222	Introductory Organic Synthesis	1	CH 221		✓
CH 228	Organic Chemistry Laboratory I	1	CH 108, CH 221	✓	✓
CH 231	Physical Chemistry I	2	CH 101, CH 102	✓	✓

CH 232	Molecular Properties, Molecular Spectroscopy and Spectroscopic Instrumentation	1	CH 231		✓
CH 238	Physical Chemistry Laboratory I	I	CH 231	✓	✓
	TOTAL	**11**			

300 Level – Chemistry

Course Numbers	Course Title	No. of Credits	Pre-requisites	Compulsory	
				General Degree	Special Degree
CH 316	Special Topics in Inorganic Chemistry	2	CH 211		
CH 317	Advanced Inorganic Chemistry	3	CH 211		✓
CH 319	Advanced Inorganic Chemistry Laboratory	2			✓
CH 324	Organic Chemistry II	2	CH 221, CH 222		✓
CH 325	Aromatic and Heterocyclic Compounds and Bimolecules	2	CH 221		
CH 326	Advanced Organic Chemistry I	2	CH 221		
CH 328	Organic Chemistry Laboratory II	1	CH 228	✓	
CH 329	Advanced Organic Chemistry Laboratory	2	CH 228		✓
CH 330	Advanced Physical Chemistry I	3	CH 232, CH 331		✓
CH 331	Physical Chemistry II	2	CH 231	✓	✓
CH 332	Physical Chemistry III	1	CH 231		✓

CH 336	Theories of Liquids and Solids	2	CH 231		
CH 338	Physical Chemistry Laboratory II	1	CH 238	✓	
CH 339	Advanced Physical Chemistry Laboratory II	2	CH 238		✓
CH 341	Analytical Chemistry	3	CH 231		✓
CH 342	Computer Applications and Instrumentation	2			✓
CH 348	Analytical and Inorganic Chemistry Laboratory	1	CH 109	✓	
CH 351	Biological Chemistry I	2	CH 325		✓
CH 361	Environmental Chemistry	3	CH 211, CH 221, CH 231		
CH 369	Industrial Training	1			✓
CH 371	Industrial Chemistry	3			
	TOTAL	**42**			

400 Level – Chemistry

Course Numbers	Course Title	No. of Credits	Pre-requisites	Compulsory	
				General Degree	Special Degree
CH 415	Advanced Topics in Inorganic Chemistry	2	CH 211, CH 212		
CH 416	Advanced Inorganic Chemistry II	2	CH 317		✓
CH 417	Topics in Solid State Chemistry	2	CH 211		✓
CH 424	Special Topics in Organic Chemistry	1			

CH 425	Advanced Organic Chemistry II	3	CH 324, CH 326		✓
CH 426	Natural Product Chemistry	3	CH 325		✓
CH 435	Advanced Physical Chemistry II	2	CH 331		
CH 436	Advanced Physical Chemistry III	2	CH 331		✓
CH 443	Advanced Analytical Chemistry	3	CH 232, CH 341		✓
CH 448	Analytical/ Instrumental Chemistry Laboratory	1	CH 443		✓
CH 455	Biological Chemistry II	2	CH 351		✓
MB 416	Environmental Biotechnology	2			
MB 421	Fermentation Technology	2			✓
CH 458	Biological Chemistry Laboratory	1			
CH 491	Seminar	1			✓
CH 492	General Aspects and Recent Developments in Chemistry	1			
CH 499	Research Project	6			✓
	TOTAL	**36**			

Course Units offered by the Department of Chemistry to Applied Sciences Subject area

400 Level – Applied Sciences				
Course Numbers	**Course Title**	**No. of Credits**	**Pre-requisites**	**Compulsory For Special Degree**
AS 408	Industrial Organic Chemistry	2	Chemistry	
AS 431	Chemical Technology	2	Chemistry	
AS 437	Industrial Applications (Chemistry/Physics) Laboratory	2	Physics and Chemistry	