Chapter One

Introduction

1.1. Concept of Self-Assessment:

The quality of education refers to the fitness of the university graduates to meet the needs of stakeholders in terms of knowledge, skills, attitudes and performance. It depends on the institutional fitness for the purposes in terms of capacity & process to attain intended learning outcomes (ILOs). The institutional capacity & process includes quality of learners with commitment and interest, environments, content that is reflected in relevant curricula and processes to facilitate attainment of learning outcomes. Governance, curriculum design and review process, physical facilities, quality of students, progress and achievement, teaching-learning and assessment etc. have immense impact on the capacity of the educational institutions and process to provide quality education.

Self-Assessment is a systematic process of evaluating the various aspects of institution or academic programs including the major QA areas in respect of national qualifications framework and criteria whether quality standards are being met. For the purpose of further improvement SA collects information and evidences from the stakeholders, reviews those and identify the weaknesses and areas need further improvement to enhance quality of teaching learning and education. Self-Assessment does not mean that evidences of quality education are not available. It provides direction to continuous improvement through gradual internalization of the standards and good practices. It examines the state of practices and quality using a well-structured survey framework. Self-Assessment serves as a preparation for external peer review and validation for approval and accreditation. It explores the following issues a) what does the university do to provide education? b) Whether the university does the right things to provide education? c) Whether the university is doing the right thing in the right way? d) Has the university clearly defined goals to achieve? e) Whether the process guiding the university is adequate to achieve the goals?

1.1.1 Global Perspective on Self-Assessment:

Under the impact of ICT and globalization jobs, business and careers for young graduates have become highly competitive all over the world than ever before. The revolutionary developments in technology are changing the socio-economic systems, thinking, and nature of work and increased the opportunities available to university graduates. In the face of these entire complexes, competitive and changing environment, success mostly depends on what people know, what they are capable of doing, what skills they have acquired, and how fast they are able to adjust to changes around. Education must be more closely aligned to the needs of the community and society and the graduates need to develop their potential in terms of employability and lifelong learning. Industries are increasingly complaining

about the skill shortage and skill mismatch of the graduates. Academic institutions need to focus on new sets of skills driven by higher order of learning to make the graduate globally competitive. In order to enhance and ensure quality in higher education, educational institutions are required to be more responsive to the changing needs of the stakeholders and the nation. In that case it is very important for the educational institutions to know how well they are doing and how can they do even better to meet the needs of the stakeholders and the country.

1.1.2 Significance of Program Self Assessment

Quality assurance (QA) in higher education is a global practice now. With the changes in higher education landscape and emerging needs of the stakeholders there is an urgency to look into the effectiveness of the academic programs. Higher education must be more closely aligned to the needs of the community, needs of the graduates to explore their potential in terms of employability and lifelong learning. Universities should focus on preparing graduates with positive mindset, skills and competence, which would help them to find a good fit into the social system. In order to drive the QA system towards the right direction following questions are very critical. Significance of self assessment lies in:

a) Understanding the current state of quality of education the institution is providing,

b) Identifying the areas and issues that need to be addressed and improved to enhance and maintain quality in education,

c) Integrating the concerns of major stakeholders into the educational system to provide better experience,

d) Provision of feedback (from students, faculty, employers and alumni) and will enable universities to improve quality and respond effectively to market needs.

e) Implying dedication from faculty members and commitment from university administration.

f) Establishment of measurable objectives and evaluate their outcomes to assess if programs meets the educational objectives.

g) Facilitation to enhance learning (quality).

1.1.3 Objectives of Self-Assessment

The general objective of the Self-Assessment is to improve the quality of education addressing the needs of the major stakeholders and national relevance. The specific objectives of self-assessment exercise are to:

a) Identify learning needs.

b) Assess and verify the teaching learning capacity of the institution that meet their objectives and Institutional goals

c) Identify the areas need to be improved that maintain academic standards

d) Provide feedback for quality assurance of academic programs

e) Create a basis for external assessment and validation.

f) Provide guidelines or direction to the program offering entity

g) Enhance students learning

1.1.4 Quality Assurance in Higher Education

Quality is the means through which an institution can guarantee with confidence and certainty, that the standards of its educational provision are being maintained and enhanced. Assurance of quality in higher education is a process of establishing stakeholders‟ confidence that provision (input, process and outcomes) fulfill expectations or measures up to threshold minimum requirements.

Quality assurance is an all-embracing term covering all the policies, processes and actions through which quality of higher education is maintained, developed and enhanced. Quality assurance cannot happen automatically or accidentally, it has to be planned. Quality assurance is not any single thing but, an aura, an atmosphere, an over powering feeling that "The Institution is doing everything with excellence". Quality assurance is the own responsibility of the institution.

1.1.5 Need for Quality Assurance

Factors triggering the need for quality assurance include:

- Intense competition among universities;
- Increasingly higher expectations of employers;
- Global pressures emphasizing the significance of quality education;
- Increasing emphasis of the government and the regulatory bodies on quality of education;
- Internationalization of education;
- Recognition of our degrees at world level; and above all,
- Moral obligation to give the best possible education to our own students.

1.1.6 Implementing the Quality Concept

Firstly it needs prioritization of projects and activities across the university structure. Foremost priority obviously goes to academic activity, wherein quality enhancement initiatives should focus on: curriculum development, improvement in delivery methods, faculty training and development, appropriate use of technology, effective stakeholders‟ orientation of academic programs, and enhancing the quality of R & D programs of the university.

1.1.7 Diverse Methods for Assessing Quality

Methods used for assessing quality include: peer review, inspection, experts' judgments, criterion/standards-based judgments, compliance models, quantitative models, self-regulatory models, threshold models, excellence models, hybrid models, etc.

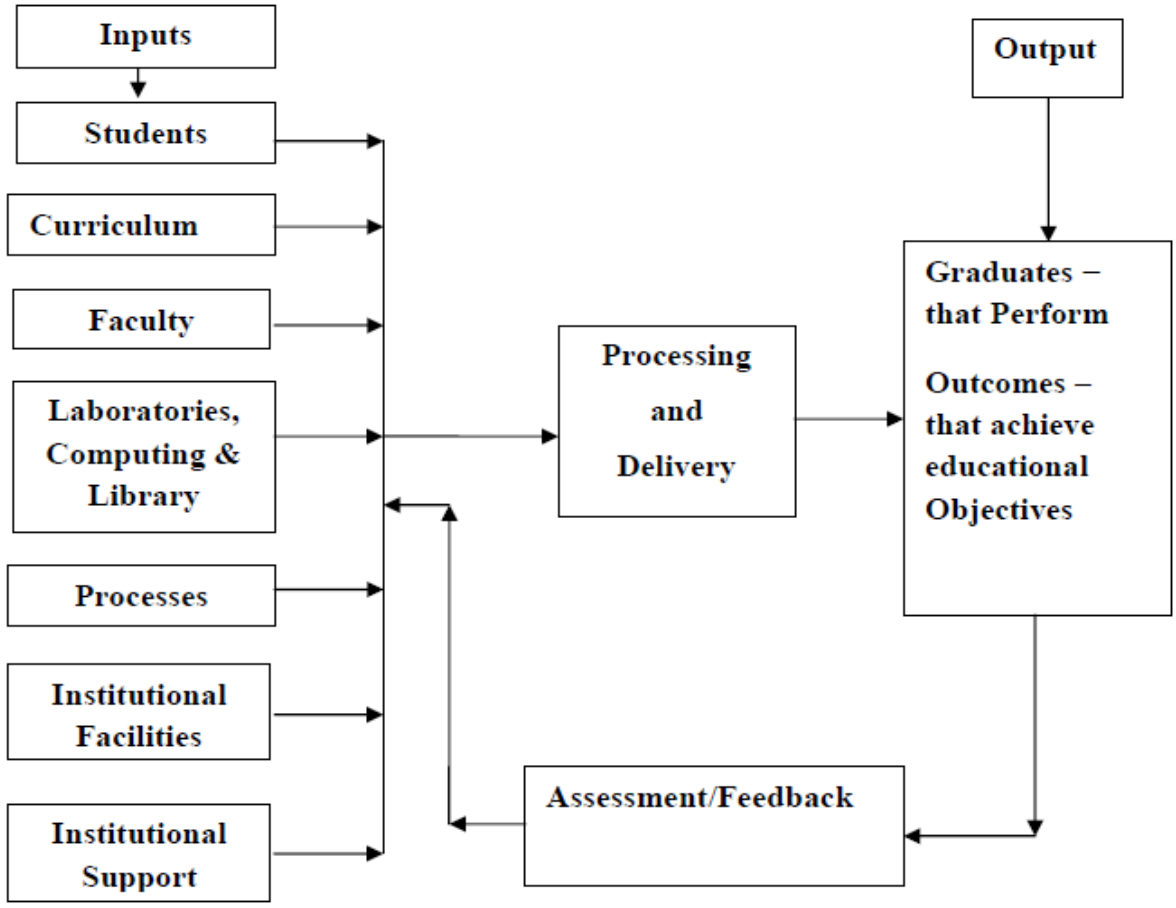
1.1.8 Self-Assessment Program

Self assessment is an exercise conducted by the institution/department itself to assess whether its program(s) meet their educational objectives and outcomes with the purpose to improve quality of program(s) and enhance students‟ learning. Consequently, Self assessment Report makes the basis of all future reviews/audits.

1.1.9 Elements of Assessment

Elements of assessment are: purpose identification, outcomes identification; measurements and evaluation design, data collection, analysis and evaluation, and, decision-making regarding actions to be taken. Diagram 1 shows the model of self assessment.

Diagram 1. Model of Self assessment



1.1.10 Desired Outcomes of Self Assessment

Desired outcomes of self assessment are: to be proactive than reactive, systemize the process of assessment, to be current with the changes in the respective fields, assist in preparing good professionals of tomorrow, and, initiate improvements to achieve academic excellence.

1.1.11 Criteria for Assessment

Each criterion has an intention/a statement of requirements to be met; and several standards, which describe how the intents are minimally met.

1.1.12 Criteria and Standards

There are a total of nine criteria and seventy-one standards (Table 1.1).

Table 1.1 Criteria and Standards

Criteria No.	Description	No. of Standards
1	Governance (mission and objective, management, accountability and transparency, academic leadership and autonomy, stakeholders, feedback)	13
2	Curriculum Content, Design and Review (involvement of stakeholders, need assessment, content & structure, defining course learning outcomes, skill development mechanism or strategy, evaluation and review)	5
3	Student admission, Progress and Achievements (entry qualification, admission procedure , progress and achievement)	9
4	Physical Facilities (classroom, library, laboratory and field labor atones, medical facilities, other facilities)	2
5	Teaching Learning and Assessment (teaching-learning , quality staff, appropriate teaching learning methods, use of lesson plan, technology integration, focus, skill development mechanism, assessment of student performance)	10
6	Student Support services (academic guidance and counseling, co-curricular and extra-curricular activities, career and placement, alumni, services, community services)	8
7	Staff and Facilities (recruitment, staff development, peer observation, career development, key performance indicators)	17
8	Research and Extension	4
9	Process, Management and Continuous Improvement	3
Total		71

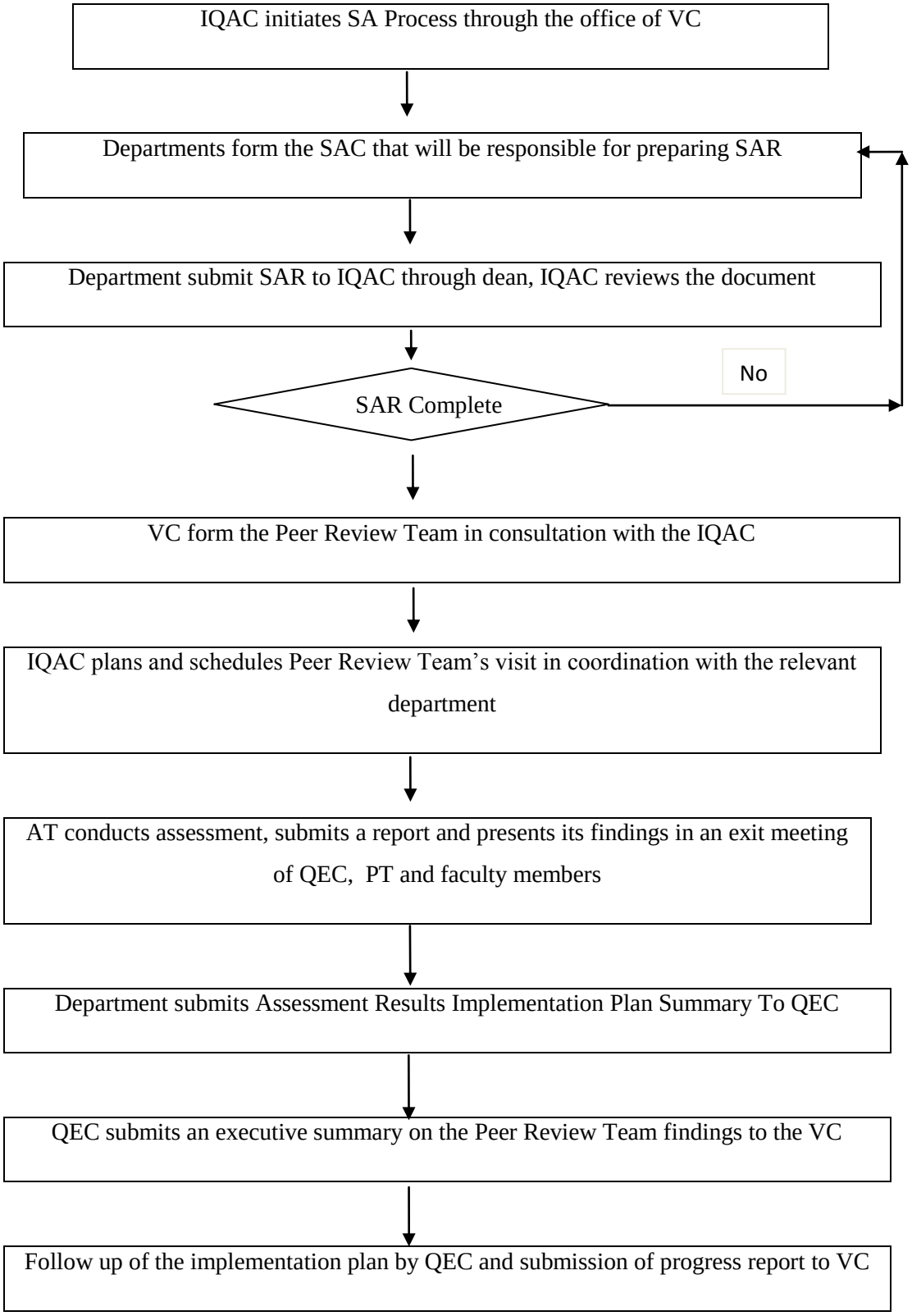
Source: Self-Assessment Manual, Ministry of Education, UGC, HEQEP, IQAC, Bangladesh.

1.2 Process of Assessment

Self-assessment may be considered as the groundwork for effective decisions and work plan relating to quality assurance and further improvement.

SA procedure specifies the process of initiating, conducting, and implementing the assessment. The IQAC is responsible for planning, coordinating and following up on the self-assessment (SA) activities.

Diagram1.2. Self assessment procedure



1.3 Overview of the University

Bangladesh is a developing country, simultaneously endowed with a huge population and plenty of natural resources, intends to meet the challenge of globalization through building up of a knowledge-based economy. For this, extending the base and improving the quality of its education at all levels is considerably necessary to prompt the country to a higher growth curve. These very facts, led to the establishment of Shahjalal University of Science and Technology (SUST) at the end of last century. SUST bears a distinct significance due to its location in the divisional headquarter Sylhet, Bangladesh. The university was established in 1986 *under* the *University* Act No LXVII of *1986* taken by the Bangladesh Government. This university started its academic program in 1991 by opening three departments: Chemistry, Physics and Economics.

There prevails an amiable atmosphere for carrying out research activities by the students and the faculty. The university has a highly qualified faculty imparting lectures, instructions and providing persistent supervision to the students in the fields of science, engineering and technology, life science, business studies and social science.

There are 5 schools and 28 departments under these schools. The most promising characteristic of this university is that it is technologically rich and there is almost no session jam in academic activities. A large number of faculty members are serving in various departments of the university. Presently, many national and international research projects are ongoing. Student accommodation facility is available in part. There are three halls for male students and five halls for female students. Library and laboratory facility is also of good quality. Students and staffs are provided with transport facility across the Sylhet town every day.

1.4 Mission and Objectives of the University

Shahjalal University of Science and Technology is the first science and technology university to have acted as a powerful performer in the economic and cultural life of the north eastern region of Bangladesh. The university aims to produce well-round graduates capable of thinking in a comprehensive approach. Consequently, it has established itself as a center of excellence in the arena of higher education in Bangladesh within a short period of time. The academic programs and services are driven by the needs of the community and from a global perspective; such that the graduates of this university could successfully meet the challenges of altering world.

1.5 Overview of the Program Offering Entity

At the edge of new millennium Physical Science was introduced in SUST, under which department of chemistry (CHE) was the first to start. After its commencement in 1991, this department rose rapidly as a center of excellence in the school of physical sciences. This department offers dynamic field of study and research, which help to prepare a student to become one of tomorrow's leaders. Our

undergraduate and postgraduate programs provide a broad knowledge of theoretical and empirical aspects of chemistry. In its twenty seven years' journey, this department has established close cooperation with various Universities and Research Centers in home and abroad. The department has also conducted some national and international seminars, workshops and conferences.

It has also recently successfully conducted HEQEP, TWAS. MOST, UGC, SUST Research Center funded projects. Presently several projects are running which are supported by UGC, MOE, MOST, TWAS and SUST Research Center. Using these projects' funding department has built up several enriched sophisticated laboratories. Below table shows list of the graduates of the CHE department since beginning. Until now 801 graduates have been graduated. Currently around 350 students have been studying in the department among them 250 students are studying in the undergraduate level.

Here around 100 students are studying at MS level. In addition there are 9 MPhil and 4 PhD students are curently studying in the department.

Education year	Total Graduate	Education year	Total Graduate
1990-91	30	2001-2002	24
1991-92	19	2002-2003	45
1992-93	23	2003-2004	51
1993-94	29	2004-2005	50
1994-95	32	2005-2006	51
1995-96	40	2006-2007	43
1996-97	25	2007-2008	41
1997-98	34	2008-2009	45
1998-99	38	2009-2010	40
1999-2000	41	2010-2011	39
2000-2001	28	2011-2012	33

Total = 801

Current students

Semester	Education year	Number of students
4/2	2012-13	44
3/2	2013-14	37
3/1	2014-15	66
2/2	2015-16	44
1/2	2016-17	59

Total = 250

1.5.1 Vision & Mission of Chemistry Department

CHE department aims at providing world class education in the area of Chemistry at undergraduate level. The students of this department get the opportunity to learn the state-of-art methodologies, techniques and technologies in the field of chemical sciences. Subsequently, the graduates get their way into higher studies and research across the earth. As progression of the career, they are

effectively contributing into modern chemistry oriented academia, research and industrial organizations in home and abroad.

1.5.2 Aims of Chemistry Department

The aim of CHE department is to disseminate efficient, complete and diverse chemistry based education in the country. After successful completion of the courses and given appropriate opportunities the CHE graduates will be able to work successfully in the academics, research and industrial sectors anywhere in Bangladesh and the world as well.

1.6 Intended Learning Outcomes of the Department

The undergraduate program in chemistry at SUST aims to provide rigorous education in the fundamental areas of chemical knowledge and experimentation. The program is sufficiently flexible in its curriculum to provide an excellent preparation for careers in many different areas of chemistry. The goal of the Chemistry program is to encourage students to become active members within the chemistry department community. Interaction between undergraduates, faculty, and graduate students is strongly promoted through class and laboratory contact, advising, and informal meetings. The chemistry major provides an education based on science both for students planning to go on to graduate study, and for those intending to immediately pursue professional careers in chemistry or an allied field in which sound knowledge of chemistry is important. Students at all levels are encouraged to undertake original research under the supervision of a member of the chemistry faculty through the Undergraduate Research Opportunities Program. After graduation a student will able to

1. get various theoretical and laboratory based knowledge regarding physical, inorganic, organic as well as analytical and environmental chemistry
2. acquire theoretical and practical knowledge in physics, mathematics, statistics relevant to chemistry,
3. develop communication skill in Bengali and English language,
4. achieve diverse practical knowledge of industrial chemistry for their future career in industry,
5. conceive detailed knowledge in materials, medicine, food, energy, environmental and pharmaceutical and become a good researcher in any of the chemistry area.
6. communicate very well in all forms of communication, e.g., written, verbal (oral) and presentation,
7. develop information and communication technology (ICT) related skills,
8. work in a team with good time management and interpersonal skill
9. acquire problem solving and research skills.

1.6.1 Level of Achievement Expected from Students

It is common in Bangladesh that graduates of public universities possess better academic quality as compared to nongovernment one. We expect better output from our students throughout their university life. We, the faculties of CHE department always try to help our students to extract best of their qualities. We also think students will be efficient leader in their future career.

1.7 Graduates of the chemistry department

Over eight hundred (801) graduates of this department have joined the personnel so far. They have been acting as the ambassador of the department to progress it positively both nationally and internationally. From this department, already 22 batches have graduated under Bachelor in Chemistry as well as have completed Masters in 4 branches of chemistry: Analytical and environmental, Inorganic, Organic and Physical. Currently two hundred and fifty students are studying at undergraduate level, around 100 students are studying under Masters Program. With its 31 qualified and well-trained faculties, the department is successfully moving on the task of producing educated, highly skilled, and trained graduates to meet the challenges of contemporary and future local as well as global issues.

1.8 Brief Descriptions of the Chemistry Department, SUST

Shahjalal University of Science and Technology has started three separate departments such as Chemistry, Physics and Economics in 1991. CHE offers 4 years undergraduate, one and 1.5 years graduate, M. Phil. and doctoral programs which provides students world class education with a state-of-the-art- research experience that prepares them well for their good career and leadership. The course curriculum is focused on the development needs and covers multidisciplinary subject areas to create appropriate knowledge base to cope with fast paced advancement in chemistry and chemistry world. The research activities at the department are focused on various aspects of materials, medicine, natural product chemistry, energy, environmental issues, which includes both basic and applied research.

1.8.1 Credit Requirement

1.8.1.1 BSc (Hons.) in Chemistry Program

The students enrolled under BSc (Hons.) in CHE degree will complete their studies within 4 (four) years of registration to obtain their degree. The minimum credit to be earned for the degree is 146.5 (one hundred and forty six point five) along with completion of all core courses. The minimum CGPA requirement is 2.00 to obtain the degree.

1.8.1.2 MS in Chemistry Program

The students enrolled under MS in CHE program must complete their studies within 1 year (two semesters) for non thesis group and Thesis group 1.5 years (three semesters) of registration to obtain their degree. The minimum credit to be earned for the degree is 36 (thirty six) for non thesis and 48 for thesis group along with completion of all core courses. The minimum CGPA requirement is 2.00 to obtain the degree.

1.8.2 Term Final Examination

1.8.2.1 BSc (Hons.) in Chemistry Program

The duration of term final examination shall be of 3 (three) hours for 3 credits and 2 hours for 2 credits theory courses. The Head of the department in consultation with faculty in the departmental meeting set up the term final examination schedule normally two weeks ahead of first day of examination. The Controller of Examinations will officially announce the examination schedule. There are two internal question setters (one of them is course teacher) for each course. A total of six questions for three credits and six questions for two credits usually set up through moderation in presence of an external member of the committee. The examinee is required to answer any 4(four) questions for three credit course within 3 h and also they have to answer 4 (four) questions for two credit course within 2 h.

1.8.2.2 MS Program in Chemistry

The duration of final examination shall be of three hours for all courses. The Controller of Examinations, in consultation with the Head of the department consulting with other faculties prepare and circulate the schedule for final examination of the courses offered by the department in a particular term, at least two week before the commencement of the examination. There will be two question setters for each course (among them one is course teacher). A total of six questions are set up for each course. The examinee is required to answer any 4 (four) questions (2 from part A and 2 from part B) within 3 h for three credit course and also any four question (2 from part A and 2 from part B) for 2 credit course within 2 h. The final examination system is almost same for undergraduate and graduate courses.

1.8.2.3 MPhil Program in Chemistry

The candidates for M. Phil will be selected for admission after a written and/or viva voice examination conducted by the GSC (Graduate Studies Committee) of the department. Full time teachers of SUST are not required to sit for the admission test. GSC will then recommend the qualified candidates for admission to the academic council through the BAS (Board of Advanced Studies). During the process of admission each candidate shall be assigned by the appropriate GSC

and approved by BAS a supervisor from among the teachers of the relevant Chemistry department not below the rank of an associate professor or an assistant professor with a PhD degree.

MPhil Course requirements and Duration

Category A: (1) Students, who completed **4-Year BSc (Hons.) and 1 Year MSc** in Chemistry from a Public University (2) Faculty members of public Universities/ researchers of any national institute.

Category B: Students, who completed **3-Year BSc (Hons.) and 1 year MSc** in Chemistry from a Public University, will complete 48 credits within two semesters.

Course structure

Semesters	**Category A**		**Category B**	
Semester 1	Course	Credit	Course	Credit
			Theory course-1	3.0
			Theory course-2	3.0
	CHE 600A (Progress of research works)	6.0	CHE 601: Research skill development	6.0
Semester 2	CHE 600B Thesis dissertation	18.0	CHE 610: Research planning CHE 615: Project work CHE 690 General viva	4.0 6.0 2.0
Semester 3			CHE 600A (Progress of research works)	6.0
Semester 4			CHE 600B Thesis dissertation	18.0
	Total	**24.0**		**48.0**

1.8.2.4 PhD Program in Chemistry

The candidates are eligible for direct admission to PhD if they have a CGPA of 3.25 or more at Bachelors (8 semesters) and Masters (3 semesters) Level and 3.00 or equivalent in all public examinations. University teachers with two years of teaching experience and one publication in standard academic journal are eligible for admission to PhD directly. Teachers of colleges with three years of teaching experience and one publication in a standard academic journal and researchers of recognized research organizations with three years of research experience and at least three publications in standard academic journals are also eligible for PhD admission. Every year PhD student has give a presentation with a final public seminar at the end. After completion of research a PhD students must submit a thesis consulting with supervisor, which is evaluated by internal as well as external examiner.

Chapter Two

Governance

In the face of dramatic changes over recent decades in higher education landscape, governance has become a crucial issue in quality assurance in higher education. Chemistry is called the "central science" because it connects in many areas of science. As it is central to intellectual and technological advances, the excellence in chemistry education for undergraduate students is the prime goal of the chemistry department. Chemistry programs have the responsibility to communicate this view to their students and to teach the skills necessary for their students to apply this perspective. Our program vision is to establish a center of excellence in chemistry with research in advanced level. The mission of the department of Chemistry is to provide a creative educational program to meet the challenges that our graduates are likely to be faced throughout their professional careers with highly-developed skills in lifetime learning, planning, problem-solving, communication and leadership.

2.1. Program Management: Good governance and quality assurance depends on the integrated approach of management by the statutory bodies and individual units of the university. It needs commitment, sense of responsibility, team work, collaboration and coordination among the top management, academic, administrative and support units of the university. All the responsibilities are defined basically by the university governance system mainly syndicate, and academic Council etc.

Disciplinary rules and regulations are well communicated. Every year SUST publishes a diary containing lists of the teachers, officers of all academic and administrative sections, proctorial rules and regulations and code of conduct for students, teachers, officers and staff members. Basically the policies are set by the university act. The highest authorities syndicate and academic council have been empowered to review its policy and procedure regularly. All the teachers, students, officers and staff members are provided a diary every year. At the beginning of the first semester of the program, every student is provided a copy of the syllabus book that contains detail information on student admission, academic calendar, course registration, graduation criteria, examination system and grading system. After completion of the self-assessment process, the department will provide a curriculum book including program mission, objectives, intended learning outcomes, graduate profile and other relevant information to all the students.

The head of the department ensures proper functioning of all bodies and units according to their defined area. Decisions in the department are taken democratically. A committee comprising all the faculty members of the department at station led by the head is liable for all academic decisions in the department. This committee generally sits once a week and takes decisions in a transparent way. Here

presence of all faculties increases the reliability and transparency in decision making process. Again for convenience of departmental activities (academic and non-academic), a number of specialized committees are formed through the departmental meeting; such as syllabus committee, examination committee, procurement committee, students advisory committee etc. Absence of provision in SUST academic ordinance for formal representation of students, they cannot participate in academic decision making mechanism directly. All academic and administrative affairs are strictly maintained in compliance with rules and regulations to ensure good governance in the program.

2.2. Academic Documentation

Accountability and transparency are very critical to develop stakeholder's confidence and trust. It needs proper documentation and access to information relating to all aspects of management of academic programs and the university.

The university has a well-designed website. Web address of our university is ***www.sust.edu***. This website contains required information for the prospective students and visitors. Individual faculty/ staffs have their own page. The website is becoming more informative and conducive to the stakeholders by regular updating.

The resolutions (signed by the participating members) of all meetings of the academic committee are preserved in specific files. The academic committee has the access to those files.

Documentation at all levels is also kept properly at different concern entities e.g. faculty member personally, office of the department, dean office, registrar office, VC office and if needed examination control office, accounts section etc.

A data base has been developed where all the published results of each semester from the beginning of the department to the present are available. The hard copy of all results and students' registration cards have also been preserved in bounded form. Academic papers are documented in a very structured way. All the academic papers are given a memo number. Then the documents are filed with specific title and number.

2.3 Peer Observation and Feedback Process

Active role of major stakeholders, particularly employers and students, in higher education process is highly recognized for quality assurance.

At the end of the semester, feedback form is provided to the students to evaluate the quality of the course delivery in informal and irregular way. Formally peer observation is absent and head of the department or any other body at present do not have enough logistic support to take any initiative. Again, we don't have any structured way to obtain the feedback from other stakeholders at present,

for example, alumni, academic staffs and employers. A platform through departmental website to ensure active role will be started and collected feedback from the major stakeholders particularly from the alumni and employers soon.

2.4 Internal Quality Assurance Process

The process of quality assurance is a new concept for our university. Among twenty eight (28) departments of SUST, this department is one the eight that has been selected for self-assessment in the second cycle. According to the direction of IQAC, self -assessment committee has been formed with three senior teachers to conduct survey among the existing students, alumni, employers, academic and non-academic staffs. The survey results followed by a detail SWOT analysis now will be the base for future development plan. Such a systematic and a periodical approach to collect the stakeholder's ideas, evaluation and comments would help the department to achieve the established criteria or standards of QA practice.

2.5 Key Performance Indicators (KPI)

KPI is not well defined yet. But after the completion of running SA projects, KPI will be defined and maintained.

2.6 Survey results on governance

Survey is conducted among appropriate group of stakeholders where the following aspects of the curriculum have been evaluated according to the scale given:

Evaluation Scaling (Five Point Scale):

5–Strongly agree; 4–Agree; 3– Undecided; 2–Disagree; 1–Strongly disagree

& <5-highly Satisfied, <4- Satisfied and <3- Dissatisfied

(i) Academic-Staff (teachers) survey

As part of 'Program Self-Assessment' the teachers of chemistry department participated in the survey. In this part, twenty eight (28) teachers were surveyed out of 31. Findings on governance survey of teachers are summarized below.

Table 2.1: Teachers' Evaluation on Governance Aspect

Stake holder	Areas of Evaluation	Scale(5)	Observation
Teachers (N=28)	1. Program aims, objectives and learning outcomes are clear enough	3.5	Satisfied
	2. The program objectives and learning outcomes are periodically reviewed in consultation with stakeholders (students, alumni, employers, civil society organizations and international peers etc.	3.2	Satisfied
	3. Department provides student handbook containing the program aims, objectives, learning outcomes, and	3.0	Undecided

	methods of assessment of the students.		
	4. Students 'opinion regarding academic and extra-academic matters are treated properly.	3.8	Satisfied
	5. The department provides student a conducive learning environment in which scholarly and creative achievements are nurtured.	4.1	Highly satisfied
	6. Teachers are friendly and cooperative to each other and which make a positive impact over the teaching-learning environment.	4.8	Highly satisfied
	7. Fairness and transparency of academic decisions at all levels are maintained	4.3	Highly satisfied
	8. Decision making procedure in the discipline/department is participatory.	4.3	Highly satisfied
	9. Academic calendar is maintained properly.	3.7	Satisfied
	10. Results at all levels are published in compliance with the ordinance.	4.3	Highly satisfied
	11. Documentations (decisions of committees, class attendance registers, questions, continuous assessment answer scripts, marks, examination results, students' progress etc.) are maintained properly.	4.2	Highly satisfied
	12. Peer observation, mentoring and feedback are in practice.	3.2	Satisfied
	13. KPIs are well defined and well communicated.	2.5	Dissatisfied
	14. Perfect evaluating system for teaching staffs' performance is prevailing.	2.7	Dissatisfied
	15. Internal quality assurance unit is working.	3.2	Satisfied
	Average	**3.64**	**Satisfied**

(ii) Students' Survey

Chemistry department offers BSc (Hons.) and graduate program. From BSc (Hons.) program, 106 students out of 250 undergraduate students were surveyed. The sample distribution of the survey on undergraduate students was as follows:

As the questionnaire was basically a perception survey, the senior batches have given priority.

4-2 semester (No. of Students 33; Session 2011-12); 3-2 semester (No. of Students 36; Session 2012-13) and 2-2 semester (No. of Students 37; Session 2013-14)

Table 2.2: Students' Evaluation on Governance Aspect

Stake holder	Areas of Evaluation	Scale (5)	Decision
	1.Vision, mission and objectives of the entity are clearly stated	3.23	Satisfied
	2.The intended learning outcomes (ILOs) satisfy the stated mission and objectives of the entity.	2.70	Dissatisfied
	3.The entity provides comprehensive guidelines to the students in advance by means of a brochure/handbook	2.90	Dissatisfied

Students (N= 106)	4.The entity has adequate infrastructures to satisfy its mission and objectives	2.57	Dissatisfied
	5.Students' opinion regarding academic and extra-academic matters are addressed properly.	2.27	Dissatisfied
	6. The entity ensures a conducive learning environment.	3.37	Satisfied
	7. Academic decisions are taken by the entity with fairness and transparency.	3.23	Satisfied
	8.The entity reviews its policy and procedures periodically for further improvement	3.10	Satisfied
	9. Codes of conduct for the students are well communicated.	3.87	Satisfied
	10. Disciplinary rules and regulations are explicitly defined and well circulated	3.90	Satisfied
	11.Academic calendars are maintained strictly by the entity	2.53	Dissatisfied
	12.Results are published timely in compliance with the ordinance	1.77	Highly dissatisfied
	13. Website is updated properly.	2.43	Dissatisfied
	Average	**3.17**	**Satisfied**

(iii) Alumni Survey

As important stakeholders, alumni (N = 115) opinion was sought for meaningful assessment of the programs run by the department and its future improvement.

Table2. 3: Alumni Evaluation on Governance Aspect

Stake holder	Area of Evaluation	Score(5)	Observation
Alumni (N = 115)	1. Department provided written information in advance about the aims, objectives, learning outcomes and methods of assessment of the program to the students.	3.43	Satisfied
	2. The department provided its student a conducive learning environment in which scholarly and creative achievements were nurtured	3.88	Satisfied
	3. Fairness and transparency of academic decisions at all levels were maintained	4.05	Highly satisfied
	4. Teachers were friendly and cooperative to the students and which made a positive impact over the teaching-learning environment	4.21	Highly satisfied
	5. Formal process using structured questionnaire to collect student feedback was in practice.	2.76	Dissatisfied
	6. Academic calendar was maintained properly	3.00	Undecided

	7. Results at all levels were published according to the stipulated time mentioned in the ordinance	2.66	Dissatisfied
	8. Students' opinion regarding academic matters (Credit hour/Course content/PL timing/Class hour) were treated properly	3.43	Satisfied
	9. Students' opinion regarding extra-academic matters (sports/study tour/cultural activity) were treated properly	3.61	Satisfied
	10. Website was informative and students could use that in various purposes	2.66	Dissatisfied
	Average	**3.369**	**Satisfied**

(iv) Non- academic staffs:

As important stakeholders, non- academic staffs' opinion was important for future improvement of the program. In this section, existing four (N = 4) non-academic staffs were surveyed.

Table 2.4: Non- academic staffs Evaluation on Governance Aspect

Stake holder	Areas of Evaluation	Scale(5)	Observation
Non -academic staffs (N = 4)	1. Department provides a brochure to the students in advance consisting a comprehensive guidelines of the program	4.30	Highly satisfied
	2. Fairness and transparency of academic decisions at all levels are maintained.	3.5	satisfied
	3. The department provides its student a conducive learning environment in which scholarly and creative achievements are nurtured	4.0	Agreed
	4. Academic calendar is maintained properly	3.8	satisfied
	5. Results at all levels are published in compliance with the ordinance	3.8	satisfied
	6. Documentations (decisions of committees, class attendance registers, questions, continuous assessment answers scripts, marks, examination results, students' progress etc.) are maintained properly.	4.0	Agreed
	7. Perfect evaluating system for nonacademic staffs' performance is prevailing	3.3	Satisfied
	8. Teachers are friendly and cooperative to the staffs and which make a positive impact over the teaching-learning environment	3.5	Satisfied
	9. University has defined procedures for all activities performed.	3.0	Undecided
	Average	**3.69**	**Satisfied**

Table 2.5: Overall average of different stake holders on Governance:

Aspect: Governance (Scale 5)	
Teachers	3.64
Students	3.17
Alumni	3.37
non-academic staff	3.69
overall average	3.47
Decision	Satisfied

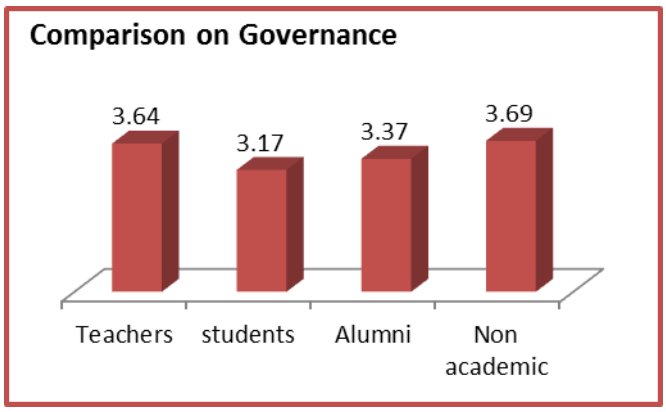


Fig.: 2.1 Survey result comparison on Governance aspect

Good governance in education systems promotes effective delivery of education services. Comparison of survey on governance (Fig 2.1) showed the satisfaction from all stockholders where satisfaction level for teachers is the highest among others. Tabulated result (Table 2.5) from our survey findings shows that, the average value of important four stake holders is 3.47. This is implying a midway opinion between most expected and most unexpected situations.

Table 2.6: Comparison on different areas of Governance among different stake holders:

Areas of Evaluation	Teacher	Student	Alumni	Non- aca staff
	Scale (5)			
Program Management				
1. Program aims, objectives and learning outcomes are clear enough	3.5	3.23	-	-
2. The program objectives and learning outcomes are periodically reviewed in consultation with stakeholders (students, alumni, employers, civil society organizations and international peers etc.	3.2	3.10	-	-
3. Department provides student handbook containing the program aims, objectives, learning outcomes, and methods of assessment of the students.	3.0	2.9	3.43	4.3
4. Students 'opinion regarding academic and extra-academic matters are treated properly.	3.8	2.27	3.43	-
5. The department provides student a conducive learning environment in which scholarly and creative achievements are nurtured.	4.1	3.37	3.88	4.0
6. Teachers are friendly and cooperative to each other and which make a positive impact over the teaching-learning environment.	4.8	-	4.21	3.5
7. Fairness and transparency of academic decisions at all levels are maintained	4.3	3.23	4.05	3.5

8. Decision making procedure in the discipline/department is participatory	4.3	-	3.61	-
9. Academic calendar is maintained properly.	3.7	2.53	3.0	3.8
9(i) Website was informative and students could use that in various purposes.	-	2.43	2.66	-
Academic documentation				
10. Results at all levels are published in compliance with the ordinance.	4.3	1.77	2.66	3.8
11. Documentations (decisions of committees, class attendance registers, questions, continuous assessment answer scripts, marks, examination results, students' progress etc.) are maintained properly.	4.2	-	-	4.0
Internal quality assurance process (feedback process)				
12. Perfect evaluating system for teaching staffs' performance is prevailing.	2.7	-	2.76	-

From Table 2.6 it is noticeable that clear information on program aims, objectives and learning outcomes and its reviewing process in consultation with stakeholders (Q.1,2), teachers and current students opinion is not agreed . Basically the program information is not so clearly written and well elaborated in the syllabus presented in any written document like brochure or curriculum. Again providing student handbook containing the program aims, objectives, learning outcomes, and methods of assessment of the students and properly treating of students' opinion regarding academic and extra-academic matters (Table 2.6), they are not agreed also. These objectives are not practiced formally.

Now it is very positive that teachers are friendly and cooperative to each other. Thus department provides student a conducive learning environment in which scholarly and creative achievements are nurtured.

Here teachers are happy about maintenance of transparency and fairness in academic decisions at all levels with participatory and democratic way (Table 2.6).

About the maintenance of the academic calendar strictly, informative website, and publication of results within stipulated time, students' are less satisfied. These are the strong weaknesses of the program.

Teachers are little bit satisfied about completion of academic calendar properly because they know the limitation. Again they are highly satisfied that results at all levels are published in compliance with the ordinance and documentations (decisions of committees, class attendance registers, questions, continuous assessment answer scripts, marks, examination results, students' progress etc.) are maintained properly though students and alumni are not agreed about result publication within stipulated time (Table 2.6).Students and alumni are not sure about the result processing system. On the other the hand, students' opinion regarding academic and extra-academic matters are surprisingly frustrating. They are also not happy with the infrastructures to fulfill its mission and objectives. Definitely this is one of the main weaknesses of the program. Again by entity's effective

communication, students are informed code of conduct with disciplinary rules and regulations as yearly diary is circulated.

More specifically, there is a disagreed observation over the issues, prevailing of a well-defined and communicated KPIs and a perfect evaluating system for teaching staffs' performance. Actually these are usually are not practiced now. Formal process using structured questionnaire to collect student feedback was not also in practice.

Following table is an overall evaluation of the findings obtained from different stakeholders on governance.

Table 2.7: Overall Evaluation on Governance

Stake holders	Best two aspects	Scale (5)	Worse two aspects	Scale (5)
Teachers	1. Teachers are friendly and cooperative to each other and which make a positive impact over the teaching-learning environment.	4.8	1. KPIs are well defined and well communicated.	2.5
	2. Fairness and transparency of academic decisions at all levels are maintained	4.3	2. Perfect evaluating system for teaching staffs' performance is prevailing.	2.7
Students	1. Disciplinary rules and regulations are explicitly defined and well circulated	3.90	1.Results are published timely in compliance with the ordinance	1.77
	2. Codes of conduct for the students are well communicated.	3.87	2. Website is updated properly.	2.43
Alumni	1. Teachers were friendly and cooperative to the students and which made a positive impact over the teaching-learning environment	4.21	1. Results at all levels were published according to the stipulated time mentioned in the ordinance	2.66
	2. Fairness and transparency of academic decisions at all levels were maintained	4.05	2. Website was informative and students could use that in various purposes	2.66

Source: Compiled on the basis of survey, Department of Chemistry, SUST, 2016-2017

Chapter Three

Curriculum Design and Review

In education, a curriculum is broadly defined as the totality of student experiences that occur in the educational process. It includes the content of courses (the syllabus), the methods employed (strategies), and other aspects, like norms and values, which relate to the way the department is organized. Curriculum design and review is a continuous, cyclic process. It involves making decisions about how to give effect to the national curriculum in ways that best address the particular needs, interests, and circumstances of the department's students and community. Self-Assessment facilitates the integration of the procedure in redesigning, modernizing and updating the curricula to accommodate the job market requirements as well as to judge the department.

Degree Title

The program degree title is: Bachelor of Science (Hons) in Chemistry.

3.1 Need Assessment

Throughout the world, education is considered to be the very important tool for attaining national goals. Education provides learners with skills needed for survival. Chemistry is a popular subject among undergraduate students in Bangladesh due to its nature. It addresses the needs of majority through its relevance and functionality in content, practice and application. What many nations like Bangladesh need now is a functional chemistry education that will assist in national development. Chemistry education has been identified to be one of the major bedrock for the transformation of our national economy. Chemistry Education can be seen as the acquisition of knowledge or ideals relevant to chemistry. It is concerned with the impartment of knowledge on properties, components, transformations and interactions of matter. An assessment of a chemistry lesson can be measured using a quiz, lab practical exam, written exam, or student satisfaction survey (formal); or can be evaluated through observations or conversation. Usual way of assessment are often designed by the teacher for assessment, like term test, assignment, presentation etc. Dual examination assessment tools have the advantage of being unbiased and statistically valid. The Department of Chemistry at SUST is following the way of dual examination assessment tools in that regards.

3.2 Curriculum Design

The Department of Chemistry at SUST has been designing its syllabus and assessment procedures and formalizing the connection between departmental mission, curriculum objectives, and student learning outcomes every year. Regular changes in curriculum give students more flexibility in defining the

breadth and depth of their chemistry education as well as in getting up to date flavor of chemistry with in country and globally. In addition, by including industrial training as mandatory, students are getting realistic knowledge of chemistry applications. The objective of the Bachelor of Science (Hons) degree in Chemistry is to enable the students to be competent as chemistry professionals as well as to perform further studies. **It is a 146.5 (Total eight semesters; 16 + 21.0 + 19.0 + 18.5 + 20.5 + 18.5 + 19.0 + 14.0 =146.5) credit for of 4 years of undergraduate program.** As per SUST academic ordinance, a student has to complete a blend of at least 60% of the total credit from the major courses and 20% from the non-major courses. At the bachelor courses it is always tried to balance different courses from four different major branches of chemistry, which are physical, inorganic, organic and analytical.

During the first year, the students are introduced to the basic principles of chemistry. First year and second year syllabus also contains different non major courses, like physics, mathematics, statistics, ICT and language, which are very important to understand chemistry and to make correlation of knowledge among those subjects matter.

The other semester's syllabus provides the advance knowledge of chemistry. Where, students are encouraged to deepen their understanding in areas of particular interest and ability. Finally the students are required to complete a research project on topic / industrial assignment of student's interest and assigned by the department. The structure of the curriculum is presented in the following table with course code, course title, course credits and prerequisite (when applicable)

Definition of Credit Unit

One credit represents one class hour. An academic semester represents 13 weeks of classes exclusive of final exams.

Table: 3.1 Syllabus for session 2016-2017

Department of Chemistry

Session: 2016-17

First Year: *Semester I*

Course No	Course Name	Hours/Week Theory+Lab	Credits	Prerequisite Courses / Observation
CHE 121	Physical Chemistry-I	2 + 0	2.0	
CHE 131	General Principles of Inorganic Chemistry-I	2 + 0	2.0	
CHE 132	General Inorganic Chemistry Practical	0 + 4	1.5	
CHE 141	Fundamental Organic Chemistry-I	3 + 0	3.0	

Second Year: *Semester II*

CHE 142	Laboratory Techniques for Organic Chemistry	0 + 4	1.5	
MAT 102K	Trigonometry, vectors & Geometry	3 + 0	3.0	Non major
ENG 101K	English Communication Skills	2 + 0	2.0	Non major
ENG 102K	English Language Lab	0 + 2	1.0	Non major
	Total	13 + 10 = 23	16.0	

First Year: *Semester II*

Course No.	Course Name	Hours/Week Theory + Lab	Credit	Prerequisite Courses / Observation
CHE 122	Physical Chemistry-II	3 + 0	3.0	
CHE 123	Physical Chemistry Practical -I	0 + 4	1.5	
CHE 134	Inorganic Chemistry Practical (Qualitative)	0 + 4	1.5	CHE 131
CHE 135	General Principles of Inorganic Chemistry II	2 + 0	2.0	
CHE 143	Fundamental Organic Chemistry-II	3 + 0	3.0	CHE 141
MAT 103K	Calculus & Differential Equations	3 + 0	3.0	Non major
PHY 103K	Mechanics, Waves, Heat and Thermodynamics	3 + 0	3.0	Non major
ENG 103K/ BNG 101K	Academic English / Bengali Language	[2 + 0] [2 + 0]	2.0/ 2.0	Non major
ENG 104K/ BNG 102K	English Language Lab-II / Bengali Language Lab	[0 + 2] [0 + 2]	1.0/ 1.0	Non major
CHE 100	Seminar and Oral	-	1.0	
	Total	16 + 10= 26	21.0	

Second Year: *Semester I*

Course No.	Course Name	Hours/Week Theory + Lab.	Credit	Prerequisite Courses / Observation
CHE 221	Thermodynamics	3 + 0	3.0	CHE 122
CHE 222	Physical Chemistry Practical-II	0 + 4	1.5	
CHE 232	Inorganic Chemistry Practical (Quantitative)	0 + 4	1.5	
CHE 234	Group Chemistry–I	2 + 0	2.0	CHE 131, CHE 135
CHE 235	Group Chemistry-II	2 + 0	2.0	CHE 131, CHE 135
CHE 241	Topics in Stereochemistry and Heterocyclic Chemistry	2 + 0	2.0	
PHY 207K	Optics, Electromagnetism & Modern Physics	3 + 0	3.0	Non major
PHY 202K	Basic Physics Laboratory	0 + 4	2.0	Non major
STA 209K (For CHE)	Statistics	2 + 0	2.0	Non major
	Total	15 + 12 = 27	19.0	

Course No.	Course Name	Hours/week Theory + Lab.	Credits	Prerequisite Courses / Observation
CHE 223	Phase Equilibria, Colloids & Surface Chemistry	2 + 0	2.0	CHE 121, CHE 122
CHE 224	Electrochemistry	2 + 0	2.0	
CHE 236	Advanced Chemical Bonding	2 + 0	2.0	CHE 131
CHE 242	Preparation of Organic Compounds	0 + 4	1.5	CHE135
CHE 243	Organic Reaction Mechanism	3+ 0	3.0	CHE 141
MAT 202K	Mathematical Methods	3 + 0	3.0	MAT 103C
CSE 203K	Introduction to Computer Language	2 + 0	2.0	Non major
CSE 204K	Introduction to Computer Language Lab	0 + 3	2.0	Non major
CHE 200	Seminar and Oral	-	1.0	
	Total	12 + 7 = 19	18.5	

Third Year: *Semester I*

Course No.	Course Name	Hours/week Theory + Lab.	Credit	Prerequisite Courses / Observation
CHE 321	Chemical Kinetics & Photochemistry	3 + 0	3.0	
CHE 331	Co-ordination Chemistry-I	3 + 0	3.0	CHE 235, CHE 236
CHE 332	Nuclear Chemistry	2 + 0	2.0	CHE 222
CHE 342	Qualitative Identification of Organic Compounds	0 + 6	2.0	
CHE 343	Chemistry of Natural Products	3 + 0	3.0	
CHE 351	Analytical Chemistry	3 + 0	3.0	
CHE 361	Industrial Chemistry-I	2 + 0	2.0	
CHE 363	Industrial Chemistry Practical	0 + 4	1.5	
CHE 364	Field work (Industrial Tour)	0 + 3	1.0	
	Total	15 + 13 =28	20.5	

Third Year: *Semester II*

Course No.	Course Name	Hours/Week Theory + Lab.	Credit	Prerequisite Courses / Observation
CHE 322	Chemical Spectroscopy	3 + 0	3.0	
CHE 323	Physical Chemistry Practical-III	0 + 4	1.5	
CHE 333	Organometallic Chemistry	3 + 0	3.0	CHE 331
CHE 334	Inorganic Chemistry Practical	0 + 4	1.5	
CHE 341	Polymer Chemistry	2 + 0	2.0	CHE 241
CHE 352	Analytical Chemistry Practical	0 + 4	1.5	CHE 232
CHE 353	Environmental Chemistry	2 + 0	2.0	CHE 351
CHE 362	Industrial Chemistry-II	2 + 0	2.0	
CHE 370	Computational Chemistry Practical	0 + 4	1.0	
CHE 300	Seminar and Oral	-	1.0	
	Total	13+ 16 = 29	18.5	

Fourth Year: ***Semester I***

Course No.	Course Name	Hour per week Theory + Lab	Credits	Prerequisite Courses / Observation
CHE 421	Quantum Chemistry & Statistical Mechanics	3 + 0	3.0	MAT 202, STA 209
CHE 431	Coordination Chemistry-II	3 + 0	3.0	CHE 331
CHE 441	Advanced Organic Chemistry	3 + 0	3.0	CHE 241, CHE 243
CHE 443	Organic Reagents and Synthesis	3 + 0	3.0	CHE 243
CHE 451	Spectroscopic Methods in Structural Analysis	3 + 0	3.0	CHE 322
CHE 452	Chromatographic Methods	2 + 0	2.0	
CHE 470	General Practical	0 + 8	2.0	
	Total	17 + 8 =25	19.0	

Fourth Year: ***Semester II***

Course No.	Course Name	Hour per week Theory + Lab	Credits	Prerequisite Courses / Observation
CHE 422	Solid state Chemistry & Crystallography	3 + 0	3.0	
CHE 432	Bioinorganic Chemistry	2 + 0	2.0	
CHE 442	Biological and Medicinal Chemistry	2 + 0	2.0	
CHE 453	Electroanalytical Techniques	2 + 0	2.0	CHE 351

CHE 471/ 472	Research Project / Industrial Assignment	0 + 8	3.0
CHE 400	Seminar & Oral		2.0
	Total	9 + 8 = 17	14.0

Total eight semesters; 16 + 21.0 + 19.0 + 18.5 + 20.5 + 18.5 + 19.0 + 14.0 =146.5

Table: 3.2 Summary of the Course Structure:

Category	**Credit**	**Percentage of Total Credit %**	**Credit of different branches**	**Credit Percentage of different branches %**
General education	ENG and BNG courses: 6 credits	4.10	Theory: 4	2.73
			Lab:2	1.37
Non- Major courses	MAT, PHY, STA and CSE: 23 credits	15.70	Theory: 19	12.97
			Lab: 4	2.73
Major courses: Theory	CHE courses: 89 credits	60.75	Physical: 26	17.75
			Inorganic: 21	14.33
			Organic: 26	17.75
			Analytical: 16	10.92
Major courses: Lab	CHE courses: 19.5 credits	13.31	Physical: 4.5	3.07
			Inorganic: 6	4.10
			Organic: 5	3.41
			Analytical: 4	2.73
Major courses: Seminar / Oral	CHE courses: 5 credits	3.41		
Major courses: Research Project / Industrial Assignment	CHE courses: 3 credits	2.05		
Major courses: Field work (Industrial Tour)	CHE courses: 1 credit	0.68		
	Total: 146.5 Credits	Total percentage: 100%		

3.3 Curriculum Review Process

As per SUST Act, curriculum for every program is designed by all the faculty members led by the head of the department. Two external members (experts) are always invited additionally to give their opinion on the contents of the curriculum. Non major courses are designed and reviewed by the respective department taking consideration of our suggestions. The curricula are usually being reviewed every year as the procedure described above before a new batch is enrolled.

3.4 Curriculum Alignment/ Skill Mapping

The following table shows the curriculum alignment considering the 'Intended Learning Outcomes' given below:

1. To get various theoretical and laboratory based knowledge regarding physical, inorganic, organic as well as analytical and environmental chemistry
2. To acquire theoretical and practical knowledge in physics, mathematics, and statistics relevant to chemistry
3. To develop communication skill on Bengali and English languages.
4. To achieve diverse theoretical and practical knowledge of industrial chemistry for their future career in industry.
5. To conceive detailed knowledge in materials, medicine, food, energy, environmental and pharmaceutical to become a good researcher in any of the chemistry area.
6. To communicate very well in all forms of communication, e.g., written, verbal (oral) and presentation,
7. To develop information and communication technology (ICT) related skills,
8. To work in a team with good time management and interpersonal skill
9. To acquire problem solving and research skills.

Table: 3.3 curriculum alignment considering the 'Intended Learning Outcomes'

Courses	Learning Outcomes								
	1	2	3	4	5	6	7	8	9
CHE 121, 131, 132, 141, 142, 122, 123, 134, 135, 143,221, 222, 232, 234, 235, 241, C 223, C 224, 236, 242, 243, 321, 331, 332, 342, 343, 351, 322, 323, 333, 334, 341, 352, 353, 421, 431, 441, 443, 451, 452, 470, 422, 432, 453	√			√	√	√			
MAT 103K, PHY 103K, 207K, 202K, STA 209K, MAT 202K		√							
ENG 101K, 102K, ENG 103K/BNG 101K, ENG 104K/ BNG 102K			√						
CSE 203K, 204K, CHE 370							√		
CHE 100, 200, 300,400						√			
CHE 471/472, CHE 442					√			√	√
CHE 361, 362, 363, 364				√					

3.5 Survey Results on Curriculum Design and Review

Survey is conducted among appropriate group of stakeholders where the following aspects of the curriculum have been evaluated according to the scale given:

5–Strongly agree; 4–Agree; 3– Undecided; 2–Disagree; 1–Strongly disagree

& <5-highly Satisfied, <4- Satisfied and <3- Dissatisfied

Stakeholders participated for these surveys are 28 teachers out of 31 teachers, 106 current students [4-2 semester (No. of Students 33; 2011-12), 3-2 semester (No. of Students 36; 2012-13) & 2-2 semester (No. of Students 37; 2013-14)] and 115 alumni.

Table: 3.4 Survey Results on Curriculum Design and Review

Stake holders	**Areas of Evaluation**	**Scale (5)**	**Observation**
Teacher (N=28)	1. Curriculum addresses the program objectives and program learning outcomes	3.0	Undecided
	2. Inputs from the relevant stakeholders are taken into consideration in designing curriculum	2.6	Dissatisfied
	3. Curriculum consists course learning outcomes, content, teaching strategy and assessment strategy	3.3	Satisfied
	4. Curriculum evaluation is done regularly following appropriate procedures with the involvement of students, teachers and other stakeholders.	3.0	Undecided
	5. Volume of curriculum in terms of study load is optimum for achieving learning outcomes.	4.0	Agreed
	6. Stated teaching strategies are appropriate for achieving learning outcomes	3.7	Satisfied
	7. Assessment strategies are suitable and match to the learning outcomes	3.5	Satisfied
	8. Current curriculum is reviewed and updated regularly in consultation with the stakeholders (students, alumni, employers, civil society organizations and international peers etc.)	2.7	Dissatisfied
	9. Current curriculum is enough to develop students‟ creativity, positive attitude with ethical standard.	3.5	Satisfied
	Average	**3.26**	**Satisfied**
Current Students (N= 106)	1. Courses in the curriculum from lower to higher levels are consistently arranged	4.0	Agreed
	2. Teaching strategies are clearly stated in the curriculum	2.50	Dissatisfied
	3. Assessment strategies are explicit in the curriculum	3.70	Satisfied
	4. Curriculum load is optimum and exerts no pressure	2.80	Dissatisfied
	5. Curriculum is effective in developing analytical and problem solving skills.	3.10	Satisfied
	Average	**3.22**	**Satisfied**
Alumni (N=115)	1. Curriculum addresses the program objectives and program learning outcomes	3.81	Satisfied
	2. Curriculum in the program was too heavy and induces huge pressure	3.02	Satisfied
	3. Courses in the curriculum were structured and arranged properly	4.12	Highly Satisfied

	4. Teaching strategies stated in curriculum (!) were appropriate for achieving learning outcomes	3.42	Satisfied
	5. Assessment strategies were suitable and match to the learning outcomes	3.67	Satisfied
	6. The curriculum was effective in enhancing team-working abilities.	3.74	Satisfied
	7. The curriculum was effective in developing analytical and problem solving skills.	3.54	Satisfied
	8. The curriculum was effective in developing ICT & communication skills	3.04	Satisfied
	9. Lecture hours were enough to finish course content	3.88	Satisfied
	Average	**3.59**	**Satisfied**

From our findings, teacher's evaluation on 'Inputs from the relevant stakeholders are taken into consideration in designing curriculum' showed dissatisfaction.

Due to absence of provision in the SUST academic ordinance, specific body or formal committee with representation from the major stakeholders like current students, alumni, employers etc. for their view in designing and redesigning of curriculum are not practiced. However, informal input from the alumni and employers up to date improvement of global chemistry are always taken in to consideration with utmost importance for reviewing the curriculum.

Changes in curriculum are always made on the basis of discussion in the meeting of the curriculum committee. Objectives and tentative outcomes are noted with in the content of respective course syllabus. It is usual practice to make documents for all the changes. On the other hand current students are dissatisfied with the topics "Teaching strategies are clearly stated in the curriculum". Although alumni expressed their satisfaction over this issue, current students truly focused on this issue because our curriculum does not cover teaching strategies in details. However as we have updated the syllabus, student will get in details of teaching strategies like ILO, objectives etc. Again, students showed their dissatisfaction on another issue "Curriculum load is optimum and exerts no pressure", whereas alumni and teachers' showed their satisfaction and agree on the similar issue. This is usual practice for current student because they are not in such a position to compare. Whereas alumni and teachers have the opportunity to compare in their current position. It is very good that both students and alumni are agreed and highly satisfied on the issue "Courses in the curriculum were structured and consistently arranged". It is also convincing that both current students and alumni are in same position; showed their satisfaction in some extent on the issue "Curriculum is effective in developing analytical and problem solving skills".

Comparison of survey on curriculum design and reviews (Fig. 3.1) clearly has pictured the satisfaction from all stockholders where satisfaction level for alumni is the highest among others. It is highly expected that after syllabus modification, the evaluation scaling index would be increased.

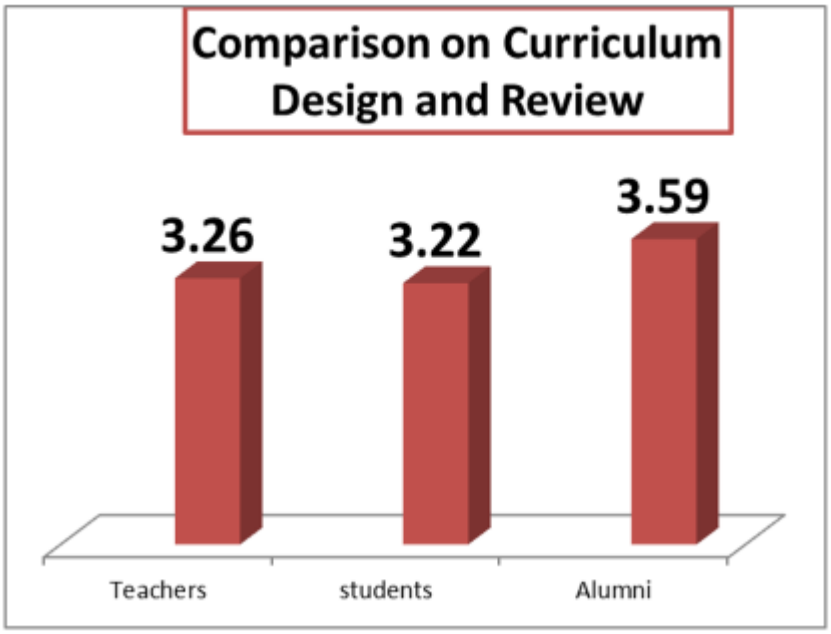


Fig.: 3.1 Survey result comparison on curriculum design and review.

3.6 Gaps in Curriculum: Adequacy to meet the needs

The chemistry department has sufficient number of teachers with excellent academic and research experiences from different renowned home and overseas institutions. To make the teaching-leaning process all-comprehensive, almost all courses related to chemistry has been tried to be included in the present curriculum (presented in curriculum section). In spite of this, there still remains scope for studying courses like, introduction to research in chemistry, chemical pedagogy, food chemistry, chemistry communication, chemical safety, business through chemistry etc. Academic environment and research facilities in this department are considerable. It is noteworthy to mention that because of shortage of funding, i) expensive research materials and regular instruments cannot be bought when needed ii) students are getting limited opportunities to visit different industries for practical knowledge.

Chapter Four

Student Admission, Progress and Achievements

4.1 Entry Qualification:

SUST is committed in operating a transparent admissions policy. Entry requirements are reviewed annually and published in the University website as well as in different newspaper. It is the aim of SUST to consider applicants solely on the basis of their merits, abilities and potential, regardless of gender, ethnic, age, religion, sexual orientation or any other irrelevant distinction. However for the national policy and the needs of society there are sorts of quota system for few seats for the admission.

The admission process is conducted in two units A and B. The students who want to be admitted in science and engineering subjects select B-Unit for admission test. Chemistry belongs to unit B. The students must have to satisfy the following conditions to be admitted to a B-Unit subject of this university: (i) A total of GPA 7.00 out of 10.0 with a minimum of 3.0. (ii) May have backlog of all most 1 year. This entry requirement for eligibility to admission test is set every year prior to admission test.

Total number of seats for Chemistry discipline is 65 for session 2017-2018.

4.2 Eligibility for Application

Eligibility for admission test in SUST for 2017-2018 session is given below:

All students who have passed HSC exam (regular and technical)/Alim/Diploma in Commerce/or its equivalent held in 2016 or 2017 and SSC exam (regular and technical)/Dakhil/or its equivalent held in 2014 or 2015 can take part in admission test. However, it should be noted that students who have passed Diploma in engineering exam have to have their SSC or its equivalent done in 2012 or 2013. Those students who have passed SSC or its equivalent from Science group can apply for both A and B units while the rest can apply for A unit only. To apply for A unit, an admission seeker has to carry at least a total of 6.5 GPA in respect of a minimum of 3.0 GPA in HSC or its equivalent exam(s) and SSC or its equivalent exam(s). As regards B unit, an applicant has to carry at least a total of 7.0 GPA in respect of a minimum of 3.0 GPA in HSC or its equivalent exam(s) and in SSC or its equivalent exam(s)

Applicants with IGCSE (O level) background have to have passed in 5 subjects obtaining at least B grade in 3 of them and in addition to that in IAL (A level) they have to have passed in 3 subjects carrying at least B grade in 2 of them

In order to admit to any specific discipline, an applicant has to have obtained at least 3.5 GPA in the concerned subject (given in Table 4.1) in HSC and in case of A level at least a B grade

Table 4.1: Concern subjects

Unit B Admission Test:

Department	**Concerned subject**
Chemistry	Chemistry and Mathematics

4.3 Quota in SUST

Other than total number of seats; 1593 (Bachelor/Bachelor (Honors) 1st Year 1st Semester Admission Session: 2017-2018), a total of 96 seats are reserved for the following: freedom fighter offspring (28), minor ethnic groups/tribal/Harijan-Dalit (28), disable (14), dependent (20), and BKSP (6) 2. Admission seekers who have secured gold, silver, or bronze medals in international Math Olympiad, international Informatics Olympiad, or any other international Olympiad(s) shall get opportunity to admit to the concerned discipline without any admission test. Admission Committee's assessment is decisive as regards "concerned discipline".

4.4 Admission Procedure

To ensure transparency and fairness at every phase of the admission test (at undergraduate level) the key practices adopted by SUST are summarized below.

i. Every year the academic council of SUST constitutes an admission committee comprising a group of experienced teachers and officers which is usually headed by a dean.
ii. A teacher/ officer having close relative supposed to sit for the admission test cannot serve as a member of the committee.
iii. A teacher/ officer cannot serve as an invigilator in a hall where his/her close relative appears at the admission test.
iv. Two applications in a row are not provided with sequential admission roll numbers. Instead two numbers randomly picked from a poll of 200 numbers are assigned.
v. Five different question sets are prepared to ensure that no two neighboring students will have the same question set.

vi. To prevent fake candidates, photograph of a student is always matched with the candidate physically in the examination hall which is again cross-checked during admission interview.
vii. MCQ answer scripts are evaluated with OMR machine.
viii. Results are processed using a fully automated system.
ix. Admission of the students is accomplished using an automated system according to the sequence of merit list. For transparency, the status of the ongoing admission process including the number of the vacant seats in every department are viewed outside the interview hall.
x. To fulfill the vacant positions created due to students moving out to another university migration to or from a department is performed automatically according to student's merit position and subject choice.

The admission test is conducted within a total of 100 marks. Only one third (30) of the total is counted from the candidate's GPA obtained in SSC (5.00) and HSC (5.00) examinations which is calculated by multiplying the total GPA with 3.0. The remaining 70 mark comes from the MCQ based admission test as shown in the following breakdown:

Table 4.2 Marking distribution for admission test

Subject	**Marks**
Physics	20
Chemistry	20
Mathematics	20
English	10

Primarily, five original questions in any two of the above subjects are solicited from faculty members of related department. A moderation committee comprising experienced senior faculties prepares the final question paper. Unlike guide-book questions, utmost care is taken to prepare creative questions so as to justify the originality of the students. This process has been practiced from long before without any noticeable short comings

4.5 Graduate Program

The graduate program consists of Masters (General), Masters (Thesis), Masters of Philosophy (M. Phil) and PhD degrees offered by CHE.

1. A graduate program may also be offered by a department in some specified field in collaboration with other departments.

2. Any student with (i) 4 year Bachelor's degree (ii) 3-year Bachelor and 1-year Master's Degree from a recognized university is eligible to get admitted into the graduate program at CHE, SUST.
3. Application for admission process for MPhil And PhD are open always.
4. After admission every student will be assigned to a student advisor/supervisor from the teacher of his/her department to guide him/her throughout the academic program.

4.5.1 Qualifications

4.5.1.1 Masters and MPhil

1. Any student with a Bachelor's degree from CHE, SUST is eligible for admission to the Masters (General) Program.
2. Any student with a CGPA of 3.25 or more from CHE, SUST is eligible for admission to the Masters (Thesis) or MPhil Program.
3. Four-year Graduates from other recognized universities and institutions can apply for admission to the Masters (Thesis) or M. Phil Program.
4. Any student registered for Masters (General) or Masters (Thesis) may transfer to the MPhil program, offered by the relevant department, if he/she can maintain a CGPA of 3.25 or more during the first two semesters.
5. The GSC of a department will decide if a student from a related department will be allowed to apply to the graduate program of that department. In these cases if necessary the GSC may ask the candidate to take extra under-graduate/graduate courses to ensure the basic foundation.

4.5.1.2 PhD

1. Candidates with Masters (Thesis) or MPhil Degrees are eligible for application for PhD and will be selected after a written and/or viva voce examination and the proper evaluation of academic records by the GSC.
2. A Masters (Thesis) or a M. Phil student may be transferred to the PhD program after the completion of first two semesters with a CGPA 3.25 and the recommendation of his/her supervisor certifying satisfactory progress of research work and with the approval of the GSC and BAS.
3. The following candidates are eligible for direct admission to PhD if they have a CGPA of 3.25 or more at Bachelors and Masters Level and 3.00 or equivalent in all public examinations

i. University teachers with two years teaching experience and one publication in standard academic journals.
ii. Teachers of colleges with three years of teaching experience and one publication in a standard academic journal
iii. Researchers of recognized research organizations with three years of research experience and at least three publications in standard academic journals.

4.5.1.3 Admission for Masters and MPhil

1. If a SUST graduate has the required qualifications he/she can be admitted to the Master's program (General or Thesis) as per the recommendation of the GSC.

2. The candidates for Masters (Thesis and Engineering) and M. Phil will be selected for admission after a written and/or viva voce examination conducted by the GSC. Full time teachers of SUST are not required to sit for the admission test. GSC will then recommend the candidates for admission to the academic council through the BAS. During the process of admission each candidate shall be assigned by the appropriate GSC and approved by BAS a supervisor from among the teachers of the relevant department/institute not below the rank of an associate professor or an assistant professor with a PhD

4.5.2 Admission for PhD

1. A candidate for admission to the Ph.D. degree program will apply in the prescribed form to the head of the department or the director of institute along with the recommendation from possible supervisor(s). The supervisor must be of the rank of professor or associate professor.
2. After approval from the GSC, the application will be forwarded to the BAS for the approvals of the supervisor and co-supervisors (if any). Each candidate shall have not more than two co-supervisors; one co-supervisor may be from outside SUST. After careful scrutiny of the research proposal BAS will send it to the Academic Council for final Approval.
3. If necessary a change of supervisor must also be approved by the BAS and the Academic Council.

4.5.3 Academic Regulations

The minimum duration for the Masters, MPhil and PhD degrees will be as followed:

Table 4.3 The minimum duration for the Masters, MPhil and PhD degrees

Degree	Duration of Completion	Required Credits
Masters (General)	2 Semesters	24
Masters (Thesis)	3 Semesters	36
MPhil / MSc (Engr.)	4 Semesters	48
PhD	8 Semesters	96

4.5.4 Others

Credit Requirement:

For the graduate program a full time student has to register for at least 12 credits each semester. For course work 1 credit means one hour of contact hour per week and for research or project work 1 credit hour means at least three hours per week. A student will be allowed to take theoretical course and research work simultaneously. Once the course requirement is completed, for the research work a graduate student has to register for "independent study" as credit/no-credit basis to fulfill the 12 credits per semester requirement.

Course Requirement

i. Syllabus committee for the graduate program will be comprised of the GSC members and two external members from other universities nominated by the Dean.

ii. Every year the syllabus committee will design the graduate level courses for the respective departments and recommend the courses for approval of the Academic Council through the School and BAS. GSC can review the curriculum from time to time and recommend any change to the syllabus committee as may be considered necessary.

Masters and MPhil

Every Masters (general, thesis and engineering) and M. Phil student has to complete at least 16 hours of theory course work during the first two semesters. GSC will propose the required courses to the students with consultation of respective supervisors.

PhD

The GSC may suggest courses, if felt necessary, for the PhD students.

4.6 Progress and Achievement

Institutional Quality Assurance Cell (IQAC) at SUST is in operation under a 3-year HEQEP project started from 2015. During this period, all 28 departments will undergo the first Self-Assessment Process through which program level gaps will be identified.

After the IQAC project tenure is ended in 2017, it is deemed to function as a regular university cell. Based on these gaps, IQAC and the departments can work together to monitor further progress and achievements.

4.7 Survey Results on Student Entry qualifications, Admission procedure, Progress and Achievements

Survey is conducted among current students where the following aspects of the curriculum have been evaluated according to the scale given:

5–Strongly agree; 4–Agree; 3– Undecided; 2–Disagree; 1–Strongly disagree

& <5-highly Satisfied, <4- Satisfied and <3- Dissatisfied

Stakeholder participated for this survey is 106 current students [4-2 semester (No. of Students 33; 2011-12), 3-2 semester (No. of Students 36; 2012-13) & 2-2 semester (No. of Students 37; 2013-14)].

Table: 4.4 Survey Results on Student Entry qualifications, Admission procedure, Progress and Achievements (SEQ).

Stake holders	Areas of Evaluation	Scale (5)	Observation
Current Students (N= 106)	1. Admission policy ensures entry of quality students.	4.60	Highly satisfied
	2. Commitment among students is observed to ensure desired progress and achievement	3.10	Satisfied
	3. Admission procedure is quite fair	4.73	Highly satisfied
	4. Students' progress are regularly recorded and monitored	3.50	Satisfied
	5. Teachers provide regular feedback to the students about their progress	2.63	Dissatisfied
	6. The entity maintains individual student's records properly	3.27	Satisfied
	Average	**3.64**	**Satisfied**

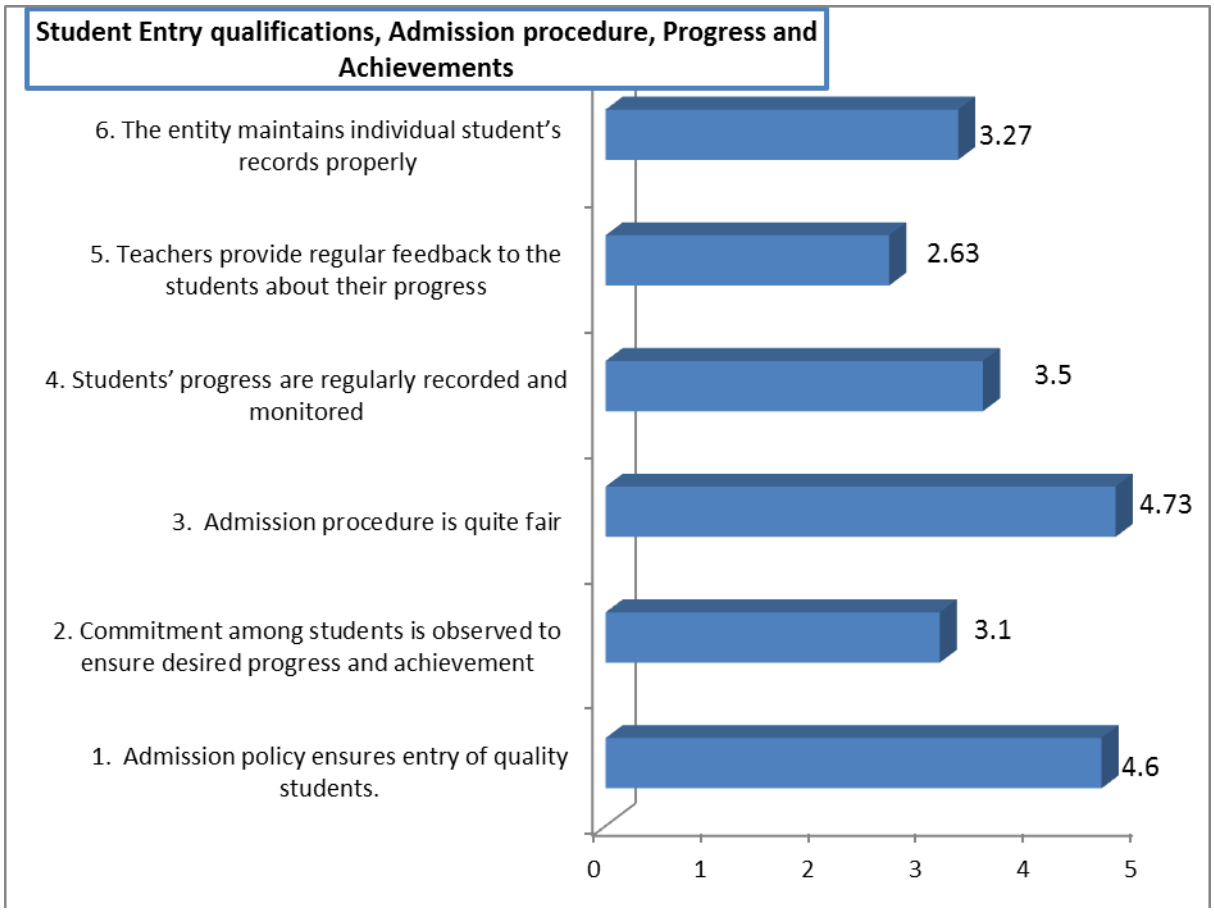


Fig. 4.1 Survey Results on Student Entry qualifications, Admission procedure, Progress and Achievements.

From our findings, current students showed their high satisfaction on the topics 'admission policy ensures entry of quality students' and 'admission procedure is quite fair'. They are dissatisfied on the issue, 'teachers provide regular feedback to the students about their progresses. This is one of our program weaknesses.

Chapter Five

Physical Facilities

Physical facilities create favorable learning condition and facilitate the attainment of learning objectives. They are integral part of the quality learning opportunities and are very important for strengthening effective teaching learning and quality education.

The department of CHE has good physical facilities compared to many other departments of the university. The following aspects of physical facilities of the department will be described in this chapter: class room, library, laboratories, sports, medical, internet and few others.

5.1 Classroom

CHE department has 3 well-furnished classrooms (Building B, Room number; 211, 213 and 301) facilitated with multimedia projector and AC. The number of rooms is sufficient for the students in terms of total number of courses offered and required lecture hours. However the number of seats of those rooms does not cover all the students specially for taking examination.

5.2 Library Facilities

SUST has a central library for all students, where the learners of CHE department get access to books and journals. CHE department has a separate seminar library where up-to-date books, journals and research thesis are available.

5.2.1 Central Library

Central library provides the basic services of learning process to the students of this university. It has well-decorated study spaces with reading desks and other necessary facilities This library premise covers free Wi-Fi internet connection so that students can use internet in their academic purposes. Moreover, this library has subscription to E-books and E-journals and thus the students have easy access to those. The library administration maintains the system of issuing a library card to each student with a deposit of some caution money (BDT 30) and issues books for 15 days on this card. The library rules and regulations are strictly followed in the entrance, issue and return of books. If any' student fails to return the book in time, she/he is asked to give fine for late return.

5.2.2 Seminar Library of CHE Department

Seminar library lies in the 1st floor (R-201) of academic building B. This room is being also used for departmental faculty meeting for 2 hrs once in a week and for oral examination. The room can

accommodate 35 students. There are approximately 1330 books, journals, MS thesis paper and BSc (Honors) project paper available for the students.

5.2.2.1 Seminar Library Administration

The seminar library follows some rules for maintaining a proper study environment. To administer the library activities one employee has been appointed who is responsible for checking student's entry-exit, issuing books, collecting the returned books etc. Department issues a seminar library card to each student and no student can get a book without the card.

5.2.2.2 Beneficiary Services

Students, the main beneficiaries and the faculty members can take books, journals, research project reports and thesis from seminar library. Students are allowed to study and group discussion inside the seminar library. Few computers are available at this library which are being used for internet searching for class materials and journal papers.

5.3 Laboratories

The academic structure of undergraduate program includes different lab courses. There are total five undergraduate teaching labs. There are also one MS teaching lab and four research labs. There are also two instrumental labs. The details are given below in the table. For proper functioning of these labs, computers and other electronic devices are periodically monitored by technologist.

Table: 5.1 Specification of different labs.

Category	**Name of lab**	**Room no (Building B)**	**No. of room**	**No of students accommodated**
Under graduate Teaching Lab	Organic Chemistry	308	01	30
	Inorganic Chemistry	414	01	30
	Physical Chemistry	209	01	30
	Analytical & Environmental Chemistry	408	01	30
	Computational Chemistry	20	01	10 computers
MS Teaching Lab	Organic, Inorganic, Physical & Analytical & Environmental Chemistry	212	01	
Research Lab	Organic Chemistry	312	01	10
	Inorganic Chemistry	218	01	10
	Physical Chemistry	217	01	10
	Analytical & Environmental Chemistry	214	01	10
	Instruments Lab	413	01	
		311	01	
Total			**13**	

5.4 Medical facilities

Shahjalal University medical centre is open on every week day from 9 am to 10 pm on Saturday to Thursday. On Friday, medical centre is open from 9am to 5 pm. On emergency, doctors are available 24 hours on call. To get care from medical centre, the students need a medical card which is free but each student has to pay BDT 50 with the semester fee in every semester. There are 6 doctors and one nurse. A pharmacist is available at the medical centre who provides available drugs to the patients. Medical centre has one ambulance which is free for the students but charge is applicable for the faculties.

5.5 Office Rooms and Resource Facilities

The department has no sufficient number of office rooms, equipment and other resource facilities for its students as well as for the academic, non-academic and project staffs. The following table summarizes the facilities we have at CHE department.

Table: 5.2 Specification of different office rooms and resource facilities.

Room No.	Category	No of teacher /No of seats	Room No	Category	No of teacher /No of seats
201	Seminar library / Meeting room	30	216	Bathroom (Female student)	
202	Teacher's room	1	219 (Extension of lab)	Teacher's room	1
203 (A)	Teacher's room	1	301	Class room	70
203(B)	Teacher's room	1	304 A (Extension)	Teacher's room	1
203(C)	Teacher's room	1	304 B (Extension)	Teacher's room	3
204	Teacher's room	1	305 A (Extension)	Teacher's room	1
205	Bathroom (Teacher)		305 B (Extension)	Bathroom (Teacher)	1
206	Office of Department Head		306 A (Extension)	Teacher's room	1
207	Department office		306 B (Extension)	Teacher's room	2
208	Teacher's room (Extension of lab)	2	307 A (Extension)	Teacher's room	1
210	Bathroom (Male Student)		307 B (Extension)	Teacher's room	2
211	Class room	40	308 A (Extension)	Teacher's room	1
212	Teacher's room (Extension of lab)	2	308 B (Extension)	Teacher's room	1
213	Class room	40	311 (Lab extension)	Teacher's room	2
215	Teacher's room	1	312 (Lab extension)	Teacher's room	2
We have another one storied building which has two parts:				i. Glass Blower	
				ii. Chemicals	

The numbers of rooms are not enough for 31 teachers.

5.6 Other facilities

5.6.1 Wi-Fi

Wi-Fi is available for free in the campus. The central library provides this facility. Apart from this, CHE department is also using central broad band line for internet facilities

5.6.2 Prayer room

Building B has two sub rooms for prayer for Muslim students, one for man and another for women which are located on ground floor.

5.6.3 Common room

Unfortunately, we do not have any common room at the CHE department, especially for girls.

5.7 Alumni and Employer: Job market perspective

Formally we do not have any placement or career office but informally the students have open access to all the teachers in their need. Students very often go for some counseling to the faculties where they get help at personal level.

5.8 Survey Results on Physical Facilities (Institutional structures and facilities)

Survey is conducted among appropriate group of stakeholders where the following aspects of the physical facilities have been evaluated according to the scale given:

5–Strongly agree; 4–Agree; 3– Undecided; 2–Disagree; 1–Strongly disagree

& <5-highly Satisfied, <4- Satisfied and <3- Dissatisfied

Stakeholders participated for this survey is 28 teachers out of 31 teachers, 106 current students [4-2 semester (No. of Students 33; 2011-12), 3-2 semester (No. of Students 36; 2012-13) & 2-2 semester (No. of Students 37; 2013-14)] and 115 alumni.

The survey results are tabulated below:

Table: 5.3 Survey Results on Physical Facilities.

Stake holders	Areas of Evaluation	Scale (5)	Observation
Teacher (N=28)	1. Classrooms are good in number, well-spaced, well equipped and well maintained to ensure effective delivery	3.30	Satisfied
	2. Laboratories are good in number, well-spaced with relevant well off equipment and properly maintained for conducive teaching and learning	3.30	Satisfied
	3. The library has adequate and up-to-date reference materials that meet the academic research needs	3.30	Satisfied
	4. The library provides appropriate ICT-mediated reference materials	3.30	Satisfied

	5. Internet facilities with sufficient bandwidth capacity are available	4.30	Highly Satisfied
	6. Adequate office room facilities along with relevant equipment and competent manpower are available	3.20	Satisfied
	Average	**3.45**	**Satisfied**
Current Students (N=106)	1. Classroom facilities are suitable for ensuring effective learning	2.57	Dissatisfied
	2. Laboratory facilities are congenial for practical teaching-learning	2.40	Dissatisfied
	3. Facilities for conducting research are adequate	3.07	Satisfied
	4. The library has adequate up-to-date reading and reference materials to meet the academic & research needs.	3.60	Satisfied
	5. Indoor and outdoor medical facilities are adequate.	2.57	Dissatisfied
	6. There are adequate sports facilities (indoor and outdoor).	2.60	Dissatisfied
	7. Existing gymnasium facilities are good enough	2.50	Dissatisfied
	8. Access to internet facilities with sufficient speed are available	2.00	Disagreed
	Average	**2.66**	**Dissatisfied**
Alumni (N=115)	1. Classrooms were good in number, well-spaced, well equipped and well maintained to ensure effective delivery	3.57	Satisfied
	2. Laboratories were good in number, well-spaced with relevant well off equipment, competent manpower and properly maintained for conducive teaching and learning	3.39	Satisfied
	3. The central and departmental libraries had adequate and up-to-date reference materials that meet the academic& research needs	3.42	Satisfied
	4. The central library provided appropriate ICT-mediated reference materials	3.06	Satisfied
	5. The department library provided enough books	3.29	Satisfied
	6. Adequate office room facilities along with relevant equipment and competent manpower were available to support the students‟ need	3.48	Satisfied
	7. The department provided adequate health care support in class room and laboratory	2.62	Dissatisfied
	Average	**3.2**5	**Satisfied**
Non-academic staffs (N=14)	1. Classrooms are good in number, well-spaced, well equipped and well maintained to ensure effective delivery	3.8	Satisfied
	2. Laboratories are good in number, well-spaced with relevant well off equipment and properly maintained for conducive teaching and learning	3.8	Satisfied
	3. Internet facilities with sufficient bandwidth capacity are available	3.5	Satisfied
	4. Adequate office room facilities along with relevant equipment and competent manpower are available	3.0	Undecided
	Average	**3.53**	**Satisfied**

Note that the survey results presented in this chapter may not reflect the actual situation because the survey has also conducted on physical facilities by some alumni who used the physical facilities of Academic Building A, where CHE first operated its function. However responses from alumni are with good satisfaction but they are not satisfied about health care support in the class room and

laboratory. Similar evaluation results have also been seen from current student survey. The university provides healthcare service at University Medical Centre and on call for emergency. It is alarming that current students are mostly unsatisfied for all other criteria except facilities for conducting research and library use. The dissatisfaction of current students over class room facilities and lab facilities is because of not number of rooms but may be for their sizes and no of tables/chairs. Sometimes it is difficult to cover all the students in a class if the dropper no is high. For laboratory class, usually we allow students to work each experiment in a group, 4-5, because of lab size and ~~and~~ limitation of available instruments and chemicals, power supply etc. It would be always better and more effective in learning if two students could work in a group for experiments.

Although department provides sorts of sports facilities, the current students showed dissatisfaction in that case. Current students' evaluation on internet facilities is disagreed whereas teachers and alumni/non-academic staff are satisfied over that issue.

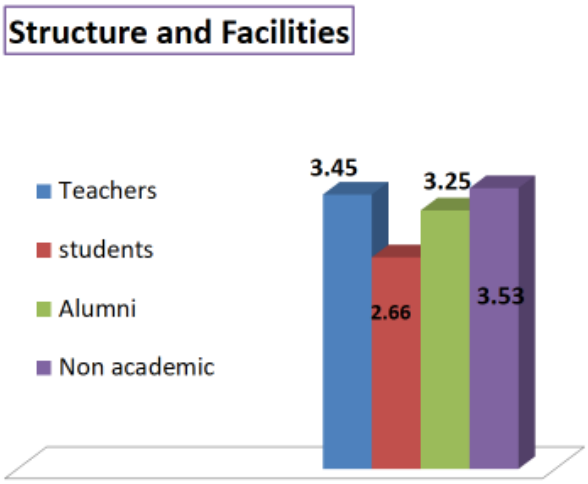


Fig: 5.1 Comparison of Survey Results on Physical Facilities.

Comparison showed that teachers, alumni and non-academic staff are satisfied over the issue of structure and facilities within the department. However currents students are dissatisfied over the similar issue. Our survey findings on structures and facilities show that the average value of four stakeholders is 3.22. That is implying a midway observation.

Chapter Six

Teaching Learning and Assessment

6.1 Teaching Methods

To achieve intended learning outcome from a specific course is primarily depends on the teaching methods applied to that course. Teaching methods again depends on the nature and contents of the course. In the CHE of SUST, different teaching methods are followed by the course teachers of different types of courses with a view to achieve their intended learning outcomes. Following teaching methods are generally followed:

6.1.1 Theory Courses

Methods and procedures followed to conduct theory courses include, lecture method (manual and power point), class room discussion, presentation and assignments.

6.1.2 Lab Courses

Methods and procedures followed to conduct lab courses include, laboratory experiment followed by the supplied procedure, group discussion, report writing on the results, assignments, written examination and viva voce. There are also field work (Industrial Tour) at 3/1 semester and research project / industrial assignment at 4/2 semester. The project are offered at 4/2 semester according to the result of the students and the availability of the facilities.

6.2 Use of Lesson Plan

Each and every faculty members should use written/formal lesson plan for conducting their courses to achieve objectives of the course in an efficient and timely manner. Use of written/formal lesson plan is not yet mandatory and practicing for the faculty members of CHE department. However, some of the faculty members of CHE department use lesson plan for their courses. Most of the faculty members use the lesson plan in a very informal/unstructured way. A new curriculum development is under process.

6.3 Technology Integration

At the present day, quality of higher education is highly associated with technology integration. CHE department of SUST has realized the importance of this technology integration and has arranged some technology oriented facilities for the students so that they can be well accustomed with modern facilities. The department has already established computer facilities for students in seminar library

room as well as computational laboratory with internet facility, well equipped multimedia class rooms with limited Wi-Fi internet access. The seminar library computers are with access to reputed e-journals. Moreover, students enjoy Wi-Fi internet facility 24 hours at the department premises. Under HECAP project some physical facilities have been done.

6.4 Teaching Learning Focus

As we have already stated, the department has an inspiring environment where they are encouraged for self- learning and their creativity is nourished. The practical knowledge of the faculty members works as a catalyst in this regard. Because of this motivating environment, our students have been able to hunt job markets in different sectors. Our students have also been able to go abroad for their higher studies. The CHE teachers always encourage students for higher study by supervising thesis works at BSc (Hons) final year, MS and PhD levels. Teachers are always willing to advise them for their future plan. Different applied chemistry courses have been included during their studies works, industry visits etc. are being exercised regularly which make more focus and attraction to the students.

6.5 Skill Development Mechanism

The teaching-learning methods are the main skill development mechanism of CHE Department. The required skills of the graduates are developed from different major and non-major courses that belong to the curriculum. Frequently the department arranges research proposal defense seminars and research findings defense seminars for the students. Sometimes, the department also arranges conferences, workshops, seminars and training programs for the students. CHE department also arranges some extracurricular activities with a view to achieving leadership skills and skills related to social and community service among the students of the department. The chemistry society within the department and department itself arrange fresher reception, cultural night, barbeque night, picnic, inter semester sports etc. which make the students' leadership and maturity for their personal life.

6.6 Assessment Methods

Assessment of student performance is a systematic process of collecting, analyzing and interpreting information to determine the extent to which intended learning outcomes have been achieved. Academic performance of students is evaluated based on certain types of exams. These include homework assignments, quizzes, written examinations, seminars, semester end projects, laboratory examinations, and final exams, as applicable to the nature of the course.

6.6.1 Grading System

The total performance of a student of CHE (BSc and MS) in a given theoretical course is based on a scheme of continuous assessment made through two class tests/ term test, class attendance and

participation, homework assignments, and a semester final Examination. The assessment in lab courses is made through observation of the student performance in class, viva-voce during the laboratory hours, written and lab exam. The way of judgment in lab course varies depending on course teachers. A letter grade with a specified number of grade points is awarded in each course for which a student has registered. A student's performance is measured by the number of credits that he/she has completed satisfactorily and the weighted average of the grade point is required to be maintained for satisfactory progress.

6.6.2 Grading Scale

Each course, irrespective of the credit hours attributed to it, will be graded at a scale of 4.00 (four). Initially the courses will be assessed in 100 to calculate percentage of marks obtained by the students. Letter grades and corresponding grade points are awarded to the students (B.Sc. and MS) in accordance with provision shown below in Table 6.1.

The grading system consists of Letter Grading Point Average (GPA), Letter Grade, corresponding Grade Point of Shahjalal University of Science and Technology.

Table: 6.1 Details of Numerical Grade, Letter and Grade Point.

Numerical Grade	Letter Grade	Grade Point
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	C-	2.00
Less than 40%	F	0.00

N.B.:

1. GPA: Grade Point Average (GPA) is the weighted average of the grade points obtained in all the courses completed by a student in a semester.
2. CGPA: Cumulative Grade Point Average (CGPA) will be calculated by the weighted average of previous CGPA and current GPA.
3. F Grades: If a student obtains an 'F' grade his grade will not be counted for GPA and s/he has to repeat the course. If the same course is not available then the Head of the department will assign an equivalent course. An 'F' grade will be in his/her record permanently and s/he will not be eligible for honors or Distinction.

4. Improvement: A student will not be allowed to repeat a course for improvement if his/her grade is C- or better.

6.6.3 Course Assessment

For a theory course, thirty percent (30%) of marks are allotted to continuous assessment, i.e., quizzes and homework assignment, term test, class attendance and class participation. The remaining marks (70%) are allotted to semester final examination, which are conducted centrally by the university. There are two examiners for each theoretical course in the semester final examination, which will be of three hours duration for 3 credit course and two hours duration for 2 credit course.

i. Assignments and Mid-Semester Examinations:

There should be at least two mid-semester examinations/assignments but not more than three for every course. The course teacher may decide the relative marks distribution between the assignments, tutorial and mid-semester examinations. The answer script should be returned to the students as it is valuable to their learning process.

ii. Final Examination:

The final examination procedure will be as follows:

a. External Examination:

The examination committee will assign an external examiner either from the department or from outside for the final examination. The questions for the final examination will be prepared by the course instructor and by the external examiner. The examination committee will select/moderate the questions for the final examination. *The course instructor and the external examiner will examine and mark the answer scripts separately. The two marks will be averaged by the examination committee. If the marks by the two examiners differ by 20% or more, answer scripts will be examined by a third examiner (recommended by the examination committee) and the two close marks among the three will be averaged by the examination committee. The marks (Class record compiled from class attendance, term tests and final written examination) will be added together to get the final grade. In question moderation and final viva voce an external examiner, usually form another university, has been appointed.

b. Duration of the Final Examination:

Duration of the 3 credits and 2 credits will be 3h and 2h examination, respectively. Tables 6.2 represent the distribution of marks for course assessment of different type of courses for B.Sc. program.

Table: 6.2 Distribution of marks for theory courses (BSc and MS).

No	Description	Marks (%)
1	Class attendance	10
2	Term test and / or assignments	20
3	Final Examination	70
	Total	**100**

*Source: www.sust.edu/admission

Thesis / project

There are two examiners to examine the thesis / project report. Each examiner will evaluate the thesis separately and the average marks (35%) are considered for grading. Marks from oral presentation and supervisor will cover rest 35% and 30%, respectively.

6.7 Survey Results on (a) Teaching Learning and (b) Assessment

Survey is conducted among appropriate group of stakeholders where the following aspects of the Teaching Learning and Assessment have been evaluated according to the scale given:

5–Strongly agree; 4–Agree; 3– Undecided; 2–Disagree; 1–Strongly disagree

& <5-highly Satisfied, <4- Satisfied and <3- Dissatisfied

Stakeholders participated for this survey is 28 teachers out of 31 teachers, 106 current students [4-2 semester (No. of Students 33; 2011-12), 3-2 semester (No. of Students 36; 2012-13) & 2-2 semester (No. of Students 37; 2013-14)] and 115 alumni.

(a) The survey results on Teaching Learning are tabulated below:

Table: 6.3 Survey Results on (a)Teaching Learning.

Stake holders	Areas of Evaluation	Scale (5)	Observation
Teacher (N=28)	1. Size of the class is good for better teaching learning	4.1	Highly Satisfied
	2. Technological devices are available for use in teaching	4.0	Agreed
	3. Students are sincere and committed to learning	3.6	Satisfied
	4. Teaching and learning strategies inspires students for their own learning	3.4	Satisfied
	5. Diverse teaching-learning methods are used to achieve intended learning outcomes (ILOs)	2.9	Dissatisfied
	6. Multiple techniques are used to develop communication skills	3	Undecided
	7. Interactive teaching-learning approach supports the achievement of the program learning outcomes	3.2	Satisfied

	8. Co-curricular activities which enrich students' experiences, and foster personal development and responsibility are encompassed in teaching learning process	3.8	Satisfied
	9. Lesson plans are designed addressing aims and objectives of each course that guides effective teaching-learning	2.8	Dissatisfied
	Average	**3.42**	**Satisfied**
Current Students (N=106)	1. Teaching-learning is interactive and supportive	3.30	Satisfied
	2. Class size is optimum for interactive teaching learning	3.53	Satisfied
	3. Entity provides adequate opportunities for practical exercises to apply in real life situation.	3.30	Satisfied
	4. Modern devices are used to improve teaching-learning process	3.63	Satisfied
	5. Diverse methods are practiced to achieve learning objectives	2.90	Dissatisfied
	6. Lesson plans/course outlines are provided to the students in advance	3.07	Satisfied
	7. Teachers are available for consultation after class.	3.27	Satisfied
	Average	**3.29**	**Satisfied**
Alumni (N=115)	1. The department created such a teaching-learning environment that inspired students to become lifelong learner	3.74	Satisfied
	2. The teachers provided additional practical ideas from real life situation	3.25	Satisfied
	3. The teachers remained available during the specified office hours and after class for consultations.	3.51	Satisfied
	4. Teaching-learning approach was interactive and supportive for the achievement of the program learning outcomes	3.63	Satisfied
	5. Class size was optimum so that students could interact with the teachers and took the opportunity to participate and feedback for better teaching learning	3.88	Satisfied
	6. Technological devices were used as regular practice to improve teaching-learning process	2.91	Dissatisfied
	7. Teaching and learning strategies inspired students for their own learning and to achieve learning outcomes	3.36	Satisfied
	8. Diverse teaching-learning methods were used to achieve intended learning outcomes (ILOs)	3.04	Satisfied
	9. Lesson plans were designed addressing aims and objectives of each course that guides effective teaching learning	3.43	Satisfied
	Average	**3.43**	**Satisfied**

Teacher, current students and alumni have shown their satisfaction for diverse teaching learning methods to achieve ILO. Alumni have showed their dissatisfaction over the issue 'Technological devices were used as regular practice to improve teaching-learning processes. This is logical during

their study tenure at this department. However it has been improved measurably for last few years. Teachers themselves are dissatisfied on the issue 'Lesson plans are designed addressing aims and objectives of each course that guides effective teaching-learning'. This realization is good for them and after modification of syllabus with objectives and ILO, that issue would be improved, we believe.

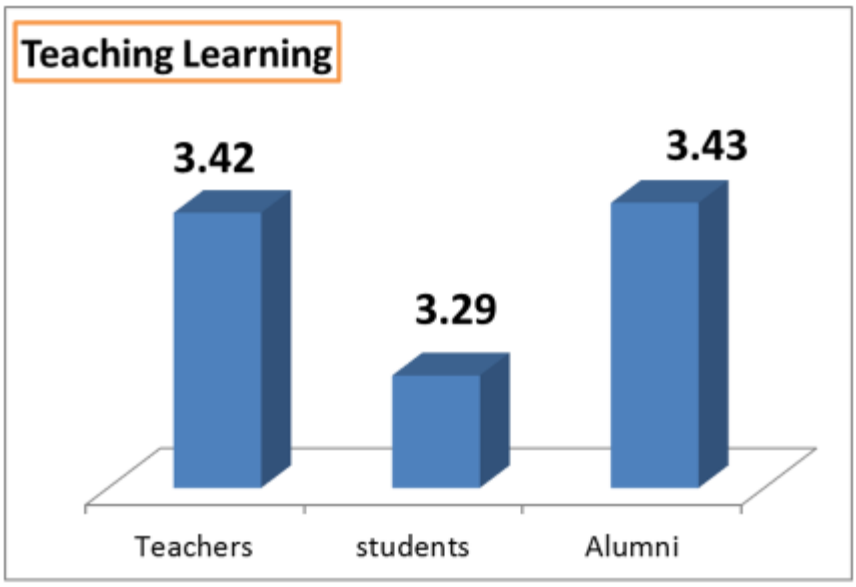


Fig. 6.1 Comparison of survey results on teaching learning.

Comparison (Fig. 6.1) showed that teachers, current students and alumni are satisfied over the issue of teaching learning. However current students have given lowest value of their judgment among others. On the other hand teachers and alumni gave almost similar judgment over the teaching learning issue. However the overall indicator is around 3.38 which is satisfactory but obviously needs to increase by improving the way of teaching learning within our department.

(b) The survey results on Learning Assessment:

Table: 6.4 Survey Results on (a) Learning Assessment

Stake holders	Areas of Evaluation	Scale (5)	Observation
Teacher (N-28)	1. Both summative and formative assessment strategies are followed	3.5	Satisfied
	2. The frequency, methods and criteria of assessment, including the grading criteria are clearly communicated to students on the commencement of the term/semester	4.3	Highly Satisfied
	3. Diverse methods and tools are used appropriately to assess the learning outcomes and competencies.	3.3	Satisfied
	4. The students are provided feedback on each assessment before the next one.	3.1	Satisfied

	5. The learning assessment methods ensure the validity, reliability, consistency	3.7	Satisfied
	6. The assessment system is reviewed at appropriate scheduled intervals.	3.0	Undecided
	7. The review of the assessment system is done in consultation with external experts	3.3	Satisfied
	Average	**3.46**	**Satisfied**
Current Students (N=106)	1. Assessment systems are duly communicated to students on the commencement of the semester.	3.77	Satisfied
	2. Assessment procedures meet the objectives of the course.	2.90	Dissatisfied
	3. Both formative (quizzes, assignments, term papers, continuous assessments, presentations etc.) and summative assessment (final examination) strategies are followed.	4.00	Agreed
	4. Diverse methods are used for assessment.	2.73	Dissatisfied
	5. The students are provided feedback immediately after assessment.	2.60	Dissatisfied
	6. The content of examinations is representative of the course material	3.97	Satisfied
	Average	**3.33**	**Satisfied**
Alumni (N=115)	1. The frequency, methods and criteria of assessment, including the grading criteria were clearly communicated to students on the commencement of the term/semester	4.00	Agreed
	2. Diverse methods and tools were used appropriately to assess the learning outcomes and competencies.	3.20	Satisfied
	3. The students were provided feedback on each assessment before the next one.	3.02	Satisfied
	4. Students' learning assessment procedures were maintained fairly.	3.68	Satisfied
	5. The content of examinations was representative of the course material	4.27	Highly Satisfied
	Average	**3.64**	**Satisfied**

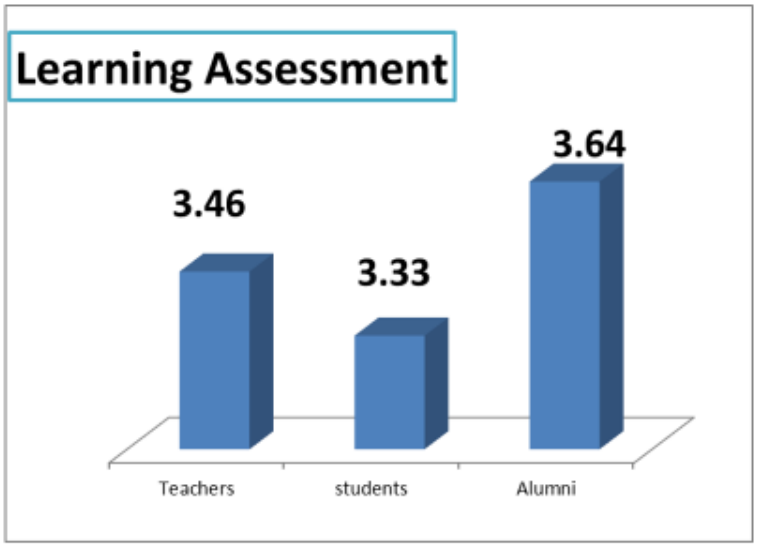


Fig. 6.2 Comparison of survey results on learning assessment.

Stakeholders, teachers, current students and alumni, have shown their satisfaction in the average values in view of present learning assessment. However, for the individual issue 'The students are provided feedback immediately after assessment', the current students have shown their dissatisfaction. We agree that it is somehow being late to give the feedback after assessment to the students. This is the weaknesses of our program. There are two more issues, i) assessment procedures meet the objectives of the course and ii) diverse methods are used for assessment, where students have shown their dissatisfaction also.

Chapter Seven

Student Support Services

The office of student welfare of SUST is the authorized body, where advisor deals with the students' affairs and provide student support services formally. The law and order aspect of the students support is taken care by the proctors office. At SUST there is also an effective office for prevention of sexual harassment cell as per the directive of high court of Bangladesh. There is no formal body at chemistry dept. to provide student support but in informal way students support services are provided through formation of different bodies by teachers of the department.

7.1. Co-curricular & Extra-curricular Activities:

To develop professional and leadership skills, co-curricular & extra-curricular activities are essential. From the very beginning, the department of CHE gave a lot of importance towards co-curricular and extra-curricular activities. Students of every second semester of each year have an oral examination and lab courses. These give the opportunity to make skilled graduate in the communication and presentation ability. Again through study tours and different lab courses, they can get experience to work in a group. Chemical society, the elected body that represents the students from each session, always arranges different types of activities for the students. The chemical society organizes intra department sports events like sports week, football, cricket, and badminton tournaments which are sponsored by the students, department and private sponsors. On the other hand university also arranges different tournaments both inter -department and nation level in the campus centrally. physical education department arranges all those events regularly. There are lots of achievements from indoor-outdoor games from both inter-department and nation level events. From all these procedures now we have some promising cricketers here. Apart from this, the department organizes picnic and formal events for the students like fresher's reception, farewell programs. The university centrally organizes a number of events like orientation for the fresher.

The university has more than 35 cultural and socio cultural organizations as shown in Table 7.1. The organizations are registered with the proctor's office and gets support for their activities. The students are encouraged to participate in extra-curricular activities through these organizations. They can develop their individual skills, learn to work as a team, run an organization and learn leadership in the process. These cultural organizations keep the campus vibrant with various cultural activities throughout the year. The university arranges cultural events on national days in cooperation with these cultural organizations. The Bengali New Year is specially being celebrated in the campus where the whole city of Sylhet joins the celebration.

Table 7.1: **List of SUST organizations**

1.Rokon Ifthekhar memorial (RIM) (established in 1997)	18.Cartoon Factory (established in 2007)
2.Theater SUST (established in 1997)	19.Sonchalon (established in 2009)
3.MaavoiAbritteeSamsod (established in 1998)	20.Kaizen SUST (established in 2011)
4.Dik Theater (established in 1999)	21.SUST Shahitya Shamsad (established in 2014)
5.NONGAR (established in 2003)	23.Green Explore Society (GES) (established in 2012)
6. KIN, A voluntary Organization (established in 2003)	24. UNYSAB SUST wing (established in 2012)
7.SUST Science Arena (established in 2004)	25. Bigganer Jonyo Valobasha (established in 2014)
8.Sports SUST (established in 2005)	26. Aniket Sangskritik Songho
9.Copernicus Astronomical Memorial of SUST (CAM-SUST) (established in 2012)	27. Anti Smoking And Anti Narcotic Organization
10.Quantum Foundation: SUST Cell (established in 2005)	28.Swapnotthan-A Voluntary Organization(established in 2007)
11. SUST Writers Club (established in 2005)	29.Bangladesh Red Crescent Society
12.Shahjalal University Speakers Club(SUSC) (established in 2005)	30.Shahjalal University Speakers Club(SUSC) (established in 2005)
13.Education Watch	31. Student Aid SUST
14.Monthly Protidhoni	32. Love for science (established in 2011)
15.Nirapod Shorok Chai	33.SUST Writers Club (established in 2005)
16.Career Design Center	34. Bangladesh National Cadet Corps, SUST
17.Promising Youth	35. Aaj Mukto moncho (established in 2008)

The students of CHE department have a huge choice to participate at various cultural and socio cultural program through these organizations at campus. However in some special occasions like freshers' reception or teacher/ graduates farewell, chemistry society organizes cultural events. They also arrange occasionally picnics at winter. Students of terminal semester of undergraduate program arrange annual national trip usually for them under guidance of teachers. Survey is conducted among appropriate group of stakeholders where the following aspects of the curriculum have been evaluated according to the scale given:

5–Strongly agree; 4–Agree; 3– Undecided; 2–Disagree; 1–Strongly disagree

& <5-highly Satisfied, <4- Satisfied and <3- Dissatisfied

Stakeholders participated for these surveys are 28 teachers out of 31 teachers, 106 current students [4-2 semester (No. of Students 33; 2011-12), 3-2 semester (No. of Students 36; 2012-13) & 2-2 semester (No. of Students 37; 2013-14)] and 115 alumni.]

Our survey findings from the three stake holders showed, teachers and alumni are satisfied to some extent with co-curricular and extracurricular activities but current students are not satisfied with co-

curricular and extra-curricular exposures to them. It is unfortunate that students are not convinced to participate in co-curricular and extra-curricular activities.

Table7.2: Evaluation on Co-curricular and extra-curricular activities

Stake holders	Areas of Evaluation	Scale(5)	Observation
Teachers	1. The faculty/department has a policy and programs for active student participation in areas that affect their welfare, for example, peer counseling, co-curricular activities, and community engagement.	3.1	Satisfied
Alumni	1. The students were encouraged to involve in co- curricular and extracurricular activities.	3.24	Satisfied
Current students	1. The entity provides co-curricular and extra-curricular exposures to the students.	2.67	Dissatisfied

7.2. **Academic guidance and counseling**

An advisor is assigned for each semester of the students of CHE. The university does not have formal counseling center for the students. Students are welcomed to all teachers for counseling or discussing any academic or nonacademic matters. Again the students working on their project or thesis have supervisors who also guide them through their research or project works. The thesis supervisors are also act as counselor .According to survey, teachers are in a midway between most expected and most unexpected situations about giving the students remedial support and proper guidance in research & publication. Teachers are not satisfied due to constraint of fund and lab facilities which is reflected in their own assessment (Table 7.3).

For an emergency or special attention for students, the senior teachers with head of the department try to address the problems to find out a solution. Generally the whole department with students, teachers and staffs get involved and work like a supportive body to each other. Unfortunately there is a limited option for students to put their grievances and make appeals to the SUST authority relating support services. Dysfunction of formal student union body and the absence of any student representation are major drawbacks about student support services.

Our findings show that teachers have a satisfactory observation to some extent about adequate student support in the department. However alumni and current students, they are not satisfied with the advisory body and all other efforts like financial supports during their hardship. Definitely department needs to recognize and handle these issues for support services more carefully and make sure to get proper guidance and counseling when required.

Table 7.3: Evaluation on Academic guidance and counseling

Stake holders	Areas of Evaluation	Scale(5)	Observation
Teachers	1.The faculty/department maintains students' progress documents and offer appropriate developmental or remedial support to assist students who need such support	3.3	Satisfied
	2. The faculty/department encourages students and provides adequate facilities to be involved in publication activities	3.5	Satisfied
	3. The faculty/department has a policy and programs for active student participation in areas that affect their welfare, for example, peer counseling, co-curricular activities, and community engagement.	3.1	Satisfied
	4. There has a mechanism for students to minimize grievances and make appeals relating to student support services.	3.0	Undecided
	5. Student support services are evaluated regularly to ensure their adequacy, effectiveness and safety.	2.2	Dissatisfied
	6. The faculty/department provides academic and career counseling to the students by qualified staff and issues with confidentialities.	2.5	Dissatisfied
Alumni	1. There was an arrangement to provide guidance and counseling for academic improvement and to take special care of the weak students.	2.37	Dissatisfied
	2. There were scholarships/ grants available to students in case of hardship.	2.69	Dissatisfied
Students	1. There is an arrangement in the entity to provide an academic guidance and counseling.	2.27	Dissatisfied
	2. Financial grants are available to the students in case of hardship.	2.63	Dissatisfied
Non-academic staff	1. The faculty/department maintains students' progress documents and offer appropriate developmental or remedial support to assist students who need such support.	3.3	Satisfied
	2. Students have access to appropriate and adequate support services, such as physical, social, financial and recreational facilities, and counseling and health services.	3.0	Undecided
	3. Students and staffs maintain a good relationship that makes teaching-learning environment healthy	3.3	Satisfied

7.3. Career & Placement:

A permanent career and placement center is absent here and most students have to pursue career themselves. Thus alumni are satisfied to some extent but not agreed because they had no formal placement center and that reflects in survey result (Table 7.4). In career planning, thesis supervisors as well as other teachers help the students by proper guidance and recommending to prospective companies or institutions for proper job or higher studies in a personal way. From teachers' survey results, they also support strongly that a permanent career and placement center should have in

department / university (Table 7.4). However all over the year recently different types of career events are organized in campus.

Table 7.4: Evaluation on Career & Placement issues

Stake holders	Areas of Evaluation	Scale (5)	Observation
Teachers	1. The faculty/department facilitates students' activities and student organization to gain basic managerial and leadership experience, to encourage character building, to inculcate a sense of belonging and responsibility, and to promote active citizenship.	3.2	Satisfied
	2. The faculty/department provides academic and career counseling to the students by qualified staff and issues with confidentialities.	2.5	Dissatisfied
Alumni	1. The placement and career planning office provided effective services to the graduating students	2.19	Dissatisfied

7.4. Alumni Services:

A central alumni association of SUST has been formed recently. Chemistry department has also formed its alumni association in 2014 separately and its web site formation process is going on. When survey was conducted back in 2016, then association was not formed which reflected in survey result (Table 7.5).

Table 7.5: Evaluation on Alumni Services

Stake holders	Areas of Evaluation	Scale(5)	Observation
Teachers	1 The faculty/department maintains active linkages with its alumni and employers.	2.7	Dissatisfied
	2 The faculty/department encourages the alumni to play a role in preparing the students for their professional future, and to provide linkages with industry and the professions.	2.6	Dissatisfied
	3. The faculty/department encourages the alumni to play a role in the development of the program.	2.5	Dissatisfied
Alumni	1. There was placement and career planning office in the university and/or department for maintaining communication with alumni and employers	2.13	Dissatisfied
	2. The placement and career planning office provided effective services to the graduating students	2.19	Dissatisfied
Students	1. There is an organized and supportive alumni association.	1.93	Highly dissatisfied
	2. The entity collects alumni feedback to update the learning outcomes of the program.	1.90	Highly dissatisfied
Non-academic staff	1. The faculty/department maintains active linkages with its alumni and employers.	3.3	Satisfied

However Facebook group of alumni and current students makes a very helpful informative association. The alumni of CHE are very active and they help personally CHE graduate in placement in various industries/ office nationally and internationally. The department had arranged students' reunion on the eve of 25th anniversary at 2014 with financial support from alumni. Our survey finding (Table 7.5) shows frustration about lack of functions of alumni association and related important matters. This should be taken into consideration by CHE department.

7.5. Community Services:

The feedback from the survey of alumni and current students on the issue of students' opportunity for community work is satisfactory to some extent as shown in Table 7.6. However the alumni are dissatisfied on the issue like 'Students were encouraged to get involved with community services (e.g. visiting high school/college and interact with students by giving popular talk, etc.)'. All these activities are not practiced usually though these are very important for students. However there are opportunities for the current students to involve in community services through different types of socio cultural organizations at campus (in Table7.2, page 56.).For example they run school for unprivileged children. They collect and distribute warm cloths during winter and during flood season prepare and distribute oral saline etc. They also arrange different types of fund raising events for sick students.

The CHE students can participate in various community works through these students' organizations. CHE students also participate in yearly national Chemistry Olympiad as volunteer which is arranged for high school and college students.

Table 7.6: Evaluation on Community Services:

Stake holders	Areas of Evaluation	Scale(5)	Observation
Teachers (N = 28)	1. The faculty/department facilitates students' activities and student organization to gain basic managerial and leadership experience, to encourage character building, to inculcate a sense of belonging and responsibility, and to promote active citizenship.	3.2	Satisfied
	2. The faculty/department has a policy and programs for active student participation in areas that affect their welfare, for example, peer counseling, co-curricular activities, and community engagement.	3.1	Satisfied
Alumni (N = 115)	1. Students were encouraged to get involved with community services (e.g. visiting high school/college and interact with students by giving popular talk, etc.)	2.45	Dissatisfied
	2. Department arranged chemistry Olympiad to encourage high school/college students	3.22	Satisfied
Students (N = 106)	1. There are opportunities to be involved with community services.	3.30	Satisfied

The following table (7.8) shows that, overall performance on Student Support aspect is dissatisfactory, which is reflected in the fact of highest value being only 3.5 and lowest value as low as 1.90 (Table 7.9).

Table7.8: Overall Average score of averages of different stake holders:

Student support service (Scale 5)	
Teachers	2.92
Students	2.45
Alumni	3.0
nonacademic staff	3.23
Average	2.9
Decision	**Dissatisfied**

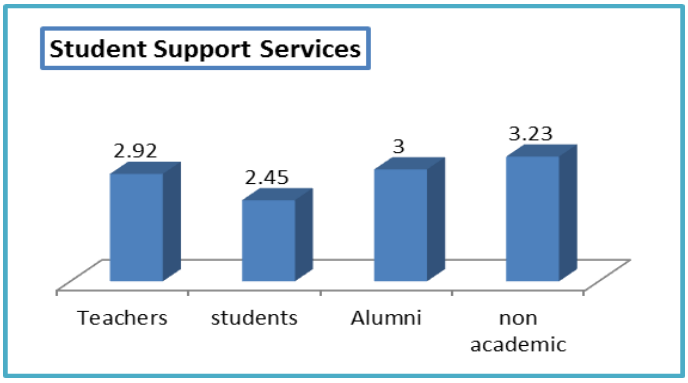


Fig.: 7.1 Survey result comparison on students support service

Table 7.9: Evaluation on Student Support Aspect

Stake holders	**Best Two Aspects**	**Scale (5)**	**Stake holders**	**Worst Two Aspects**	**Scale (5)**
Teachers	1. The faculty/department encourages students and provides adequate facilities to be involved in publication activities	3.5	**Students**	1.The entity collects alumni feedback to update the learning outcomes of the program.	1.90
	2. Students have access to appropriate and adequate support services, such as physical, social, financial and recreational facilities, and counseling and health services.	3.5		2.There is an organized and supportive alumni association.	1.93

Source: survey 2016

Chapter Eight

Staff and facilities

Ensuring quality teaching and research can be possible by the quality of faculty, non- academic staffs and the quality of their working conditions. Qualifications of teaching staffs and non-academic staffs are found to be one of the most important factors affecting the education quality.

8.1 Entry Qualifications

8.1.1 Entry Qualifications of Academic Staffs

The quality of an education system cannot be earned without the quality of its teachers. Entry qualifications of academic staffs are important to find out quality staffs for ensuring quality education. Recent trends in higher education have increased the attention given to the quality of the teaching.

Table 8.1: Entry Qualifications of Academic Staff

Designation	Entry Qualification
Lecturer	i. First division in SSC and HSC examination or having CGPA 4.00 in a scale of 5.00. ii. First class Master degree with 4/5 years Bachelor/Bachelor (Hons) or having CGPA 3.50 in a scale of 4.00.
Assistant Professor	i. Entry qualification of Lecture mentioned above and ii. Two years of experience as a Lecturer at university level.
Associate Professor	i. Entry qualification of Assistant Professor mentioned above, ii. Total seven years of experience at university level among which at least 4 years as Assistant Professor with Ph. D degree, and iii. Total three publications in any refereed reputed journal among which at least three as Assistant Professor.
Professor Grade 3	i. Entry qualification of Associate Professor mentioned above ii. Total twelve years of experience at university level among which at least 3 years as Associate Professor, and iii. Total eight publications in any refereed reputed journal among which at least three as Associate Professor.
Professor Grade 2	i. Entry qualification of Grade 3 Professor mentioned above, ii. Total 16 years of experience at university level among which at least 4 years as Grade 3, and iii. Total ten publications in any refereed reputed journal among which at least two as Grade 3 Professor.
Professor Grade1	i. Entry qualification of Grade 2 Professor mentioned above ii. Total 20 years (active job) of experience at university level among which at least 2years at highest scale slab of Grade 2 Professor, and iii. Being one of 25% of total professors of university.

Source: Documentation of registrar office, SUST

The entry qualifications (as well as the up-gradation and promotion policy) of any type of staffs either academic or non-academic are decided by the highest body of the university, the syndicate. The policy

is usually reviewed sometimes by a committee which takes feedback from stakeholders' associations (teachers/officers/employee associations) as well as from other institutions. Amendments to the existing policy are suggested which must be approved at the syndicate.

Chemistry department of SUST has four categories of academic staffs: Lecturer, assistant professor, associate professor and professor. Professor post itself has three categories; Grade-1, Grade-2 and Grade-3. Generally lecturer is the entry level academic position in SUST though in other level the qualified candidate can also enter into university as academic staff.

8.1.2 Entry Qualifications of Non-academic Staffs:

Chemistry Department, SUST has four categories of non-academic staffs. Table No. 8.2 describes the entry qualifications of nonacademic staffs of Chemistry Department, SUST.

Table 8.2: Entry Qualification of Non-Academic Staff

Designation/position	Entry Qualification
Administrative officer	i. Having a Bachelor/Equivalent degree from any reputed university and having typing speed of 40 and 50 words in Bangla and English respectively. Or, Having five years of experience as Administrative Officer cum Computer Operator. ii. Maximum age 35 years.
Assistant cum Computer Operator	i. Having passed HSC/Equivalent. And having typing speed of 40 and 50 words in Bangla and English respectively. Or, Having five years of experience as Office Assistant cum Computer Operator. ii. Maximum age 35 years.
Lab Assistant and Lab Attendant	i. H.S.C passed in science background with relevant working experience. ii. Maximum age 35 years. It can be relaxed for more experienced person.
Peon	i. Class eight passed with relevant working experience. ii. Maximum age 35 years. It can be relaxed for more experienced person.

Source: Documentation of registrar office, SUST

8.2 Recruitment

8.2.1. Transparency and Fairness of the Recruitments.

All the academic and non-academic staffs are recruited by the SUST authority. A recruitment committee for each position is formed by the university authority. For the recruitments of teacher, the head (for lecturer and assistant professor position) and the respective faculty dean become the member of the recruitment committee. Besides, one or more external members (as subject expert) are nominated for that selection process. Thus for academic positions, the concerned committee arranges viva voce examination for the applicant and after the viva voce examination they recommend selected candidates for recruitment and send it to Syndicate for final approval. Selected candidate(s) can join their respective position(s) after the approval of the syndicate. The policy is mostly fair and

transparent but only viva voce examination is not enough to find out teaching excellence. It is necessary to evaluate teaching performance as well.

8.2.2. Recruitment and up-gradation policy for non-academic staff

For the non-academic positions the same process as teachers' recruitment process is followed but the concerned committee may take written examination in this regards. The head of the department is usually not involved but the dean becomes the member of the recruitment committee for non-academic staffs (both technical and non-technical). Thus, the university authority is fully responsible for the recruitments of non-academic staffs for the departments.

Our finding from non-academic staffs about recruitment-promotion policy shows that they are undecided with the recruitment and up-gradation policy.

Survey on non-academic staffs about recruit-promotion policy is given below:

Scale: 5–Strongly agree; 4–Agree; 3– Undecided; 2–Disagree; 1–Strongly disagree

& <5-highly Satisfied, <4- Satisfied and <3- Dissatisfied

Table 8.3: Evaluation of Non-academic staffs about recruit-promotion policy

Stake holder	Area of evaluation	Scale(5)	Observation
Non-academic staff (N = 4)	1.Competence, experience and sincerity are the only criteria for promotion and up-gradation	3.0	Undecided
	2.The recruitment and up-gradation policy is good enough and inspiring.	3.0	Undecided

8.2.3. Salary and Incentives

As a public university of the country, the salary structure is determined by the government. The current salary structure, due to national pay scale 2015, is much better than the previous years. Besides the basic pay, the staffs get incentives and honorarium for their extra jobs beyond their official duties, like various examination related responsibilities, administrative positions (for academic staffs only), for working part-time in an inside project (like, sub-projects of HEQEP), etc. The academic staffs are also allowed to do consultancy or to teach at outside institutions for a limited period of time per week by submitting 15% of external earning to the university.

They get leaves with salary payments for achieving their higher degrees (Masters, Ph.D. and Post-Doctoral Fellowship). They also entitled to get sabbatical leaves and liens. Again academic staffs are not enjoying some major facilities e.g. housing, car loan etc. like other government sectors of the country.

8.2.4. Staff Sizes

A total of thirty one (31) academic staffs currently belong to chemistry department; only 3 (three) of them are in study leave for pursuing their higher studies as well as postdoc. Among the 31 faculty members, 19 are professor, 3 (three) are associate professor, 9(nine) are assistant professor and at present there is no lecturer. Table No. 8.4 represents the distribution of existing faculty members of Chemistry dept. by designation

Table 8.4: Distribution of Existing Faculty by Designation

Designation	Number	Percent (%)
Professor	19	61.3
Associate Professor	03	9.70
Assistant Professor	09	29.0
Lecturer	00	0.0
Total	31	100

Source: Official documentation of Chemistry Dept., 2017

8.2.4.1 Teaching Load justification:

The number of current students at undergraduate level is 250 and at masters level 87. Students-teacher ratio is about **10: 1**. The number of teachers is enough to run the program smoothly. Our findings from two important stake holders (teachers and alumni) that teachers work load in teaching and research is justified.

Table 8.5: Teaching load justification

Stake holders	Area of evaluation	Scale(5)	Observation
Teachers	1. Teachers work load in teaching and research is justified.	4.10	Highly satisfied
	2. Teacher student ratio is justified.	4.20	Highly satisfied
Alumni	3. Number of teachers was adequate to run the programs smoothly	3.77	Satisfied

8.2.5 Qualifications of the Existing Non-Academic Staffs

CHE department has a total number of 16 non-academic staffs. Among them one (1) principal instrument Engineer, one (1) instrument Engineer, one (1) senior technical officers & one (1) office staff as assistant administrative officer. Other 12 (twelve) members are at non-officer rank. The following table 8.6 represents the distribution of nonacademic staffs of CHE department by designation.

Table 8.6: The qualifications and responsibilities of the non-academic staffs:

Designation	No.	Degree	Responsibilities
Principle Instrument Engineer	01	M.Sc.in Physics	Instrument maintenance
Instrument Engineer	01	Diploma Engineering	Physical chemistry lab management
Senior Technical Officer	01	M.Sc. in chemistry	Organic and analytical chemistry lab management
Assistant administrative officer	01	MA	Office management
Junior administrative officer (Store Keeper)	01	MA	Chemical store management
Senior Assistant	01	BA	Seminar library supervision
Senior Assistant (Technical)	02	BSc	Chemistry lab assistance
Senior Lab Assistant	03	HSC	Chemistry lab assistance
Lab Assistant	03	HSC	Chemistry lab assistance
Photocopy Operator	01	SSC	Office assistance
Office Attendant	01	SSC	Office assistance
Total	4+12=16		
Experience			
More than 20 years	13 persons		

Our survey findings from three stake holders show that they are satisfied to some extent about non-academic staffs but not agreed. We need more qualified skilled persons.

Table 8.7: Evaluation about qualification of non-academic staff

Stake holders	Area of evaluation	Scale(5)	Observation
Teachers(N = 28)	Non-academic staffs are competent and responsive	3.4	Satisfied
Nonacademic staffs (N = 4)		3.3	Satisfied
Alumni (N = 116)	Supporting staffs in the laboratories were adequate, efficient and supportive	3.5	Satisfied

8.2.6. Qualifications of the Existing Academic Staffs

Qualifications of teaching staff are found to be one of the most important factors affecting the perception of education quality. As of December 01, 2017, among 31 faculty members, 28 are present in the department; rest three of them is in study leave for higher education. The following table 8.8 shows the classification of the academic staffs according to their position, qualification and experience. The undergraduate classes are taken by teachers of all positions. The minimum qualification of a teacher (Lecturer) is to have a four year bachelor degree with one year MS degree in chemistry. Again qualifications of existing faculty members are also very vital in achieving quality in higher education. Here table No. 8.9 depicts the distribution of existing faculty members by

quantification of CHE department. It is worthy that 80% of the total faculties have PhD and 29.0 % of the faculties have only MSc/MS degree.

Table 8.8: The qualifications of the academic staffs:

Designation		Number of teachers
Position	Professor	19
	Associate Professor	03
	Assistant Professor	09
	Lecturer	00
Experience	More than 20 years	09
	16 to 20 years	07
	11 to 10 years	08
	More than 3 years	07

Table 8.9: Distribution of existing faculty by quantification:

Quantification /Degree	Number	Percent (%)
PhD	22	80.0
Only M.Sc./MS	09	29.0
Post Doc	16	51.7

8.2.7. Commitment and Sincerity of the Academic Staffs

Chemistry department was one of the three founding departments at SUST, opening its doors in the 1991. Most of the academic staffs of the department have highest level of commitment and sincerity from the very beginning. We are well-known at the university for our good relations among the teachers and the other staffs. All of our teachers meet every Wednesday in a departmental meeting. Due to the good relations and teamwork attitude of the teachers, it has been easy for us to run the program smoothly as well as arranging different types of extra-curricular activities like conference, Olympiad etc. type events.

Among 31 teachers 22 have Ph.D. degree from abroad with high excellence and rest 09 are trying for it. After joining at this university, teachers need to finish two years probationary period to get study leave for pursuing higher education. All most all teachers took the chance of their study leaves within 3 to 6 years of their joining. Some teachers have done post-doctoral research works as well.

The following chart shows, the alumni are highly satisfied that the teachers are well qualified. It is a very strong compliment for chemistry department.

Table 8.10: Evaluation about qualification of academic staff

Stake holder	Area of evaluation	Scale (5)	Observation
Alumni (N = 116)	The teachers in the department were well qualified.	4.13	Highly satisfied

8.2.8 Key Responsibilities of Academic Staffs

Each academic position has some key responsibilities. Table No. 8.11 shows some key responsibilities of academic staffs of CHE department of SUST.

Table 8.11: Key Responsibilities of Faculty by Designation:

Designation	Key Responsibilities
Professor and Associate professor	• Conducting courses at both undergraduate and post graduate level. • Supervising/mentoring both undergraduate and post graduate research. • Acting as a chairman/member of examination committee. • Playing role as a member of academic committee. • Counseling students
Assistant professors	• Conducting courses at both undergraduate and graduate level. • Supervising/mentoring undergraduate and if have PhD degree then graduate students • Acting as a member of examination committee. • Playing role as a member of academic committee.
Lecturer	• Conducting courses at undergraduate level and graduate level. • Supervising/mentoring only undergraduate research if have PhD degree. . • Acting as a member of examination committee. • Playing role as a member of academic committee.

8.3 Staff Development:

Quality assurance recognizes the importance of training and development. Training is very important to enhance the professional skills of the staff and to keep them up-to-date with best practices in quality assurance. In addition, the academic staffs need to pursue their higher education (MS, PhD), do research, publish papers, attend conferences, etc.

Till now the university does not have any formal staff development center. However, the university provides supports in various ways for staff developments.

8.3.1. Academic Staffs

8.3.1.1. Academic Staff Training/Orientation and Guidance

An informal process of mentoring and guidance to new academic staff is existing here. Prof. Khalilur Rahman, highly qualified and experienced, served as founder for this department. Under his valuable guidance present chemistry department became most organized and it has highly experienced teachers with non-academic staffs. This is also helpful for the new academic staffs to develop themselves. Senior teachers usually act as mentor for new academic staffs. Though formal foundation training is absent here but other professional development activities for academic staff including attending

seminars, participation in training, workshops, attending professional conferences, professional writing activities, and review activities, conducting new and original research, training programs inside and outside Bangladesh are practicing. The faculty members of SUST are encouraged to take part in such professional development activities with little logistic and financial support. The following table 8.12 shows the views of the four stakeholders. According to survey on existing staff development process, stakeholders are not satisfied as there is no formal process at present.

Table 8.12: Opportunity for skill development for academic and non-academic staffs:

Area of evaluation	Scale (5)		
	Teachers	**Alumni**	**Non- aca staffs**
1.Nonacademic staffs have enough opportunity to take part in different training program for skill development	2.6	2.76	2.5
2.Academics have enough opportunity to take part in different training program for skill development	2.6	3.24	--
3. The Faculty/Department has policy to complement non-academic staffs related to service, development and appraisal.	--	--	2.5
4. The Faculty/Department has policy to complement academic staffs related to service, development and appraisal.	2.8	--	--
5. The faculty/department provides mentoring and formative guidance for new non-academic staff as part of its staff development program.	---	--	2.5
6. Academics had enough opportunity to take part in different training program and conference for skill development as well as research update.	--	3.24	----
7.The faculty/department provides necessary training, tools and technology for self-learning, access to information and for communication to the academic staffs	2.8	--	--

8.3.2 Career Development:

The university helps in the following ways for professional development of the academic staffs.

8.3.2.1. Duty Leaves

The university grants duty leaves to the faculties if they have any opportunity to get training, need to attend any workshop, seminar or conference or they have any invitation from another university for any academic activities. The university also gives some allowance to attend conferences that are held inside the country.

8.3.2.2. Study Leaves

The university has the policy to grant study leaves with full pay or without pay for pursuing MS, PhD or post-doctoral fellowships for professional development.

8.3.2.3. Sabbatical Leaves and Lien

The university also allows the faculties, for their professional developments, the sabbatical leaves and liens with some conditions after a specific period of service.

8.3.2.4. IQAC Activities

The IQAC of the university conducts different training programs and workshops on pedagogy, teaching-learning, assessment, curriculum development, self -assessment, etc. to enhance the skills of the faculties for quality education.

8.3.2.5. The University Research Center Activities

The University Research Center grants some funds every year to each of the departments for their proposed research projects. It also organizes workshops on various relevant topics like research methodology, data analysis tools, programming tools, report writing, library resource tools, etc.

8.3.2.6. External Research Grants

The university encourages and supports to start any research oriented projects with the help of external (local or foreign) grants. Such types of projects enhance the research capabilities and publications of the faculties and the students.

8.3.2.7. Research Award

To encourage the faculties of the university, every year Vice Chancellor award is given to the author (s) of best paper and research work must be done in Bangladesh.

8.4. Key Performance Indicators (KPIs)

Right now the university does not have well defined KPIs. However, for promotion and up-gradation or determination seniority of the staffs, either academic or non-academic, few factors which act like KPIs to some extent are considered as described below. Seniority is mainly used as a criterion for promotion and up-gradation and to assign any responsibility by the authority. The university or the department did not have any peer observation policy. However, recently the department has taken step to prepare this policy.

8.4.1. Academic Staffs

The recruitment, promotion or up-gradation policy considers the following criteria for the academic staffs.

Educational Qualification: For each position, the recruitment, promotion or up-gradation policy defines a minimum educational qualification. Educational qualification is relaxed in some cases if the candidate has certain amount of experiences.

Period of Experiences: Experiences (teaching or research experiences) for a minimum period in relevant field is required in some positions. Note that period of teaching experiences is considered but not the teaching performance, i.e., TPI. Again, research experiences or number of publications is considered but not other related criteria like quality of publications.

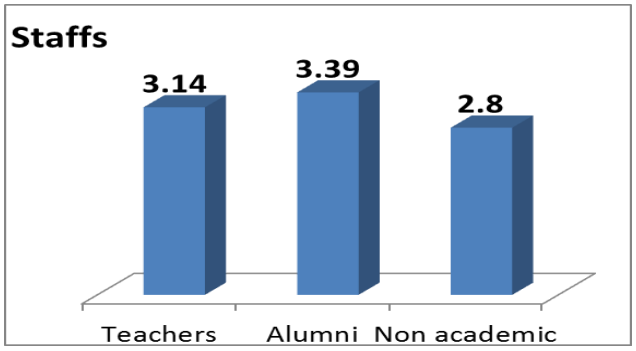
Number of Publications: It is used in two ways. For some positions, certain number of journal publications is required as a minimum criterion. In some cases, required period of experiences is relaxed if the candidate has certain number of additional publications.

Teaching performance evaluated by the students is not considered. However, we have already started taking course feedback informally from the students. After self-assessment report submission a formal departmental committee will be conducted this feedback assessment. In addition, the following indicators will also be used: total number of courses conducted so far, average number of classes conducted in a semester, number and quality of publications, number of thesis and project supervised.

8.4.2. Non-Academic Staffs

Like academic staffs, educational qualifications and relevant experiences are considered as a primary criterion of recruitment, promotion and up-gradation for the non-academic staff. In addition, ACR from the head of the respective department is used by the interview board to make decision about the candidate.

Fig No 8.1: Comparison of average scores of different stake holders:



The following criteria of ACR are assessed by the head of the respective department e.g. discipline, enthusiasm, orderliness, regularity, accountability, good behavior, efficiency, honesty, occupational

knowledge etc. Comparison of survey on staffs and facilities (Fig 8.1) from all stockholders shows that satisfaction level for alumni is the highest among others. It is noteworthy to mention that non staff members are not so understandable about the total system which is reflected in responses.

Table 8.13: Overall survey outcome on staff aspect

Stake holders	Best two aspects	Scale (5)	Lowest score aspects	Scale (5)
Teachers (N = 28)	1. Teachers work load in teaching and research is justified	4.1	1. Academics have enough opportunity to take part in different training program for skill development	2.6
	2. Teacher student ratio is justified	4.2	2. The faculty/department provides mentoring and formative guidance for new academic staff as part of its staff development program. as well for Nonacademic staffs have enough opportunity to take part in different training program for skill development	2.6
Alumni (N =119)	1. The teachers in the department were well qualified	4.13	1. Nonacademic staffs had enough opportunity to take part in different training program for skill development	2.76
	2. Number of teachers was adequate to run the programs smoothly	3.77	2. The faculty/department provided mentoring and formative guidance for new academic staff as part of its staff development program.	2.99
Non-academic staff (N = 4)	1. Nonacademic staffs are competent and responsive	3.3	1. Nonacademic staffs have enough opportunity to take part in different training program for skill development	2.5
	2. The recruitment and up-gradation policy is good enough and inspiring & Competence, experience and sincerity are the only criteria for promotion and up-gradation	3.0	2. The Faculty/Department has policy to complement non-academic staffs related to service, development and appraisal as well as provides mentoring and formative guidance	2.5

Chapter Nine

Research and Extension

Research and development is a very important part of the department. An effective research and development program depends on the quality and research background of the faculty, infrastructure and research facilities, and funds available. For performing advanced level research, a state-of-the-art research laboratory and quality of students are also important. Again, dissemination of the research result is necessary to do in due time.

Survey among the academic staff, student, alumni about student research and extension has been performed. Following table shows the survey results. We use the following criteria for the survey.

5–Strongly agree; 4–Agree; 3– Undecided; 2–Disagree; 1–Strongly disagree

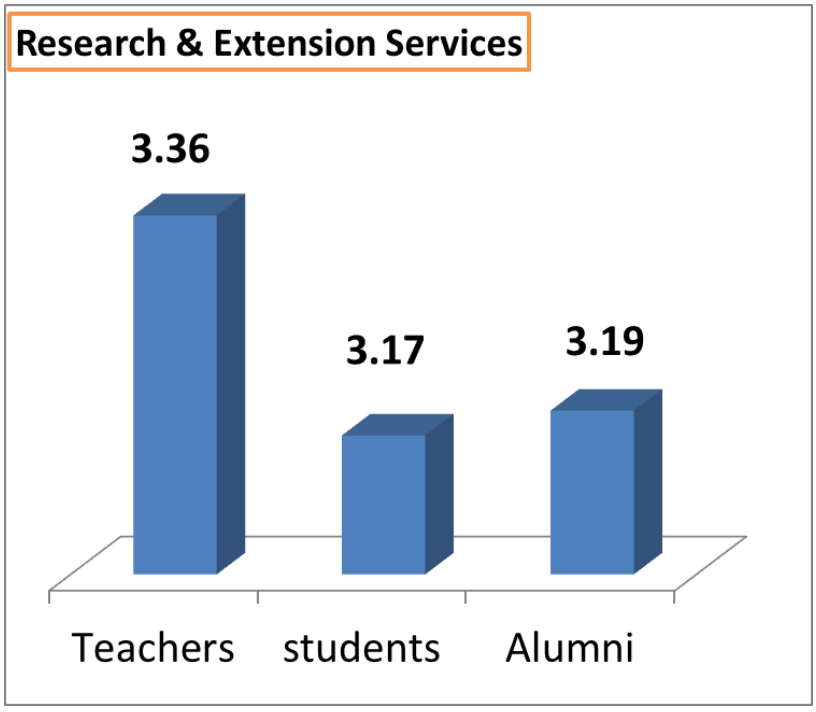
& <5-highly Satisfied, <4- Satisfied and <3- Dissatisfied

Table 1: Research and extension survey

Stake holder	Area of evaluation	Scale (5)	observation
Student (N= 106)	1. The entity has a well-defined research and development policy.	3.80	satisfied
	2. Mechanism exists for engaging the students in research and development.	3.43	satisfied
	3. The entity has a community service policy.	2.27	dissatisfied
	Average	**3.17**	**Satisfied**
Stake holder	Areas of Evaluation	Scale (5)	observation
Teacher (N = 28)	1. The faculty/department has a policy and a program on research and development	3.50	satisfied
	2. Adequate funds and facilities are provided to sustain undertaken policy and program	2.80	dissatisfied
	3. Teachers are always eager to hunt research fund for smooth running of the research.	4.10	Highly satisfied
	4. Teachers encourage and prepare students for engagement in research, scholarship and development.	4.30	Highly satisfied
	5. Research outputs are regularly published in reputed impact factor journal	4.10	Highly satisfied
	6. Research findings in the form of theses, monographs and publications are properly used in current teaching-learning.	3.60	satisfied
	7. Research findings are patented and used for commercial purposes.	2.00	disagree
	8. The faculty/department is involved in community services with the developed technologies	2.5	dissatisfied
	Average	**3.36**	**Satisfied**

Stake holder	Areas of Evaluation	Scale (5)	observation
Alumni (N= 115)	1. The faculty/department has a policy and a program on research and development	3.83	satisfied
	2. Adequate funds and facilities are provided to sustain undertaken policy and program	2.91	dissatisfied
	3. Teachers are always eager to hunt research fund for smooth running of the research.	3.39	satisfied
	4. Teachers encourage and prepare students for engagement in research, scholarship and development.	3.74	satisfied
	5. Research outputs are regularly published in reputed impact factor journal	3.22	satisfied
	6. Research findings in the form of theses, monographs and publications are properly used in current teaching-learning.	3.26	satisfied
	7. Research findings are patented and used for commercial purposes.	2.59	dissatisfied
	8. The faculty/department is involved in community services with the developed technologies	3.04	satisfied
	Average	**3.19**	**Satisfied**

Fig No1: Comparison of average scores of different stake holders:



As shown in the fig 1, among the stakeholders teachers gave highest score with satisfaction to some extent for research and extension services. The opinion of students and alumni are very similar in this connection.

9.1 Policy and program

Department of Chemistry since its starting has been working for research and development. We have 31 faculties at present (appendix 1). Among them 29 are now in department. Among the faculties 19 are Professors, 22 have got PhD from mostly universities from the abroad (foreign countries). All professors and associate professors are engaged in research and they supervise graduate as well as undergraduate students. Usually assistant Professors and lecturers are also engaged in research with senior faculties or in some cases independently. However, assistant professor with PhD degree can also supervise the student's research. A very good research environment exists in the department. There are four medium level research laboratories and two instrument laboratories in CHE Department. We have some instruments to conduct research of graduate and postgraduate students like AFM, Electrochemical work station, PL spectrofluorometer, UV-Visible, IR machine, DSC, TGA, Electrophoresis etc. (appendix 2) However, we do not have expensive instruments like NMR, XRD, SEM, TEM, XPS etc due to the financial margins. Faculty members have established several collaborations with professors from Asia, Europe, Australia and USA. Through these collaborations in recent years a good number of papers per year are being published in peer reviewed international journals from CHE department. Every year faculties are taking part in national and international conferences. There are significant progressive research interactions of faculties through regional and global affairs. Some of our alumni are also in good academic positions in other universities in Bangladesh as well as in abroad (Australia, Europe, Japan and Saudi Arabia, UK, USA etc.). Chemistry department has no well defined policy, which has been reflected in the student, alumni and academic staff feedback about student research and extension (average value is 3.71, satisfied but not agreed). However, recently we have addressed this issue. We have made a research and development policy, which has been approved in the department meeting by the academic staff (appendix 3). Teachers always encourage students for engagement in research, scholarship and development (agreement value for teachers 4.3, agreed and highly satisfied). However, students and alumni think the mechanism exists for engaging the students in research and development need further improvement (the average value for students and alumni is 3.41satisfied to some extent but not agreed). This is because most of the alumni are not aware of real picture of the present research condition of the department. They somehow judged to some extent considering the situation of their existing time in the department. Among the current students, only 4/2 semester and graduate students are engaged in the research activities of the department. So the real picture has not been reflected by students response of 2/2, 3/2 semesters. In fact, academic staffs always encourage and prepare

students for engagement in research, scholarship and development. The university has already been taken different steps for research and development as describe below.

9.1.1 Journal: Three different peer reviewed journals are published from the university as below:

(i) SUST journal of Science and Technology

(ii) SUST Journal of Social Sciences

(iii) SUST Journal in Bengali

There is one editorial board to manage all three journals. The journals are published when enough publications are accumulated for one volume. Special issues are published with selected copies after a major conference. Most of the authors are from SUST and normally reviewed by reviewers from senior researchers from outside the university.

9.1.2 Research Center: A Research Center is established recently for capacity building at the university. The center is trying to generate fund and. This center also provides small amount of fund (of the order of 100 thousand Taka) to selected research groups for one or two years term.

9.1.3 Syllabus: As part of the syllabus the undergraduate students are required to perform 6 credits of research or development work. This ensures the students to learn the research methodology. To discourage plagiarism every thesis or project is checked by two examiners. (Question1 and 4)

9.1.4 Masters and PhD Program: Only recently SUST was basically an undergraduate teaching university. However a university cannot be a complete university without strong research activities. To jump start the research program graduate programs were launched in almost all of the departments at SUST including the department of CHE. These Masters MPhil and PhD programs have generated good research activities in the Department.

9.1.5 Paper Award: To encourage the researchers of the university VC award with monetary value of 25 thousand taka was introduced if a paper is published in a peer reviewed journal with good impact factor.

9.2 Fund and facilities

The fund for research work is very limited (Question 2) in most of the public universities in the country. The major funding has to be acquired by writing proposals to agencies and organizations as described in the next section.

9.2.1 Yearly project funding: The University funds 80 to 100 small scale research projects (1 to 3 lac taka) every year. Project proposals are solicited and funds disbursed if the proposals are found reasonable.

9.2.3 Lab for research: For most of the research in CHE require very expensive equipments. Department of CHE has some of the facilities and slowly acquiring more specialized labs. Department has established some state-of-the-art research laboratories based on projects HEQEP (Higher education Quality Enhancement Project), MOE (Ministry of Education, BD), MOST (ministry of Science and Technology, BD), TWAS (World Academy of Sciences).

9.2.4 Books and Journals: University has a full-fledged library. Most of the books procured are for basic, advance courses and research work. Department of Chemistry has a seminar library with sufficient collection of chemistry books for students as well as faculty. The university also has subscribed to the e-journals and the researchers have access to many of the international research journals.

9.3 Fund Hunting

The faculties of department of CHE are always actively engaged in fund hunting from the very beginning of this department. The scope of research fund was very limited in the country and the success was limited. Recently the scope of research fund has opened up to some extent and the department has already received significant amount of fund from various sources. The survey result reflected this achievement (agreement, 4.1).

9.3.1 HEQEP: The most significant funding at SUST came from HEQEP (Higher Education Quality Enhancement Project). Different entities submitted proposals and after strong scrutiny selected research proposals were funded. Several departments at SUST developed state-of-the-art research laboratories with HEQEP fund and enhanced Masters and PhD programs. The department of CHE submit proposals every year and was awarded two projects funding recently for development research Laboratories and education facilities of the Department (HEQEP grant No.(i) CP2524 and extension SFCP 2524, SPM Professor M. Younus; (ii) CP 3665 and extension CPSF 3665, SPM Professor M. Mizanur Rahman).

9.3.2 Education ministry: Education ministry of Bangladesh provides fund for researcher to establish research laboratories. Some teachers have received MOE funds in recent years.

9.3.3 MOST: The ministry of Science and Technology also provides research funds to students and teachers. Every year 5-10 students are receiving funds from MOST. Some teachers also received MOST funds in recent years.

9.3.4 UGC: University Grants Commission (UGC) provides grants to the researcher almost every year. Some faculties have received research funds from UGC in recent years.

9.4 Dissemination of research findings

9.4.1 Conferences and Journals: The most common way to disseminate the research finding is to present in conference or to publish it in journal. There are various national and international conferences being organized in the country. Researchers present their research works in these conferences in home and also in abroad. Department of chemistry arranges conferences occasionally. In 25 February, 2006 department of chemistry arranged a Bangladesh Chemical Society conference on "The role of chemistry in environmental sustainability". The department of chemistry arranged BCS conference successfully with its excellent team effort. In 2014 (December, 6-8) an international conference was also arranged by department of Chemistry on "International Conference on Materials Chemistry (ICMC 2014)" with a great success, where many researchers from home and abroad were present and delivered lectures . SUST arranges a bi-yearly engineering conference known as CERIE. Chemistry researchers and graduate students usually take part in the conference. A significant work is published in international journals and some papers are published in Bangladeshi journals and very few in SUST journals. However the MSc, MPhil and PhD students are required to publish their findings in journals with a good impact factor. The survey result by alumni has shown that the department is lacking in the skill of paper writing and publications (Question 5, rating 3.22; satisfied in some extent but not agreed). However real picture has been reflected in teachers responses with agreement factor 4.10. The recent publication list of our faculty may be seen in the website of the University (chemistry faculty profile).

9.4.2 Thesis: Students with required CGPA in the department are allowed to do research work and at the end of the program they have to write a thesis. The hard copy of the thesis is stored in the departmental seminar library while the softcopy will be archived and will be made available through the network.

9.4.3 Portals: The department of CHE has a major research thrust in chemistry. Recent developments in research are always published in recognized international journals and displayed in department boards in front of the laboratories.

9.4.4 Industry Collaboration: In 2013 the department started an industry collaboration with TICI (Training instate for chemical industries) for training our students and exchange their views. Every year MS students in the beginning of their 1st semester visited TICI for gaining theoretical and practical knowledge in industrial sector for one month to complete their assigned course CHE570 (1 credit).

9.4.5 Community Services: Traditionally the department of CHE has been working for the community with its available facilities. But as shown in the survey result, it is not much reflected in the responses. The most important one was the organization of conferences in 2006 (Bangladesh Chemical Society, BCS conference) and an international conference in 2014, where we (with the help of students) served for the chemistry community of local and abroad. Occasionally we support the community by analyzing chemical samples requested from city corporation or others. We also support other universities and research organizations analyzing their research samples on collaborative basis. School and college students and common people are welcomed to the chemistry exhibition at the department of chemistry in the university day on February 14. As a part of community service, school and college students of the Sylhet region visit our department. We welcome them with warm reception and demonstrate our laboratory and other teaching facilities available in the CHE department. This year in November 2017, a group of 52 female students and teachers visited us from a local woman college of the Sylhet.

Chapter Ten

Process Management and Continuous Improvement

Quality assurance in higher education is a global practice now. For continuous improvement of quality in educations and achievement of objectives, the Quality Assurance (QA) activities must be in place, properly managed, periodically reviewed, evaluated and updated regularly. Quality assurance system refers to a set of administrative and procedural activities with systematic self-assessment in respect of standard, feedback, remedial measures and monitoring. The environment, standard and requirements for quality education are changing continuously. Self-assessment for improvement is not one time assignment; rather it should be done in a permanent and cyclical basis.

10.1. QA Mechanism of the University

Like most of the universities of Bangladesh, quality assurance practice of SUST was not very formal or focused except in some cases. However, since 2014 QA practice has began to flourish through IQAC (Institutional Quality Assurance Cell) of the university with the help of the QAU (Quality Assurance Unit) of UGC, Bangladesh. Being a category 1 university, the IQAC, SUST received funds from UGC under HEQEP project and started its journey by initiating self assessments in eight departments of the university in first phase. It has now started its second phase with several departments including CHE department along with few other quality assurance related programs.

The top management of the university has commitment for developing a quality culture. Hopefully, it will set additional necessary policies and procedure soon and we will be observing the benefits within few years.

10.2. QA Mechanism of the Entity

The department already has a practice of QA in a limited scale. Few examples most of which have already been discussed in previous chapters are given below:

1. As instructed in the act, the curriculum/syllabus is revised every year in a meeting of the syllabus committee where two external members are present from other universities and institutions.

2. To maintain the quality of the theory questions of final examinations (carries 70% of the total marks), the questions are moderated in a meeting of examination committee where an external member (from other university) is present.

3. To improve teaching-learning, many initiatives have been taken. One example is that we select the popular, knowledgeable and highly influential (experienced senior) teachers for the early semester students to improve their learning and confidence.

4. Every week a departmental meeting is held where we discuss and solve operational problems.
5. We monitor closely the physical facilities of the students.
6. We have recently started taking course feedbacks at the end of each semester.

For further improvement of QA practices, recently we have set policies and procedures at a departmental meeting as given below:

1. After final version of the improvement plan is prepared according to suggestions and recommendations of the external peer review team, the department will execute the plan in next five years in cooperation with the university authority.
2. The department will maintain a Self Assessment (SA) Committee (like the current one) which will continue assessment activities even after current SA process is finished. The responsibilities of this SA committee include performing self assessment every five years and also a quick assessment at the middle (after two and half years) to measure the improvement status so that necessary counter actions can be taken if necessary. This committee will also prepare a strategic action plan after SA performed every five years. For this purpose university or UGC needs to support with necessary funds.
3. The department will maintain another committee called Survey Committee whose responsibility will be to conduct regular surveys, like, course-end survey (course feedback), mid-term survey and student exit survey as described in the next table. After survey is conducted, the committee will propose necessary actions through the head of the entity (as describe below).
4. For every running course in a semester, the department will select a peer observer who will observe a class of the course and recommend necessary suggestion to the course teacher (appendix).
5. The department will take necessary actions to build up a software for conducting all types of surveys easily and for analyzing the survey data in collaboration.

10.3. Feedback Management

The department has decided to conduct the following types of surveys as shown in the table below on a continuous basis. The purpose and how the survey data will be used have also been described in the table. We have formed two committees for this purpose: (i) Survey Committee and (ii) Self-Assessment Committee. Survey committee consists of 8 members, 2 from each branch of chemistry in general according to seniority basis. We would like to use a software so that the stakeholders can participate in the survey conveniently, the department can conduct the surveys and manage the data easily and finally any type of analysis on data becomes easier.

Table1. Feedback management

Survey Name	Frequency	Stakeholder	Conducted By	Description /Purpose	Use of the Survey Result
Mid Term Survey	Twice a year	Students	Survey committee of the department	Conducted at the middle of each semester to know about course progresses	The department will take immediate remedial measure so that course objectives are fulfilled.
Course End Survey(Course Feedback)		Students		Conducted at the end of each semester to know if the objective of the conducted courses have been fulfilled and to evaluate the instructor's performance as well	The department will take remedial measure on next semester.
Student Exit Survey	Once a year	Fresh graduate		Conducted among the fresh graduates to know if the program objectives have been fulfilled.	Will be used both for necessary actions for upcoming semesters and for self-assessment.
Student Survey	Twice every five year	Students	Self-assessment committee of the department	Conducted among the current students to know about their views and satisfactions.	Will be used to measure the progress of the ongoing realization of the improvement plan and for remedial actions if necessary. Every five years a new strategic improvement plan will be prepared.
Alumni Survey		Alumni		Conducted among the alumni to know the improvement progress	
Academic Staff Survey		Academic Staff		Conducted among the academic staffs to know their views about the program and the improvement progress	
Employer Survey	Every five year	Employers		Conducted to know about the performance of graduates and the improvement progress	
Non-Academic Staff Survey		Non-Academic Staff of the department		Conducted among staffs to know about their satisfaction and the improvement progress	

10.4 Self-Assessment Management

The self assessment that is currently being conducted will generate a five years strategic improvement plan. Based on the plan initiatives will be taken considering the strength and weakness of the department and the university. To make the self assessment as a continuous periodic activity, we have

already set a policy as described in a previous section. The related survey results are given in the following chart.

a. Survey about the management of QA process Data

This survey was conducted among the faculty of the department. The survey result is as shown in the following table.

Table 2: Survey on management of QA process

Stake holder	Areas of Evaluation	Scale (5)	Observation
Teacher (N= 28)	1. The faculty/department supports the University policies, procedures and mechanisms for regular reviewing and updating of its structures, functions, strategies and core activities to ensure continuous quality improvement.	3.1	satisfied
	2. The faculty/department develops a system to review its programs from time to time.	3.4	satisfied
	3. The faculty/department has already initiated a review of the program, implement its recommendations, and record the achievements accomplished in the quality improvement of the program.	3.6	satisfied
	4. The Dean or Head of the faculty/department plays a prominent role in the policy processes of the faculty/department.	3.7	satisfied
	5. The faculty/department embraces the spirit of continual quality improvement taking into consideration past experiences, present conditions, and future possibilities.	3.6	satisfied
	6. The faculty/department ensures that courses are taken by the teachers uniformly throughout the term	4.2	Highly satisfied
	7. The faculty/department always tries to maintain academic calendar	4.2	Highly satisfied
	8. The faculty/department ensures the culture as a usual practice for evaluation of the teachers by the students and its documentation	2.2	dissatisfied
	Average	**3.5**	**satisfied**

The chemistry department supports the university policies, procedures and mechanisms for regular reviewing and updating of its structures, functions, strategies and core activities to ensure continuous quality improvement (3.1, satisfied some extent but not agreed). The faculty/department has a system to review its programs from time to time (3.4, satisfied not agreed). The faculty/department has already initiated a review of the program, implement its recommendations, and record the achievements accomplished in the quality improvement of the program (3.6, satisfied not agreed). The Dean and Head of the faculty/department and also the senior faculties play a prominent role in the policy processes of the faculty/department through faculty committee and academic council (3.7

satisfied almost agreed). In fact, the department is willing to embrace the spirit of continual quality improvement taking into consideration past experiences, present conditions, and also future possibilities (3.6, satisfied not agreed). For going with these processes still there are some difficulties to overcome, which has been reflected in the survey results. The faculty/department ensures that courses are taken by the teachers uniformly throughout the term (agreement value 4.2). The faculty/department always tries to maintain academic calendar (question 7, agreement 4.2). The department has limited culture as a usual practice for evaluation of the teachers by the students and its documentation (question 8, value 2.2 means dissatisfied). However, recently we have started evaluation of teachers by students and documentation as well to address this issue.

10.5. Employer survey

Employer survey is an important part of 'Process Management and Continuous Improvement'.

10.5.1. Placement of Chemistry Graduates:

Placement of the graduates is as shown in pi-chart below (chart 1). It indicated the percent of alumni in different sectors.

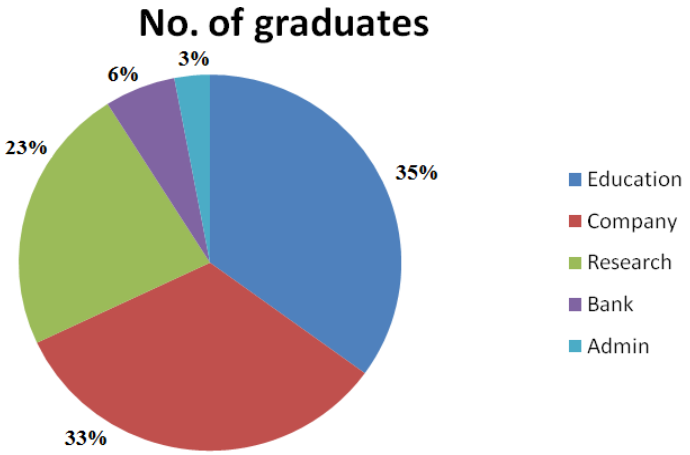


Chart1. Placement of the graduates of CHE in different sectors.

A total of 25 employers were participated in employer survey. Sector-wise employers participated in survey are as given in pi-chart below. Following pi-chart shows the nature of the employer participated in the survey. Among the employer 52% are from education sector, 8% are research organization, industrial sector are 24% (pharmaceutical 16%, chemical industry 4% and fertilizer 4%), 8% are banking sector and remaining 8% are from other financial sectors. From the survey results it is evident that our chemistry graduates have many positive dimensions in terms of entry requirement *vs* performance.

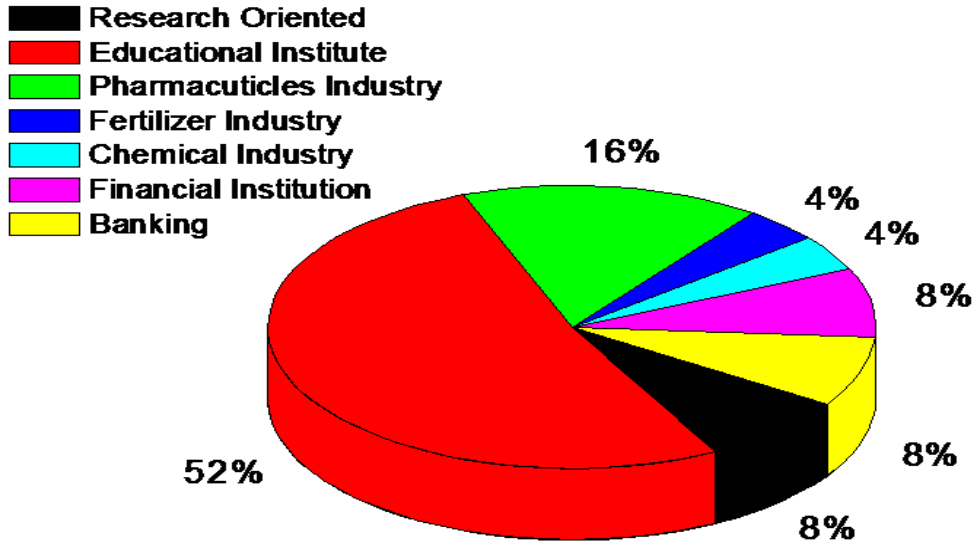


Chart 2. Percent of employer of different sectors take part in survey

Experience Requirement for Entry Level Employees

Following chart (chart 3) portrays experience requirement for entry level employees (graduates). It shows that, in 72% cases employer asked for the recruitment of fresher; and in 16% cases there is recruitment of both experienced and fresh applicants. On the other hand, 8% requirement is for few years experienced and in 4% cases only highly experienced candidates get preference.

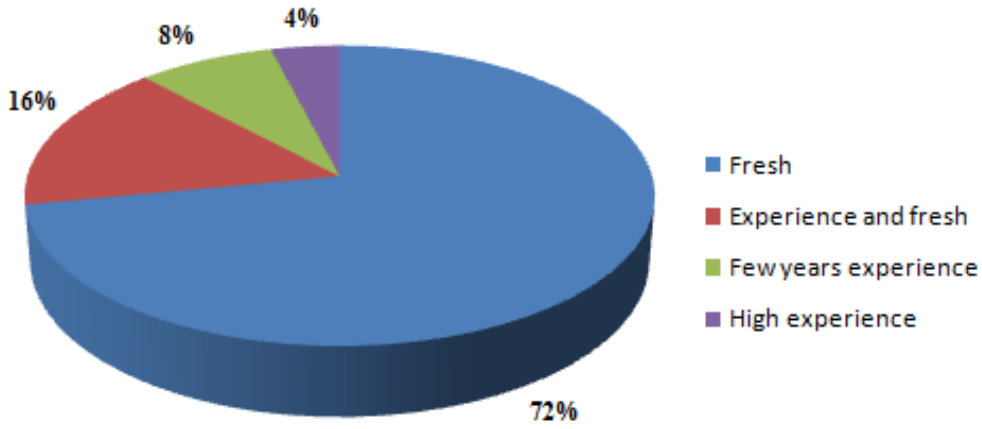


Chart 3. Experience requirement for entry level employees

10.5.2 Entry Requirement versus Performance

As part of the survey outline, the employers were asked to rate different dimensions of quality of graduates according to importance placed while recruiting. Five point scale was used for this purpose; where (i) the number 5 stood for extremely important; (ii) 4 for very important, (iii) 3 for important, (iv) 2 for less important, and (v) 1 for not important. The dimensions of quality include four broad aspects which again were divided into further sub-aspects as shown in following tables.

Table 3. Entry requirement of the employer

No.	Dimension of Quality	Rating (on a scale 5)
	A. Knowledge	
4.1	Job knowledge (knowledge on subject matter)	4.1
4.2	IT knowledge	3.4
4.3	Knowledge in designing a system component or process	2.8
	B. Communication Skills	
4.4	Oral communication	4.1
4.5	Report writing	3.8
4.6	Presentation skill	3.9
	C. Interpersonal Skills	
4.7	Ability to work on teams	4.1
4.8	Leadership	3.7
4.9	Independent thinking / Self confidence	3.9
4.10	Self-Motivation / Commitment to job	4.1
4.11	Reliability	4.1
4.12	Appreciation on ethical values	4.0
4.13	Adaptability	3.9
	D. Work Skills	
4.14	Time management skills	4.4
4.15	Judgment	4.0
4.16	Problem formulation, solving and decision making skills	4.0
4.17	Collecting and analyzing appropriate data	3.8
4.18	Ability to link theory of practice	3.9
4.19	Discipline	4.4
4.20	Sense of responsibility	4.5

Next, the employers were asked to rate the graduates of CHE department with regard to these dimensions of quality and on the basis of a five point scale; where the (i) number 5 stood for excellent; (ii) 4 for very good, (iii) 3 for good, (iv) 2 for fair, and (v) 1 for poor. The finding of this exercise is presented in the following table. Here four broad dimensions of quality, viz. knowledge, communication skills, interpersonal skills and work skills has been considered. In both the cases average value has been calculated.

Following table 5 shows evaluation of chemistry graduates by the employers in terms of entry requirements vs. performances. Chemistry graduate's performances in their work places are pleasing in terms of several points compared to the entry requirements (see table 5 below). In some cases graduates performances exactly meet the entry requirement, some cases performances are better than entry requirement, in some cases performance of the graduates are very close to the entry requirement (table 5 below). In few cases according to survey results need further improvements. We need to improve the skill of our graduates in terms of problem formulation, solving and decision making and also collecting and analyzing appropriate data.

Table 4. Rating of CHE graduates based on their performance at the Organization after recruitment

No.	Dimension of Quality	Rating (on a scale 5)
	Knowledge	
5.1	Job knowledge (knowledge on subject matter)	4.1
5.2	IT knowledge	3.7
5.3	Knowledge in designing a system component or process	3.0
	Communication Skills	
5.4	Oral communication	3.9
5.5	Report writing	4.0
5.6	Presentation skill	3.7
	E. Interpersonal Skills	
5.7	Ability to work on teams	4.3
5.8	Leadership	3.8
5.9	Independent thinking / Self confidence	3.8
5.10	Self-Motivation / Commitment to job	4.0
5.11	Reliability	4.2
5.12	Appreciation on ethical values	4.2
5.13	Adaptability	3.8
	F. Work Skills	
5.14	Time management skills	4.0
5.15	Judgment	3.9
5.16	Problem formulation, solving and decision making skills	3.7
5.17	Collecting and analyzing appropriate data	3.6
5.18	Ability to link theory of practice	3.9
5.19	Discipline	4.4
5.20	Sense of responsibility	4.2

In case of (i) IT knowledge (ii) knowledge in designing a system component or process (iii) ability to work on teams, (iv) report writing (v) leader ship, (vi) reliability, (vii) appreciation on ethical values, (viii) adaptability and (ix) sense of responsibility graduates performances are better compared to the entry requirements. Evaluation of these factors by employers clearly indicated the strength of the CHE department. Furthermore, in case of (i) job knowledge, (ii) discipline (iii) ability to link theory and practice graduates exactly fulfilled the entry requirements set by the employers. These points also indicated the strength of the department. It is necessary for the CHE department to continue these performances and encourage the graduates to keep these performances up. On the other hand, in case of (i) oral communication, (ii) presentation skill (iii) self-motivation /commitment to job, (iv) time management skills and (v) judgment graduates performances are very close to the entry requirement raised by the employer. CHE department will address these issues immediately to improve graduate performances in this regard. Finally, in case of (i) problem formulation, solving and decision making (ii) collecting and analyzing appropriate data and (iii) independent thinking/ self confidence, CHE graduates need further improvement of their performances because they failed to meet entry

requirement set by the employer. To overcome this situation CHE department will introduce more problem based classes correlating the respective courses.

Table 5. Evaluation of Entry requirement vs. performance

Aspects	Entry requirement	Performances	Observation
Knowledge			
Job knowledge (knowledge on subject matter)	4.1	4.1	Meet the requirement
IT knowledge	3.4	3.7	Better performance
Knowledge in designing a system component or process	2.8	3	Better performance
Communication			
Oral communication	4	3.9	Close to requirement
Report writing	3.8	4	Better performance
Presentation skill	3.9	3.7	Need improvement
Interpersonal skill			
Ability to work on teams	4.1	4.3	Better performance
Leader ship	3.7	3.8	Better performance
Self-Motivation /Commitment to job	4.1	4.0	Close to requirement
Reliability	4.1	4.2	Better performance
Appreciation on ethical values	4.0	4.2	Better performance
Adaptability	3.7	3.8	Better performance
Independent thinking/self confidence	3.9	3.8	Close to requirement
Work Skill			
Time management skills	4.4	4.0	Close to requirement
Sense of responsibility	4.0	4.4	Better performance
Discipline	4.4	4.4	Meet the requirement
Judgment	4.0	3.9	Close to requirement
Ability to link theory and practice	3.9	3.9	Meet the requirement
Problem formulation , solving and decision making	4.0	3.7	Need improvement
Collecting and analyzing appropriate data	3.8	3.6	Need improvement

We have also calculated the average value of entry requirement, which is 3.95. The average value of performances indicators is 3.72. The difference between these two values is 0.23. These two values are very close to each other, indicates that our graduates almost fulfill the entry requirement set by the employers. According to the current survey, a 5.8% further improvement of the graduate's performances will meet the entry requirements. This issue will be addressed by the department in a priority basis.

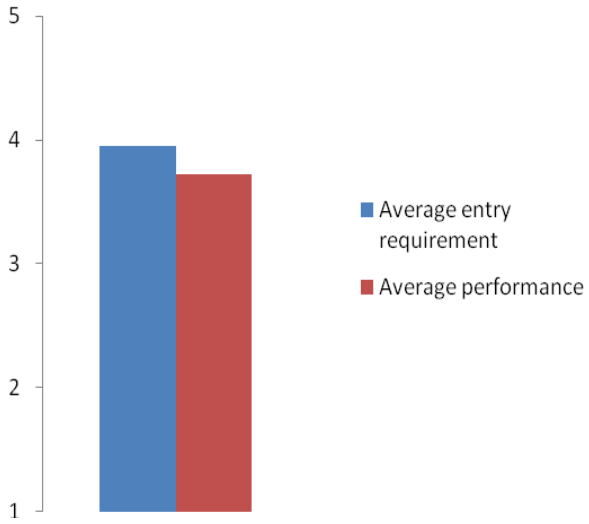


Figure 1. Average entry requirement vs performances

10.6. Peer Observation Management

The peer observation of teaching process provides both the course teachers and the observers with the opportunity to mutually enhance the quality of teaching practices and skills. It also creates an environment to disseminate good practices among the colleagues by sharing thoughts on teaching practices.

The peer observation is a cyclic, rather than a one-off episode. Each teacher will be evaluated once in a semester. The prescribed form is shown in (appendix 4**)**.

The peer observation process is performed in the following way:

1. Every semester the department will prepare a list of peers (teachers) from within the department for all the course teachers.
2. The course teacher and the peer observer will fix up a class time for observation.
3. On the scheduled class time, the observer will hand over filled out prescribed form (section 1 and 2 (appendix 4) to the course teacher.
4. During or after observation the observer will record his remarks and recommendations on the Section 2 of the form and preferably had a briefing session with the course teacher.
5. The course teacher will write a short action plan on Section 3 of the form and keep it with him and a copy will need to be submitted to the head of the department.

10.7. Implementation Management of the Improvement Plan

Our initial improvement plan, that has been prepared based on the outcome of the ongoing self-assessment of the program, will be finalized after getting feedback from external peer review team. When the final improvement plan will be ready, the department will execute the plan in cooperation

with the university. As stated in a previous section, the department will continue the activity of the SA committee all the year round to measure the improvement progress. The continuous improvement process (cyclic) is summarized below:

1. After finalizing five-year improvement plan, the head of the entity, in cooperation with the faculty members, will recommend the action plan and duration.
2. The action plan will have two parts: (i) the responsibilities of the entity and (ii) the responsibilities of the university.
3. On behalf of the department, SA committee will handed over a formal letter to the administration requesting for taking necessary actions as well as for disbursing necessary fund to implement the improvement plan.
4. Within the department the tasks will be distributed among the academic and non-academic staffs for implementing the improvement plan.
5. The SA committee and the head of the entity will monitor the progress of the improvement activity.
6. After two and half years, a quick self-assessment will be conducted by the SA committee and curative action plan will be prepared if necessary.
7. After five years, self-assessment will be conducted and again a new improvement plan will be produced. The final improvement plan will be designed according to the recommendations of the peer reviewer and will be executed duly.

Chapter Eleven

SWOT analysis

Department of chemistry has been working for excellence in teaching and research since its establishment. The department is intending to produce quality graduates to meet the local and global challenges. Through this survey we have identified several strengths and weakness of the department and have discussed the related opportunities. At the end of the chapter we also have identified threads and discussed possible way out.

11.1 Governance

Strengths

Our findings show that, the governance of the program is at satisfactory level to some extent. It is noteworthy that concern stake holders have been agreed about friendly, cooperative attitude of the teachers, which created a conducive learning environment for the program. Again they also believe that academic decisions are taken with fairness and transparency. These aspects are very important in ensuring good governance. On the basis of stake holders' opinion, these aspects can be considered as strengths of the CHE department.

Weaknesses

We have found the issues like (i) delaying of results publishing (ii) not following academic calendar properly, (iii) less informative website and (iv) inadequate infrastructures to fulfill its mission and objectives. These are the weaknesses of the program according to current students and alumni. Again absence of perfect evaluating system for teaching staffs' performance as well as KPIs are the another weaknesses of the program on the point of view of academic staffs.

Opportunities

i. A positive feedback regarding governance has been observed. However further improvement strategies should be considered.

ii. The content and security condition of the SUST website (www.sust.edu) is not up to the mark. So there is a scope to improve gradually so that students can get a lot of information.

iii. To improve the process of publishing cumulative results as well to remove obstacles to follow academic calendar.

iv. There is a scope to formalize more the issues on governance. For example, more clarification is needed for the aims, objectives, learning objectives and curriculum design than before.

v. To make a regular practice on issues of peer observation, mentoring and internal quality assurance process.

I. There is an opportunity to establish KPIs now

11.2. Curriculum Design and Review

Strength

i. Courses in the curriculum from lower to higher levels are consistently structured and arranged. It is our main strength.
ii. Assessment strategies are explicit and suitable in the curriculum, and match to the learning outcomes
iii. Curriculum addresses the program objectives and program learning outcomes
iv. Lecture hours were enough to finish course content

Weakness:

i. Teaching strategies are not clearly stated in the curriculum though teachers and alumni are satisfied with this issue.
ii. Inputs from the relevant stakeholders are not taken into consideration in designing curriculum

Opportunity:

We are going to update our syllabus where teaching and assessment strategies will be clearly mentioned which would help to cover some of our weaknesses. We have to modify our syllabus after having the analysis of survey results from different stakeholders, like teachers, currents students, employers, alumni etc. Considering this survey result we will make action plan for next few years which would also help to cover the existing weakness. An updated curriculum of the department is being prepared.

11.3. Physical Facilities

Strength:

i. Teachers and non-academic staffs are very happy with 'Internet facilities with sufficient bandwidth capacity'
ii. Though classrooms and no. of seats are not good in number, the rooms are well equipped and well maintained to ensure effective teaching delivery
iii. Research laboratories are equipped with necessary instruments and properly maintained for conducting teaching and learning
iv. The library has mostly adequate and up-to-date reference materials that meet the academic research needs

Weakness:

i. Internet facilities with sufficient speed are generally available in the campus but not adequate with in class room and labs.
ii. Facilities for medical, sports and gymnasium are not enough and well equipped.
iii. Undergraduate laboratory facilities are not amiable for practical teaching-learning because of lack of enough spacing compare to number of students. Our laboratories are set for 30 students but now a days around 6**5** are being admitted in 1st year 1st semester.
iv. Lacking of individual room facility for teachers and officers.

Opportunity:

More Wi-Fi hub needs to be installed within the class rooms and laboratories.

By constructing 3rd floor of extension (Academic Building B), the number of teacher's room could be increased.

The dissatisfaction of current students over class room facilities and lab facilities is because of not number of rooms but room size and number of seats. Sometimes it is difficult to cover all the students in a class or examination room, when exam is held and the number of dropper student is high. For laboratory case, usually we allow students to work each experiment in a group, made of 3-5, because of lab size and limitation of available instruments, chemicals, electric power etc. It would always be better and more effective in learning if two students could work in a group for experiments. This problem could be solved by dividing each lab class for two days in a week. In that case more teachers need to be recruited. The space should also be increased in the department in that case.

11.4. Teaching Learning and Assessment

Strength:

i. Class facilities are optimum for interactive teaching learning
ii. Technological devices were used as regular practice to improve teaching-learning process.
iii. Teaching and learning strategies and environment are interactive and supportive which inspires students for their own learning.
iv. The teachers provided additional practical ideas and time for consultations after class where students get practical ideas from real life situation in some cases.

Weakness:

i. Lesson plans/course outlines are not usually provided to the students in advance.
ii. Diverse methods are not used for assessment and also are not practiced to achieve learning objectives

Opportunity:

In case of other issues like (i) diverse teaching-learning methods (ii) co-curricular activities and (iii) lesson plans stand further scope for improvement. Recently it is being practiced to some extent.

Learning Assessment:

Strength:

i. The frequency, methods and criteria of assessment, including the grading criteria are clearly communicated to students on the commencement of the term/semester
ii. Both formative (quizzes, assignments, term papers, continuous assessments, presentations etc.) and summative assessment (final examination) strategies are followed.
iii. The content of examinations is representative of the course material
iv. The learning assessment methods ensure the validity, reliability, consistency

Weakness:

i. The students are not satisfied about feedback immediately after class assessment.
ii. Diverse methods are used to some extent for assessment and also not practiced to achieve learning objectives

Opportunity:

Diverse methods and tools are planned to be used appropriately to assess the learning outcomes and competencies. Though teachers usually try to provide feedback to the students immediately after assessment but there is a scope to do more properly.

11.5 Students support services

Overall performance on student support aspect is dissatisfactory. There is no strong point according to stake holders on students support services aspect.

Weakness

Disagreement is found to be highest on the aspect on supportive alumni association & collection of their feedback, absent of carrier and placement activities, limited scope of grievances. Unavailability of financial support is another weakness of this program. Unfortunately students have lack of interest on co-curricular and extra-curricular activities.

Opportunities

As overall performance on student support aspect is dissatisfactory, it is important to take necessary steps to improve student support services in long term and short term basis.

11.6 Staff & facilities

Strength:

Overall performance on Staff & facilities aspect is satisfactory to some extent. The teachers are well qualified. It is a very strong compliment for chemistry department. In point of view of teachers and alumni, teachers' work load in teaching and research is justified and number of teachers is enough to run the program smoothly. These are the strength of this program.

Weakness

A poor response has been received regarding issues like (i) non-academic staffs as well as academic staffs' skill development program and (ii) having policy to complement academic staffs related to service, development and appraisal.

Opportunities

In these points, there is a scope for further improvement.

i. Nonacademic staffs are needed to be trained for competent and responsiveness.
ii. Faculties are required to provide necessary training, tools and technology for self-learning, access to information and for communication.
iii. Faculty/department is also needed to provide mentoring and formative guidance for new academic staff as part of its staff development program.

11.7. Research and extension

Strength

Department of Chemistry since its starting has been working for outstanding research and development.

i. Teachers always encourage students for engagement in research, scholarship and development
ii. Department has a group of highly experienced teachers to conduct research as well as teaching at an international level.
iii. There are equipped research and instrument laboratories and exists a very good research environment in CHE department (appendix 2).
iv. CHE faculty members have established several collaborations among laboratories from Asia, Europe, Australia and USA. Through these collaborations in recent years a good number of papers are being published in peer reviewed international journals every year.
v. Every year faculties are taking part in national and international conferences. There are significant progressive research outcomes of faculties through local and global interactions.

vi. A number of recognition have been received like UGC award, VC award, TWAS research award, Fulbright Grants, United Group Award, Chinese Academy of Metals Award, IUPAC award, Academy of Science Award etc.

vii. Academic, research, and other positions in Bangladesh as well as in abroad (Australia,Canada, Europe, USA,UK, Japan and Saudi Arabia etc.) have been secured by some of our alumni.

Weakness

i. There is no well defined research and development policy in CHE department.

ii. A further improvement is needed for engaging the students in research and development.

iii. There is lack of necessary expensive instruments like NMR, XRD, SEM, TEM, XPS etc due to the financial margins.

iv. The laboratories are not sufficient to provide space for research to all the faculties.

Opportunities

i. CHE department has to achieve findings to purchase expensive instruments and to extend space facilities in long term basis.

ii. There is a way to overcome expensive instrumental limitations by collaborations with different universities and research institutions from native and overseas.

11.8. Process Management and Continuous Improvement

Strength

i. The chemistry department supports the University policies, procedures and mechanisms for regular reviewing and updating of its structures, functions, strategies and core activities to ensure continuous quality improvement.

ii. The faculty/department has a system to review its syllabus from time to time.

iii. The Dean and Head of the faculty/department and also the senior faculties play a prominent role in

the policy processes of the faculty/department through faculty committee and academic council.

iv. In fact, the department is willing to embrace the spirit of continual quality improvement taking into consideration of past experiences, present conditions, and also future possibilities.

v. The faculty/department ensures that courses are taken by the teachers uniformly throughout the term.

vi. The faculty/department always tries to maintain academic calendar.

Weakness

i. Although faculty/department always tries to maintain academic calendar due to socio-political situation it is very difficult to maintain it and to publish result in due time.

ii. The department has limited culture as a usual practice for evaluation of the teachers by the students and its documentation.

Opportunities

i. Evaluation of teachers by students and documentation should be practiced regularly.

11.9. Employer Survey

Strength

Almost 800 graduates of CHE department has been working all over the globe. No unemployed graduate is known to us till to date.

i. Chemistry graduate's performances in their work places are pleasing in terms of several points compared to the entry requirements according to the employer's survey.

ii. Graduates performances are mostly convincing compared to entry requirement.

iii. In case of (a) IT knowledge (b) knowledge in designing a system component or process (c) ability to work on teams, (d) report writing (e) leader ship, (f) reliability, (g) appreciation on ethical values, (h) adaptability, (i) sense of responsibility graduates performances are better compared to the entry requirements asked by the employers. These factors by employers clearly indicated the strangeness of the CHE department.

iv. In case of (a) job knowledge, (b) discipline (c) ability to link theory and practice graduates exactly fulfilled the entry requirements set by the employers. These points also indicated the strangeness of the department.

v. On the other hand, in case of (a) oral communication, (b self-Motivation /commitment to job, (c) time management skills and (d) judgment, graduates performances are very close to the entry requirement raised by the employer. Faculty of the CHE department will address this issue immediately to improve graduate performances in this regard.

Weakness

In few cases need further improvements of the graduate performances as found from the survey analysis. We need to improve the skill of our graduates in terms of problem formulation, solving and decision making and also collecting and analyzing appropriate data. In case of (i) problem formulation, solving and decision making (ii) collecting and analyzing appropriate data CHE graduates need further improvement of their performances because they failed to meet entry requirement set by the employer.

Opportunities

i. In addition to the seminar and oral presentation each course teacher will ask students for oral presentation in classes or in a particular topic.

ii. Department will arrange motivational lecture to the students, for improving self-motivation, by faculty members or inviting faculty members from other universities or from abroad.

iii. To improve the time management skill students will be asked to perform their task in due time, attend classes regularly and manage relevant events organized by the department with sincerity in due course of time.

iv. Good judgment capability of students can be improved by examining the choices they make at department, their successes as well as mistakes. Critical thinking and analytical skill are essential subsets of good judgment; and we need to practice them all the time at department. We will emphasize on this point.

v. It is necessary to follow more problem based classes correlating with the respective courses. Again chemistry department needs to enhance laboratory and field work for the students for collecting, accumulating and analyzing appropriate data on different issues. The department is intended to take in hand this issue (as stated in the weakness) in short-term and long-term basis to solve the problem and improve the graduate performance.

11.10 Threats

11.10.1 Political Influence: The public Universities are autonomous but Vice Chancellor (VC) is appointed by the government. The governance of a public university is very much dependent on the Vice Chancellor appointed by the government. It is traditional to appoint a pro-government VC and there is scope to show loyalty to government by running the administration. The combination of teacher and student politics greatly destabilizes the academic environment. The local political parties also get involved in the university affairs sometimes and if the administration is biased they start influencing and University administration. As a result the whole university suffers and the department of CHE has no control on it. The steadiness of the university academic environment become vulnerable and the academic activities may fall down without any notice.

11.10.2 Space, infrastructure and Funding Problem: The department is in threat of unavailability of enough space and big budget to create a new laboratory of international standards, maintenance of existing labs.

11.10.3 Proper handling of weakness: If the weakness of the program is not handled properly, skilled graduate production will be retarded and unskilled graduate will be threatened to the country.

11.10.4. New job sectors: Every year a lot of graduates are being produced but in parallel no relevant new job sectors are being created that may be another threat in near future.

Chapter Twelve

Improvement Plan and Conclusion

Based on the strong and weakness, threat and opportunities further improvement plan for the CHE department has been suggested as follows.

12.1 Strategic plan for further improvement of the department:

The strategic plan for further improvement of the department of CHE is intimately connected with the overall improvement of the university itself. So the plans could be distinctly divided in two parts, (i) improvement of the university and (ii) improvement of the department. The strategic plan for the improvement of the university can be describe as follows:

12.1. Strategic plan for the improvement of the university

12.1.1 Minimize political influence: Political influence is a major issue for a university. It interferes with recruitment of teachers and staff, encourages corruption, controls development works and creates unrest in the university. It is difficult to develop a university to a world standard without eliminating political influence. This process can start with appointment of a true academician, an honest and generally accepted person to all teachers with a vision as vice chancellor of a university.

12.1.2 Manage More Funding: SUST does not have a significant internal income and is mostly dependent on government fund. It is important to increase the budget and have sustainable projects to generate more funds. It is hard to believe that even 27 years after initiation of SUST, there is not enough physical facilities to the students and also there is not enough male as well as female dormitories.

12.1.3 More computerization for better management: Even after a lot of effort given towards the digitalization at SUST the management software is not ready yet. The university governance should be done completely with digitalization to increase the efficiency.

12.1.4 Safety and Security of the university: The university campus is unprotected and without any boundary wall. This makes the campus very vulnerable. It is important to have a safe campus for the students and teachers.

12.1.5 Effective Link with other universities: Over the past years SUST has signed several MOUs with various universities of the world but not able to have the benefit from those links yet. It should

have more effective links and start various effective programs like student and teacher exchange, science and technology transfer and specially cooperation in research (appendix 6).

12.2 Strategic plan for further improvement of the department of CHE

12.2.1 Revitalization of Academics: The department of CHE has been offering courses but is not monitored in a structured way. To revitalize the academic activities course teachers should follow the standard procedures like submitting a concrete course plan and following it exactly.

12.2.2 Recruitment of more teachers: Although the total number of teachers at CHE, SUST is quite reasonable but because of the teachers at study leave further recruitment is necessary. According to students appeal for improving the laboratory facilities more teachers should be recruited as soon as possible. As per University organogram department can have up to 35 teachers. There is a tradition of recruiting teachers at the vacant posts temporarily. The university may take necessary steps in this regard. The university authority should recruit more teachers at the CHE department.

12.2.3 Recruiting Teaching Assistant: The excess load of the teachers could be partially compensated by recruiting teaching assistant from graduate students. The university should provide necessary funds to the departments to recruit teaching assistant.

12.2.4 Upgrade teaching skills: The major workforce of CHE department is mostly experienced teachers. SUST teachers do not get proper training in teaching skills. Most of the teachers just use their common sense in teaching. There should be basic training for every newly recruited teachers on teaching methodology and upgrade the teaching skill for senior teachers.

12.2.5 Special stress on research: Earlier the research program at SUST was limited to undergraduate projects and in some cases a few Master's thesis. The individual research of the teachers was also done in a very limited scale. Recently the CHE department has started a well coordinated research programs. This effort should be continued on.

12.2.6 Regular seminar symposiums: The CHE department should organize regular seminar and symposium, and participate in conferences as part of the research effort.

12.2.7 More Specialized Labs: There are only a few specialized labs in the department for research at the moment. The number of specialized laboratories should be increased. Uninterrupted electric supply is a major issue in the country and the labs should have proper protection against failure of electric supply.

12.2.8 Industry University collaboration: In Bangladesh there is a little scope for collaboration between the industry and university. It restricts to grow healthy industry-university collaboration over the past years. Recently there is a few industry-university collaborations. Department of CHE at SUST should be positive to build collaboration with industry in various fields.

12.2.9 Alumni Connection: Alumni are strong partners of their parent university. Department of CHE has created an alumni association formed in 2014 and get them involved with the departmental activities in a limited extent. Department of chemistry should enhance the activity of alumni association. They can help developing special industry focused curriculum, arrange seminars and workshops, sponsor programs, provide scholarships or even get involved in major fund raising. To improve active communication between alumni and the department a website is being developed.

12.3 Conclusion

12.3.1 SAR Importance: This self-assessment project was designed to assess the programs offered by the department of CHE at SUST. A major focus of this project was the analysis of the field level survey results from the five major stake holders: students, teachers, alumni, employers and the non-academic staff. The survey was completed using the structured questionnaire with modification and getting responses from 106 current students, 115 alumni, 25 employers, 28 teachers and 4 staff members. It also collected and explored the stakeholders' ideas, suggestions, evaluation and comments about the program.

The scope of SAR was very broad, it encompassed basic education related issues of students like admission, curriculum design, teaching and assessment and their support services. The project also looked into criteria like staff, physical facilities and overall governance along with the research and process management for continual improvement.

The survey result was useful and interesting at the same time. The present students and alumni were the most critical about various programs while the teachers generally gave satisfactory responses. It is found from the employer survey result that the graduates of the department have performances satisfactory compared to entry requirements.

12.3.2 Student Response: Among the five stakeholders the students were most critical in their response. However, they gave the most positive feedback about their teachers. They considered their teachers knowledgeable, friendly, supportive and inspiring. They are happy to find their teachers available even after class hours for consultation in some cases. Senior teachers are good enough and well qualified. However they demanded to improve teaching skill of newly appointed or junior teachers through training on effective teaching. They also think that peer observation of courses will improve the teaching quality. More comments and suggestions by the students are as follows: (i) Lab

courses should be performed after theory course in the same day and lab courses should be more practical as well as real life oriented, (ii) some teachers should be trained up, (iii) lab apparatus should be sufficient, (iii) less no. of students should be in a group in lab class and lab duration should be increased (iv) physical and analytical lab facilities have to be increased, (v) oral presentation facility should be more and quiz test should be included, (vi) non major courses like math, CSE should be minor courses should be interesting and in an understandable way as well as correlated to the major courses, (vii) Math and CSE courses should be chemistry application related and CSE course should include database programming. Students do not get any practical usages of these minor courses. (viii) Chemical technology and chemical engineering based courses may be included as non major courses (ix) Field tour facilities should be offered, (x) Career and future oriented learning should be added, (xi) Teacher student interactions should be improved and lesson plan should be provided by the teachers before starting a course, (xii) they demanded more emphasis on analytical, mathematical and practical problems to be included in the courses. (xiii) content of the 2 and 3 credit question must be different and concerning time frame and credits, (xiv) students also complaint about the poor website, inadequate class room, insufficient lab facilities and lack of alumni and employer connection, (xv) the students expect to see improvement in academic activities of the department, (xvi) they want new technologies and more concern about their project, research and job opportunities.

The students are engaged in the co-curricular and extra-curricular programs arranged by department as well as university. More active participation of the students is needed to be encouraged.

The department already has close connection with the alumni and is about to start more participatory activity of the association. The students were most critical about not having placement and career planning office and delay in the publication of result. There concern is genuine and unfortunately the department of CHE cannot address this issue alone and is dependent on the university actions also. The department is concern about the gender and religious discriminations, which should be avoided.

12.3.3 Alumni Response: Many positive responses came from the alumni. They also paid shining tribute to teachers. As former students the alumni gave a few ideas to improve the program like updating syllabus, reducing extra academic pressure, introducing counseling and taking more care of weaker students. They suggested to publish the results quickly and improve the website. They recommended to provide the term test feed back immediately after the exam. They requested to arrange science and job fair at regular basis and to establish a career club within the department. Allotted number of classes for each course should be taken and needs to be monitored regularly this issue. They further emphasize on to improve lab facilities, improvement in English language skill. Financial support for poor and brilliant students should be offered. Scope to do lab work and also instrument handling by each should be ascertained. Need to include polymer, pharmaceutical, biosensor, agro chemistry, chemical safety, and energy related courses. Each student should learn

operation of UV, IR and other basic instruments. Collaboration with international universities will improve teaching and research facilities. Teachers should be neutral and impartial in view of religious and political as well as gender issues to students. Mathematics and statistics classes should be covered with chemistry based problems.

12.3.4 Teacher Response: The responses of the teachers were the most objective as they run the program and know the details of the opportunities and challenges of the department. In their view the major weakness of the CHE graduates are (i) students low confidence level, laziness, lack of vision and commitment to achieve the desired goal, lack of communication and leadership skill, poor presentation skill, (ii) some of the students are interested in getting a certificate rather than understanding or having appropriate knowledge in subject, (iii) they waste their time browsing internet for non academic purpose, (iv) students are not sincere about their study but they want good grade without appropriate learning. Teachers think there is lacking of well equipped lab and lacking of program objective and learning outcome. Teacher assessment strategy, student evaluation procedure is not clear to them. Unavailability of chemicals for labs, lack of foreign language skill is also among the difficulties. Course load is excess within the stipulated time for a semester. Lack of student residence facilities for both male and female students causes difficulties for the students to adopt with the campus environment and continue their studies from the beginning. Non major courses are not updated. Again, there is lack of training on teaching methods, lack of counseling to 1st semester students. Moreover, Bengali medium instruction in HSC level is one of the major problems for the students' background.

They have appreciated the collective decision making procedure of the department (through weekly departmental meeting), proper official documentation, and overall departmental fairness. Teachers suggested to improve the quality of graduates by designing a suitable curriculum with aim, learning objective and outcomes. They interested in making a policy for teaching and research to improve teaching quality. The teachers suggested to complete the semesters on time, be more serious about the examination and publishing the examination result quickly in due time. They are enthusiastic to improve motivation towards learning chemistry, to improve experimental and research skill, communication skill and foreign language skill etc. Teachers training on teaching methodology will improve the teaching quality. Academic calendar should be followed properly. Regular and on time career counseling should be provide to the students. Job fair and industrial visit should be more frequently. Regular interactions with employer and alumni should be enhanced and include their feedback to curriculum. Training of new faculty is especially encouraged. Teachers' evaluation system should be practiced through current student feedback. Duration and equipment of lab should be sufficient. Student and teacher politics should not affect the university environment any way.

12.3.5 Employer Response: It is encouraging to see that the employers of CHE graduates gave positive responses about their employees. Traditionally the teachers of the department of CHE at SUST teach their students honesty, ethical values and social responsibilities also. All these efforts were reflected in their appreciation of the high ethical values, reliability, leadership and adaptation power of CHE graduates. However, the employers were a bit critical about the report writing and presentation skill of CHE graduates. The employer's evaluation about the problem formulation, solving and decision making; collecting and analyzing appropriate data indicated the demand of further development of the CHE graduates performances. The department works hard to develop overall skill of the students and will address this issue very seriously in coming years.

In summary, if the strategic plans described above could be executed step by step the department of CHE at SUST could be an excellent place to pursue higher studies in Bangladesh to produce world class CHE graduates.

Appendix

Appendix 1

Shahjalal University of Science and Technology, Sylhet

Faculty list, Department of Chemistry

Phone # PABX: (0821)- 713491/714479 / 716123/713850 /717850-251

Fax: 880-821-715257 EX-251

Branch-Analytical and Environmental Chemistry

Teachers	**Designation**	Qualification
Dr. Syed Shamsul Alam	Professor	PhD, Postdoc
Dr. Ahmed Jalal Farid Us Samed	Professor	PhD
Md. Mahbubul Alam	Professor	PhD
Md. Azharul Arafat	Assistant Professor	PhD thesis submitted
Mr. Shishir Kanti Pramanik	Assistant Professor	PhD student

Branch-Inorganic Chemistry

Teachers	**Designation**	Qualification
Dr. Muhammad Younus	Professor	PhD, postdoc
Dr. Md. Abdus Subhan	Professor	PhD, postdoc, Head
Dr. Rocksana Begum	Professor	PhD
Mrs. Sabina Begum	Associate Professor	PhD
Md. Ramkrishana Saha	Assistant Professor	MSc
Mr. Belal Ahmed	Assistant Professor	PhD student
Rehana Parvin	Lecturer	MS
Masnun Nahar	Lecturer	MS

Branch-Organic Chemistry

Teachers	**Designation**	Qualification
Dr. Md. Mizanur Rahman	Professor	PhD, postdoc
Dr. Md. Ashraful Alam	Professor	PhD, postdoc

Dr. Shameem Ara Begum	Professor	PhD, postdoc
Dr. Mohammad Jalilur Rahman	Professor	PhD, postdoc
Dr. Dipen Debnath	Professor	PhD
Dr. Mohammad Mizanur Rahman Khan	Professor	PhD, postdoc
Mohammad Salim	Professor	PhD, postdoc
Dr. Md. Mostafizur Rahman	Associate Professor	PhD
Md. Masum Talukder	Lecturer	MS

Branch-Physical Chemistry

Teachers	**Designation**	Qualification
Dr. S.M. Saiful Islam	Professor	PhD, postdoc
Dr. Md. Nizam Uddin	Professor	PhD, postdoc
Dr. Iqbal Ahmed Siddiquey	Professor	PhD, postdoc
Dr. Md.Rezwan Miah	Professor	PhD, postdoc
Dr. Mohammad Abul Hasnat	Professor	PhD, postdoc
Dr. Nuruddin Ahamed	Professor	PhD, postdoc
Dr. Md. Rezaul Karim	Associate Professor	PhD, postdoc
Mr. Shahdat Hossain Chowdhury	Assistant Professor	PhD student
Md. Saiful Alam	Lecturer	MS

Appendix 2

List of the Instruments

Department of Chemistry, SUST, Sylhet

SL	**Name of Apparatus**	**Model No**	**Room**	
1	AFM	(Nio AFM)	203	MoE Project
2	Digital Balance (4 Digit)		203	TWAS
3	Digital Natural dry Oven (Max 300 $^{\circ}$C)	DO-56	209	
4	Sartorius Balance	MCI Analytic AC 120S	209	
5	Digital Water Bath	DWB-11	209	

6	Digital Water Bath	DWB-11	209	
7	Oven Binder	ED -56	212	HEQEP CP-3665
8	Water Bath (Digital Electrical)	DWB -11	212	
9	Water Bath (Digital Electrical)	DWB -11	212	
10	Digital Natural dry Oven (Max 300 °C)	DO-56	214	
11	Digital Balance (4 Digit)	AS220R2	214	
12	Centrifuge Machine	1736R	214	
13	Sonicator	GT Sonic	214	Most project
14	Laminar Air Flow (Chamber)	ESCO	214	Project
15	Incubator	Human Lab Inc	214	Project
16	Gel Electo forecis	EDVO Tech	214	Project
17	Oven	ON -11E	214	MoE Project
18	Muffle Furnace	Glankamp size 3	214	
19	Oven Binder	ED -56	217	HEQEP CP-3665
20	Sand Blashing machine	10101AG	217	
21	Furnace KEJIA		217	
22	Incubator	JSR JSG I050	217	
23	Vacuum Drying Oven	HYSE	217	
24	Refrigerating bath	R-W-0525G	217	
25	Biologic	SP-200	217	
26	Rotating Electrode Speed Control	PINE	217	
27	Auto lab-Metroohm		217	
28	CH- Instrument	I 602D	217	
29	HCH-Instrument	I 660	217	Prof. Dr. M.A. Hasnat
30	Ultra Sonicator	SW 6N	217	MoE Project
31	Oven Lab tech Daihan lab tech Max (320 °C)	DLO-080F	218	HEQEP CP-2524
32	Oven Lab tech Daihan lab tech Max (320 °C)	DLO- 080F	218	HEQEP CP-2524
33	Rotary Evaporator	RE 300	218	HEQEP CP-2524
34	Nihon freezer Refrigerator		218	HEQEP CP-2524
35	Ice Maker Machine	FB 80	218	HEQEP CP-2524
36	Oven Binder	ED -56	308	HEQEP CP-3665
37	Oven Binder	ED -56	308	HEQEP CP-3665
38	Oven Binder	ED -56	308	HEQEP CP-3665
39	GPC	UFLC Shimadzu	311	HEQEP CP-2524
40	DSC	DSC-60	311	HEQEP CP-2524
41	Electronics Balance (4Digit)	AS220R2	312	HEQEP CP-3665
42	Rotary Evaporator	HS 2005S-N	312	
43	Jelo tech Oven (Max 300 °C)	ON -11E	312	
44	Incubator Digital	DI-56	312	
45	Oven Binder	ED -56	312	HEQEP CP-3665
46	Distillation Plant (GLASS)	Basic/PH4	312	HEQEP CP-3665
47	IR (Shimadzu)	Prestige -21	413	
48	UV- Spectrophotometer	RF- 5301PC	413	
49	UV – Spectrophotometer	UV – 1800	413	
50	Oven	DSO-800D	414	

Appendix 3

Research and development Policy

Department of Chemistry, SUST

Mission:

- To solve the chemistry related problems of regional and international interests.
- To conduct research on fundamental and applied problems by supporting scientific ideas proposed by individual faculty and student, promoting the innovative interdisciplinary research programs, exchange of scholars with other developed and developing countries.

Vision : To create adequate knowledge for supporting academic and industry through research.

Research Area: Basic and contemporary applied chemistry and related area with a multi disciplinary approach.

Research interest groups: Biological, materials, synthetic, analytical, inorganic, Organic, physical and environmental chemistry.

Research performances: All teachers are encouraged to perform original research in the department in collaboration with others universities/organizations home and abroad.

Students eligibility for research: Undergraduate students of BSc 4/2 semester, MS student, M. Phil and PhD students one eligible for research. BSc 4/2 students having excellent result up to 4/1 semester (CGPA 3.25) in undergraduate level are eligible for research. MS students with CGPA 3.25 in undergraduate level are eligible for research. M.Phil and PhD students admitted in the department will perform research. All students must submit a thesis at the end of research.

Research students: Besides, **BSc** and MS students' faculty of Professor or Associate Professor level can recruit a research student with the permission of department.

MPhil and PhD Research Criteria: MPhil and PhD students will be admitted according to university rules/criteria. Department will recruit M. Phil and Ph,D students through GAC (graduate admission committee) BAS (Board of advanced studies), AC (Academic Council) and syndicate.

MPhil Course requirements and Duration

Category A: (1) Students, who completed **4-Year BSc (Hons) and 1 Year MSc** in Chemistry from a Public University (2) Faculty members of public Universities/ researchers of any national institute.

Category B: Students, who completed **3-Year BSc (Hons) and 1 year MSc** in Chemistry from a Public University, will complete 48 credits within two semesters.

PhD Course requirements and Duration

PhD course duration is 3 years. This course is basically research course. A PhD student has to present progress of the work every year. At the end of the course students required to submit PhD thesis. This will be evaluated by peer reviewer from inside and outside of the University. PhD student has to give a public seminar on PhD thesis.

Research Finding and disseminations of the research result:

Research result is a property of the department of chemistry. Research result will be published in peer reviewed national and international journals with the acknowledgement of the department. Researcher must publish the paper with the affiliation of department.

Patent right: Inventor and university will share the Patent right.

Appendix 4

PEER OBSERVATION PROFORMA

Observer :	Teacher to be observer :	
Class :	Period :	Date :
Observation Notes :		
What was really good?		
Action Plan after the observation		
Targets you have set yourself/areas for your own development 1. 2. 3.		

Peer Observation Committee

Branch: Analytical

Name Of Teacher	Observer	Comment
Professor Dr. Syed Shamsul Alam	Professor Dr. Ahmed Jalal Farid Us Samed	
	Professor Dr. Md. Mahbubul Alam	

Professor Dr. Ahmed Jalal Farid Us Samed	Professor Dr. Md. Mahbubul Alam	
	Md. Azharul Arafath	
Professor Dr. Md. Mahbubul Alam	Professor Dr. Syed Shamsul Alam	
	Md. Azharul Arafath	
Md. Azharul Arafath	Professor Dr. Ahmed Jalal Farid Us Samed	
	Professor Dr. Syed Shamsul Alam	

Branch: Organic

Name Of Teacher	Observer	Comment
Professor Dr. Md. Mizanur Rahman	Professor Dr. Md. Jalilur Rahman	
	Professor Dr. Md. Mizanur Rahman Khan	
Professor Dr. Shameem Ara Begum	Professor Dr. Md. Jalilur Rahman	
	Professor Dr. Dipen Debnath	
Professor Dr. Md. Asharaful Alam	Professor Dr. Shameem Ara Begum	
	Md. Masum Talukder	
Professor Dr. Md. Jalilur Rahman	Professor Dr. Md. Mizanur Rahman Khan	
	Professor Dr. Shameem Ara Begum	
Professor Dr. Dipen Debnath	Professor Dr. Md. Mizanur Rahman	
	Dr. Md. Mustafizur Rahman	
Professor Dr. Md. Mizanur Rahman Khan	Professor Dr. Md. Mizanur Rahman	
	Dr. Md. Mustafizur Rahman	
Professor Dr. Mohammad Salim	Professor Dr. Dipen Debnath	
	Professor Dr. Md. Mizanur Rahman	
Professor Dr. Md. Mustafizur Rahman	Professor Dr. Mohammad Salim	
	Md. Masum Talukder	
Md. Masum Talukder	Professor Dr. Md. Mizanur Rahman Khan	
	Professor Dr. Mohammad Salim	

Branch: Inorganic

Name Of Teacher	Observer	Comment
Professor Dr. Md. Abdus Subhan	Professor Dr. Rocksana Begum	
	Masnun Nahar	
Professor Dr. Rocksana Begum	Professor Dr. Md. Abdus Subhan	
	Masnun Nahar	

Mst. Sabina Begum	Professor Dr. Rocksana Begum	
	Mr. Ramkrishna Saha	
Rehana Pervin	Professor Dr. Md. Abdus Subhan	
	Mst. Sabina Begum	
Masnun Nahar	Mr. Ramkrishna Saha	
	Mst. Sabina Begum	

Branch: Physical

Name Of Teacher	Observer	Comment
Professor Dr. S. M. Saiful Islam	Professor Dr. Md. Nizam Uddin	
	Professor Dr. Iqbal Ahmed Siddiquey	
Professor Dr. Md. Nizam Uddin	Professor Dr. S. M. Saiful Islam	
	Professor Dr. Iqbal Ahmed Siddiquey	
Professor Dr. Iqbal Ahmed Siddiquey	Professor Dr. Md. Nizam Uddin	
	Professor Dr. Muhammad Abul Hasnat	
Professor Dr. Md. Rezwan Miah	Professor Dr. Muhammad Abul Hasnat	
	Dr. Nur Uddin Ahamad	
Professor Dr. Muhammad Abul Hasnat	Professor Dr. Md. Rezwan Miah	
	Professor Dr. Md. Mizanur Rahman Khan	
Dr. Nur Uddin Ahamad	Professor Dr. Md. Rezwan Miah	
	Professor Dr. Md. Mizanur Rahman Khan	
Professor Dr. Md. Mizanur Rahman Khan	Professor Dr. S. M. Saiful Islam	
	Mr. Md. Shahadat Hussain Chow	
Mr. Md. Shahadat Hussain Chow	Professor Dr. Md. Mizanur Rahman Khan	
	Mr. Md. Saiful Alam	
Mr. Md. Saiful Alam	Dr. S. M. Saiful Islam	
	Mr. Md. Shahadat Hussain Chow	

Feedback Management Committee

Name of Branch	Name Of Teacher	
Analytical	Professor Dr. Syed Shamsul Alam	
	Professor Dr. Ahmed Jalal Farid Us Samed	
Inorganic	Professor Dr. Rocksana Begum	
	Mst. Sabina Begum	
Organic	Professor Dr. Md. Mizanur Rahman	
	Professor Dr. Shameem Ara Begum	
Physical	Professor Dr. S. M. Saiful Islam	
	Professor Dr. Md. Nizam Uddin	

Appendix 5

Course wise student feed-back proforma

STUDENT QUESTIONNAIRE (course wise)

(Be honest about opinion) Exam held on .....

Session:_____ **Department of Chemistry, SUST**

The goal of our student questionnaires is to provide student feedback to help teachers' evaluation area in their teaching. Please complete the following reflection and return it to your departmental self-assessment committee through class monitor / Chief Invigilator on final exam day. All these data will be confidential.

Please rate the teaching-learning of your courses in each of the following categories by marking "√" in the box of corresponding column/section according to the scale given:

5–Strongly agree; 4–Agree; 3– not decided; 2–Disagree; 1–Strongly disagree;

Aspects of Evaluation	**5**	**4**	**3**	**2**	**1**
1. The teacher is generally well-organized and prepared for class.					
2. The teacher maintains enough classroom discipline so the class and I can learn. Class time is used in an efficient and productive manner.					
3. Feedback is provided to the students immediately.					
4. Tests and assignments are corrected and returned to me, and I know where I stand in this class.					
5. The teacher explains the material clearly and in ways that are easy to understand, offers alternative explanations or additional examples, and clears up confusion.					
6.The teacher uses a variety of activities (discussion, group work, technology, etc.) during class time.					
9.The teacher knows the subject area very well.					
10.Learning Outcomes of this course are clear to me.					
11.The teacher encourages the students to think for themselves, offers encouragement and positive reinforcement, as well as constructive criticism. The teacher is interested and enthusiastic about teaching of this course also.					
13.The teacher evaluates my abilities as a student, and this course requires consistent time, study, and preparation.					
14. In this class, I feel free to ask questions and participate in discussions and activities.					
15. The teacher is available to students outside class time for tutoring, review work, or to answer questions.					
16.This teacher encourages me to become a person as good human being					

Student Self-Evaluation Questions (Give tick mark as needed)

20. On average, how much time do you spend completing study/ homework for this class each night or before next class?

1) *Less than 30 minutes* 2) *About 30 minutes* 3) About *45 minute*
4) About *60 minutes or more* 5) *Don't get time*

- How many classes did you attend? Out of classes. or .....%
- How satisfied were you with your effort in this course? 100% ; 70% ; 50% ; less
- Are you engaged with private teaching? (i)Yes (ii) No .

Open-Ended Questions

21. Please write opinion about the strengths-weakness of the course & teaching:

22. Please identify area(s) where you think the course could be improved:

……

Appendix 6

MEMORANDUM OF UNDERSTANDING
Between
BILKENT UNIVERSITY, TURKEY
And
SHAHJALAL UNIVERSITY OF SCIENCE AND TECHNOLOGY, BANGLADESH

I. INSTITUTIONS & PURPOSES

Bilkent University, Republic of Turkey and Shahjalal University of Science and Technology (SUST), People's Republic of Bangladesh, desire to establish collaborative relations between the two institutions to cooperate in a mutually beneficial association.

II. DEFINITION

a) The two institutions shall encourage co-operation in the area of recruiting Bangladeshi students who have fulfilled requirements toward a B.Sc. or B. Eng. degree to Bilkent University for M.S. and Ph.D. studies in the fields of Science and Engineering.
b) Faculty members and researchers of both institutes in the fields of Science and Engineering will be encouraged to establish research collaboration between them.

III. APPLICATION & ADMISSION

1. Prof. Dr. Md. Nizam Uddin from SUST will act as the coordinator of this MOU for the SUST.
2. Students who wish to apply for graduate studies at Bilkent University should submit their application through the following web site online; https://stars.bilkent.edu.tr/gradapp/ .
3. Applicants will be required to meet the needed criteria defined by Bilkent University's related Graduate Schools every year. Written examination(s) will be provided by Bilkent University to SUST and exam period will be carried out by the respective head of the department(s) at SUST.
4. English proficiency is a must. Bilkent University reserves the right to review these students and to make the final decision concerning their admission.
5. Accommodation may be available to eligible applicants.

IV. PERIOD OF MEMORANDUM & REVISION

This Agreement shall be executed on the date of signature and remain in effect for five (5) years. It will be extended automatically for an additional period of five (5) years at each expiration date unless either party gives six (6) months' advance notice in writing to terminate the Agreement.

Both SUST and Bilkent University will engage in mutual consultation and negotiation in the event(s) of any major issue(s) arising in connection with this Agreement. In the case of any discrepancies arising

21-9-2011

from this Agreement, either institution may terminate this Agreement with six (6) months' prior notice, provided that exchanges in progress, or agreed to, are not interrupted. In addition, articles of this Agreement may be revised upon mutual consultation of the both parties herein.

For this purpose, the responsible parties will be **Prof. Dr. Orhan Aytur**, the Vice Rector of Bilkent University and **Prof. Dr. Md. Elias Uddin Biswas,** the Treasurer of Shahjalal University of Science and Technology.

Signed on behalf of:
Bilkent University

Prof. Dr. Orhan Aytur
Vice Rector

Bilkent University, Turkey

Date: 21 September 2011

Signed on behalf of:
Shahjalal University of Science and Technology

21-9-2011

Prof. Dr. Md. Elias Uddin Biswas
Treasurer

Shahjalal University of Science and Technology, Bangladesh

Date: 21-9-2011

Appendix 7

Feedback Management Committee

Analytical Chemistry	1. Professor Dr. Syed Shamsul Alam 2. Prof. Dr. Ahmed Jalal Farid Us-Samad
Inorganic	1. Professor Dr. Md Abdus Subhan 2. Professor Dr. Rokshana Begum
Organic	1. Professor Dr. M. Mizanur Rahman 2. Professor Dr. Jalilur Rahman
Physical	1. Professor Dr. S. M. Saiful Islam 2. Professor Dr. Md. Nizam Uddin