



**PIR MEHR ALI SHAH
ARID AGRICULTURE UNIVERSITY
RAWALPINDI**

DEPARTMENT OF BIOCHEMISTRY

**Self Assessment Report
(2009-2010)**

Program Self Assessment Team

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Introduction

The discipline of Biochemistry in PMAS-AAUR was introduced as a separate Department in 2003. Earlier it was under the umbrella of the Department of Biological Sciences, under which M.Sc. and Ph.D. degree programmes were started in 1998 and 2001 respectively. M.Phil degree programme was initiated in year 2006. The Department has highly competent and qualified faculty, most of whom by the Department of Biochemistry have post doctoral experience from reputable International Universities/Institutes and seven out of seven faculty members are HEC approved supervisors for Indigenous Ph.D. programme. The faculty has produced many publications in journals of international repute. The faculty members have specialization in the field of Biochemistry, Environmental Biochemistry, Molecular Biology, Biotechnology, Protein Chemistry and Enzymology. Presently the total strength of students in the Department is 193.

The courses offered for the degrees programs provide the students not only extensive exposure of basic Biochemistry but also of Molecular Biology and Biotechnology, to face the future challenges. As a result the Department has established good repute in a very short period of time. The Department has twelve HEC sponsored Ph.D students. To strengthen the academic and research activities, Department has an active collaboration with University of California Davis, USA and Iowa State University, Iowa, USA. The Department is further in process of developing active collaboration with Universities in UK.

The program of Biochemistry is designed to provide necessary skills and knowledge in applying biochemical and molecular approaches for solution of problems related to health, agriculture and environment.

With the latest development in the field of Biochemistry, the Department regularly updates its curriculum by keeping in view the recent advances in Biochemistry. The Department offers a variety of study programs to enhance students' professional training and career opportunities. It regularly holds national and international training Workshop, Seminars to exchange knowledge and views. The faculty is actively engaged in a number of research projects; some of which are internationally collaborated and funded.

SECTION 1:

Components of Self Assessment Process:

This Self Assessment Report has been prepared on the basis of following eight criteria as described in Self Assessment Manual.

Criterion-1: Program Mission, Objectives and Outcomes

Introduction

The discipline of Biochemistry deals with the Molecular Biology, Genetic Engineering and Biotechnology. There are four main research domains in the Department, which are mainly focusing on the human and animal biochemistry, plant biotechnology and environment biotechnology.

Mission Statement of the Department of Biochemistry:

Mission of the Department of Biochemistry is to deliver quality teaching and to conduct basic and applied research.

Standard 1-1: Documented Measurable Objectives

1. To carry out teaching and research programs
2. To train young scientists and research students with advanced techniques in Biochemistry, Molecular Biology, Genetic Engineering and Biotechnology
3. To provide facilities for advanced research in Biochemistry, Molecular Biology and Biotechnology
4. To train academicians and scientists of other Universities and Institutes through seminars and workshops
5. To conduct scientific meetings/ conferences/ workshops/ seminars to facilitate exchange of ideas between scientists and transfer of technology

Expected Outcomes

1. To produce different lot of students and researchers e.g .M.Sc. M.Phil and Ph.D in Biochemistry and Biotechnology.
2. To make the students and researchers able to handle the different techniques independently.
3. Different institutes and universities will be provided the facility of advance techniques for their research problems like Sequencer, GC, PCR, RT-PCR and Electrophoresis.
4. Approximately nine workshops have been organized since 2004
5. Different conferences have been organized to facilitate exchange of ideas.

Main Elements of Strategic Plan to Achieve Mission and Objectives

1. Post-graduate research with reports and theses
2. Setting up of well equipped specialized research laboratories depending on the available resources.
3. Development of a sound teaching system for the award of degrees based on the experience and vision gathered from world reviews, literature, innovations, proceedings, and symposia etc
4. Publication of scientific papers, books, manuals etc.
5. Designing and constantly updating the curricula involving core subjects, elective subjects and specialized areas and study tours.
6. Implementation of research projects funded by the universities and other agencies.
7. Development of linkages with National and International research organizations to faster research.

TABLE-1: PROGRAM OBJECTIVES ASSESSMENT

S. #	Objective	How Measured	When Measured	Improvement Identified	Improvement made
1	To carry out teaching and research programs	On the basis of evaluation by students.	It is a continuous process as per requirement	Course Contents	Course contents time to time and more audio visuals aids are being improved
2	To train young scientists and research students with advanced techniques in Biochemistry, Molecular Biology, Genetic Engineering and Biotechnology	Pre requisite information and status of knowledge of researchers and students, through entry tests and student feed back	At the end of semester	Regular update curriculum	Revision of curriculum as per requirement. Scheme of Studies revised from time to time
3	To provide facilities for advanced research in Biochemistry, Molecular Biology and Biotechnology	Assessing interest of researcher and students	During routine exchange of various discussins	Students to make presentations and reports	Presentations, seminars, communication skill development
4	To conduct scientific meetings/ conferences/ workshops/ seminars to facilitate exchange of ideas between scientists and transfer of technology	By inviting applications through proper channels	At the time of completion of seminars and workshops	By regular conducting seminars and workshops	Workshops and Seminars are conducted frequently
5	To train academician and scientists of other Universities and Institutes through seminars and workshops e.t.c	At the time of starting research and academic sessions	At the completion of research thesis	More need is requied to trained academician and scientists	Academician and Scientists are trained

TABLE-2 STANDARD 1-2: OBJECTIVES VS OUTCOMES

	Objectives					
Outcomes	Sr. No.	1	2	3	4	5
	1	++	++	+++	++	++
	2	+++	++	++	+++	+++
	3	++	+++	++	+++	++
	4	+++	+++	+++	+++	++
	5	++	++	++	++	++

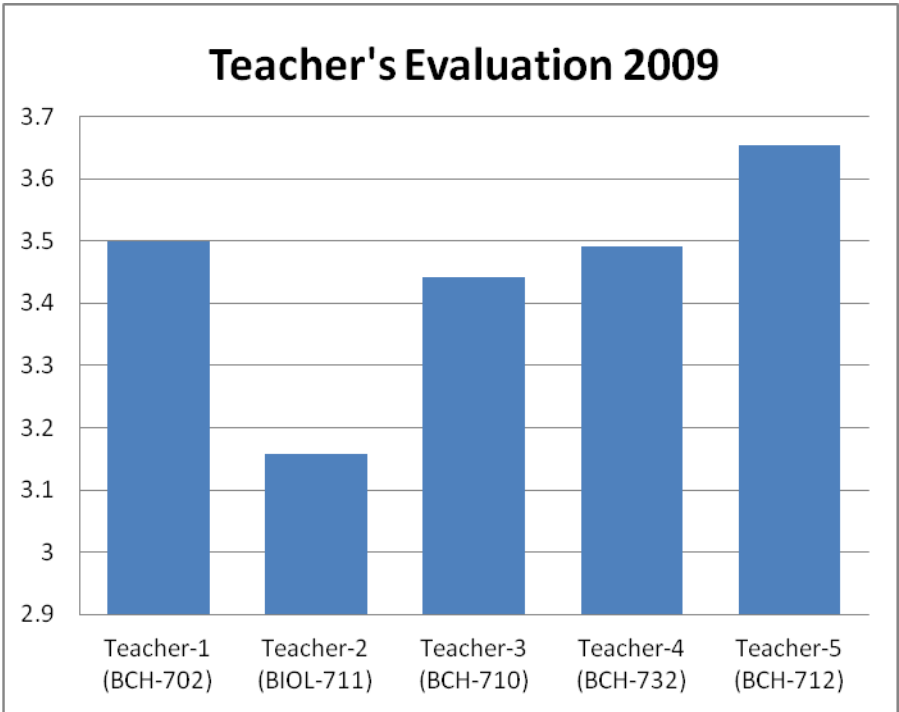
Key: ++ = Relevant
 +++ = Highly Relevant

The program outcomes are fully supportive to program objectives mentioned above. Outcomes are based on actual details obtained from department documents.

Program Assessment Results:
Teachers Evaluation 2009

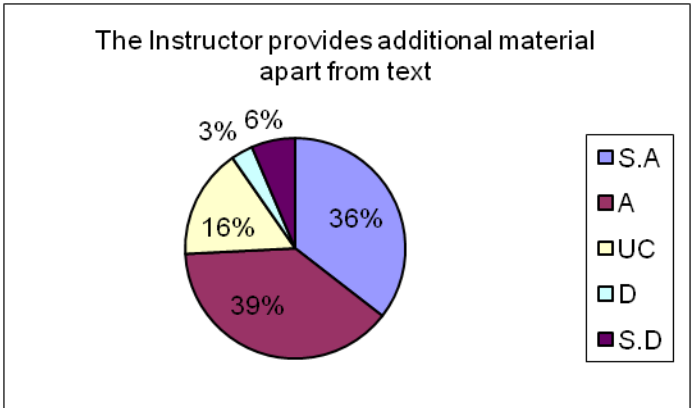
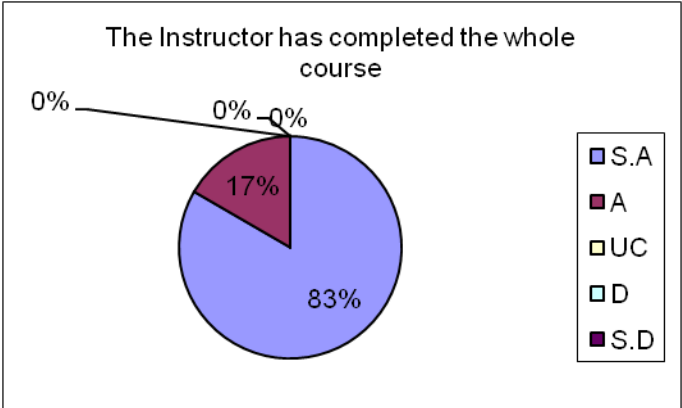
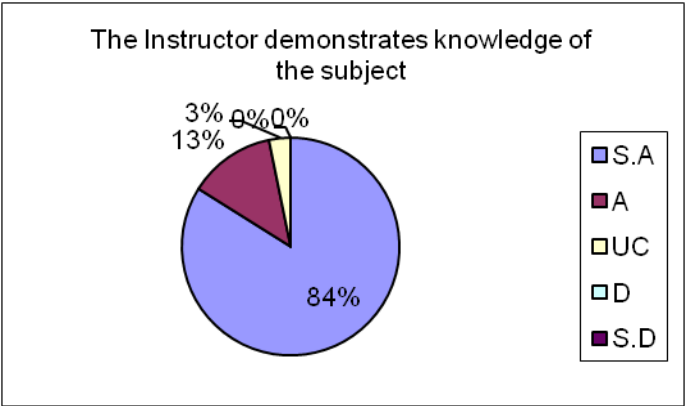
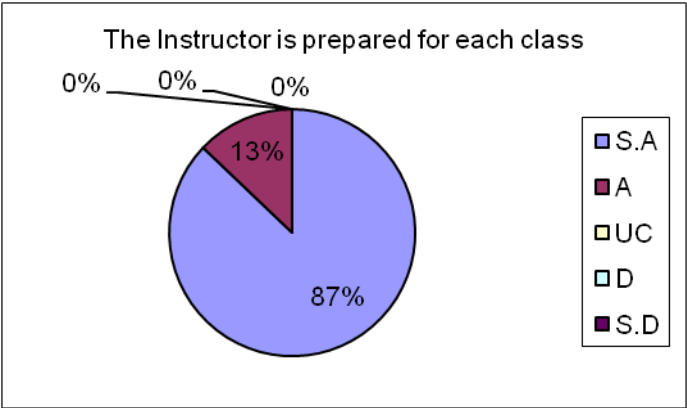
Overall Results of Performa 10 of Teacher 1, 2, 3, 4 and 5

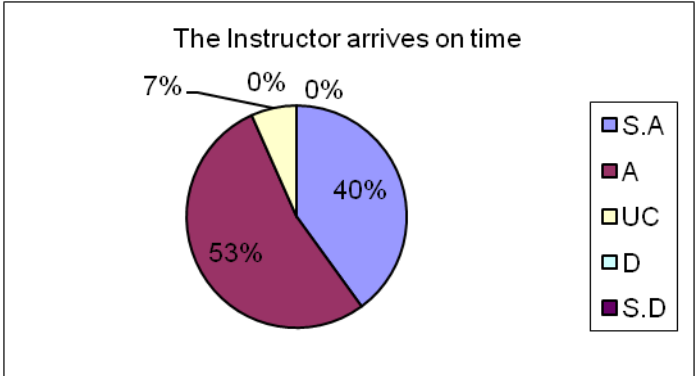
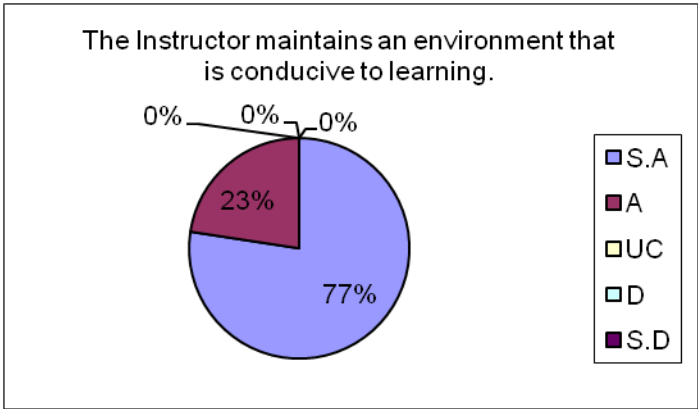
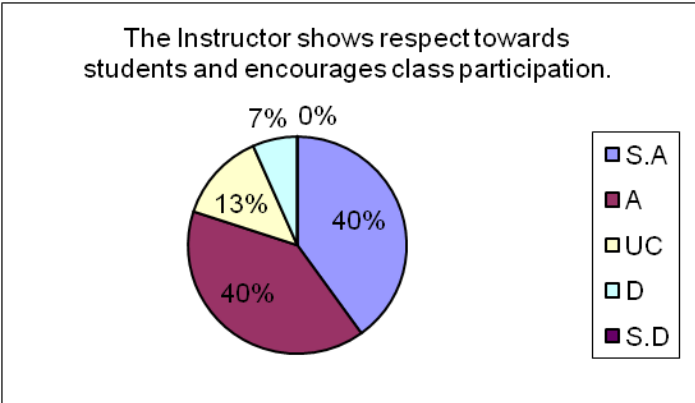
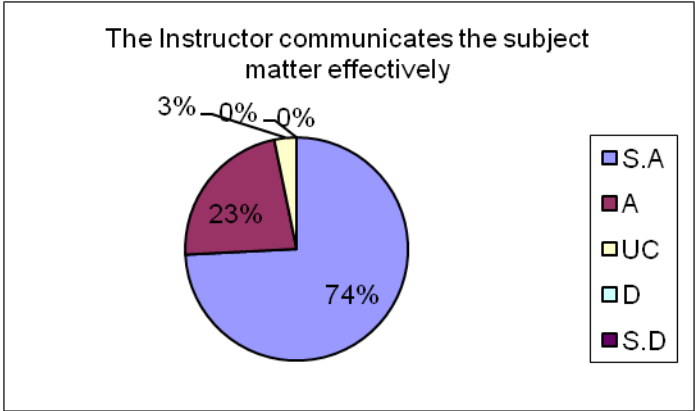
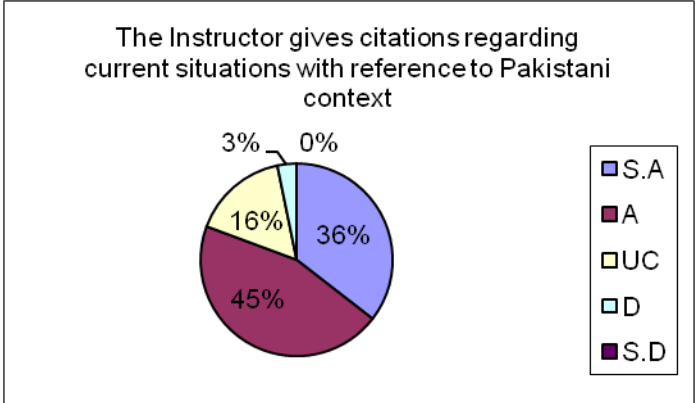
The teachers were evaluated by the students at the end of the semester in accordance with Proforma-10. In the graph teachers are represented as 1, 2, 3..., instead of mentioning their names. The graph shows that most of the teachers have scored above 75% which may safely be considered as quite satisfactory. Results and performance of individual teachers will follow.

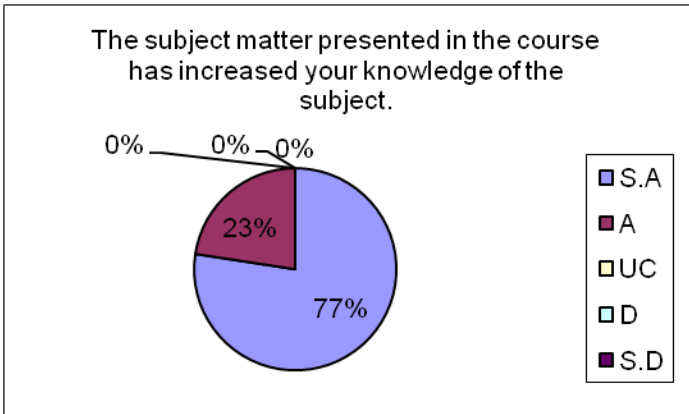
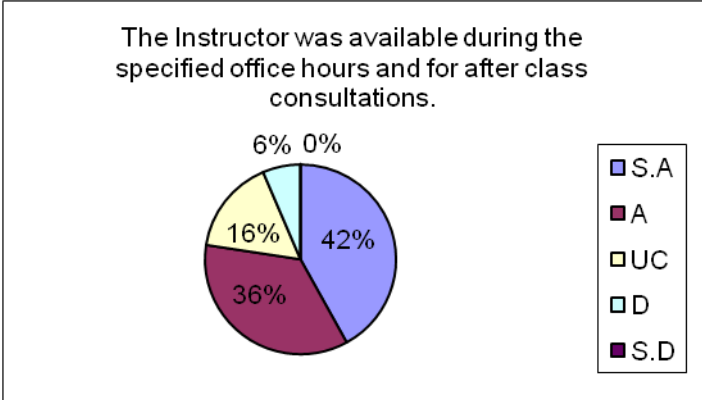
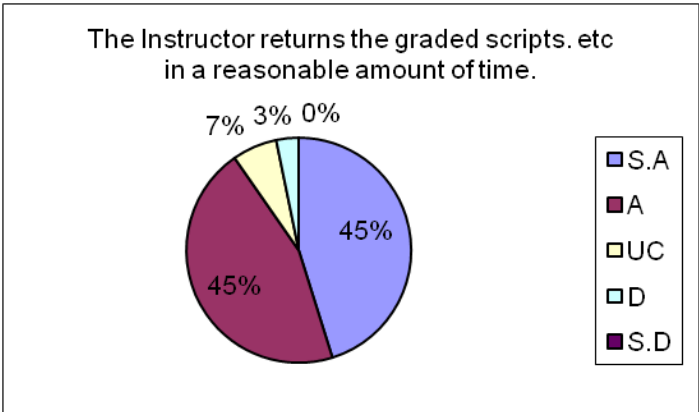
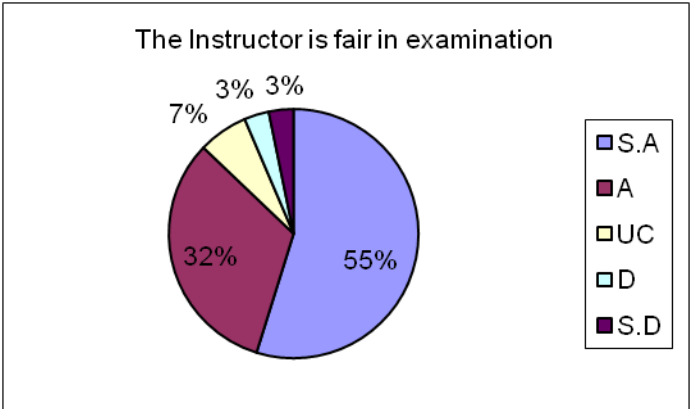
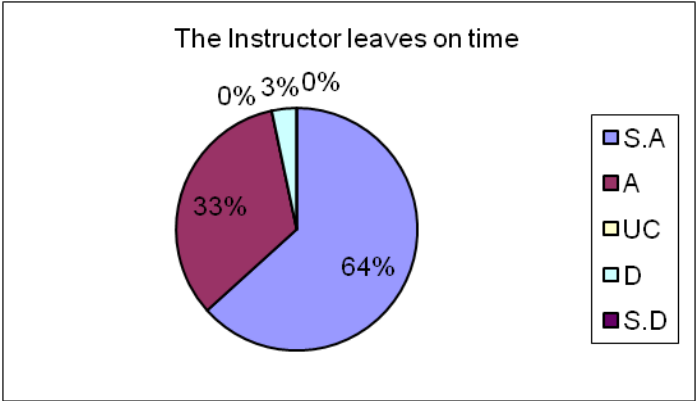


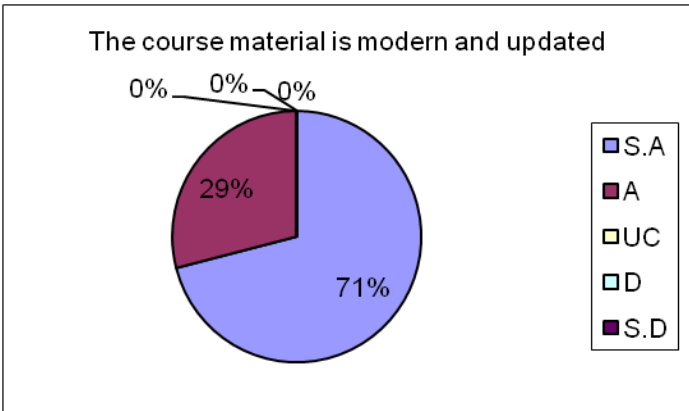
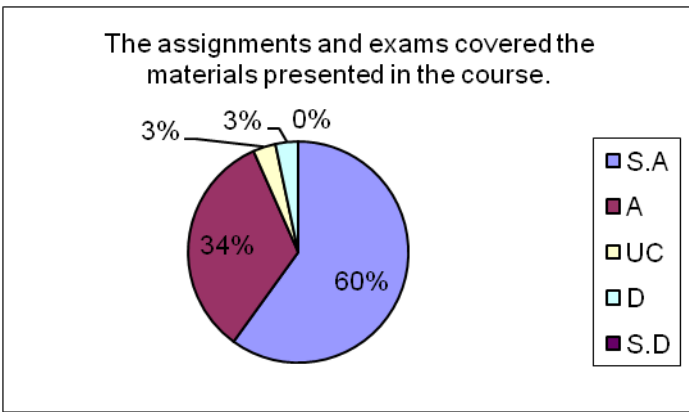
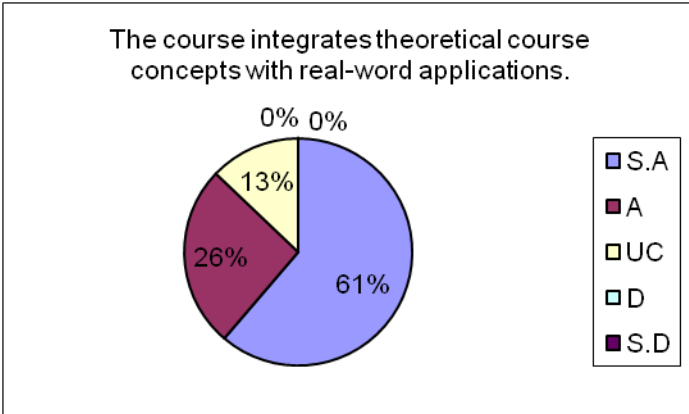
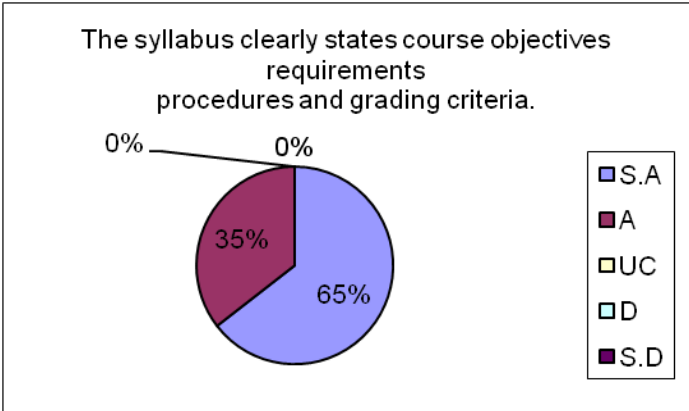
Result of Proforma 10 of Teacher 1- (BCH-702)

The strongest point which students like about teacher 1, the Instructor is prepared for each class. 87% of the students either agreed or strongly agreed on this aspect (parameter 1). On the other hand very few people disagreed or strongly disagreed on any of the parameter.



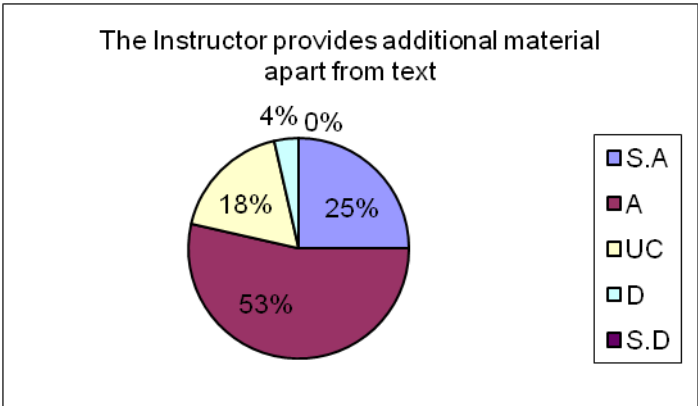
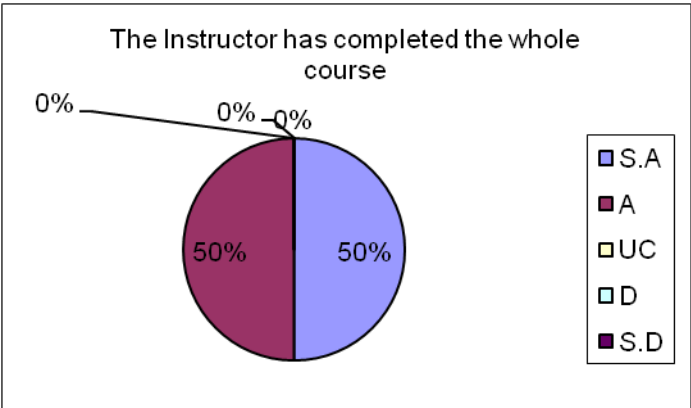
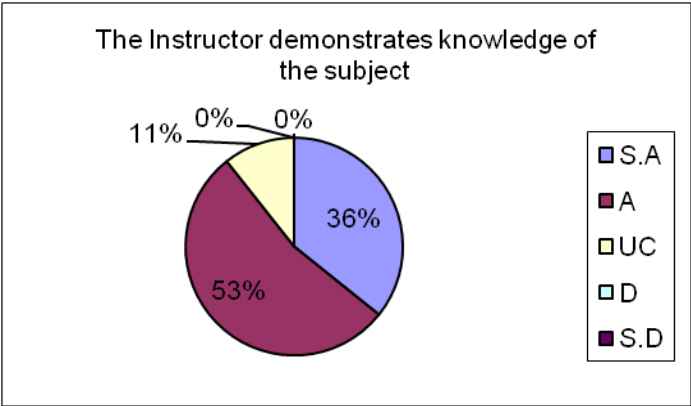
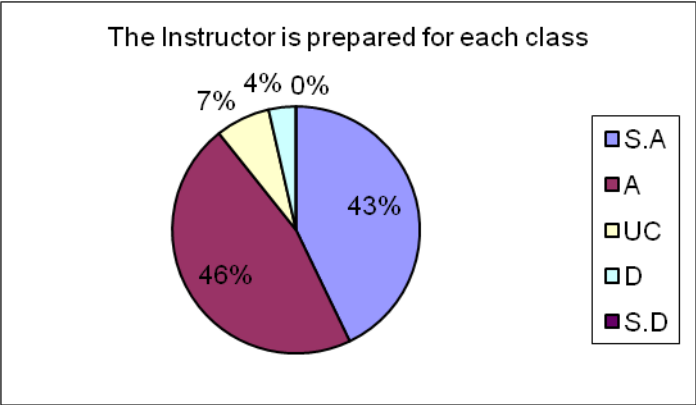


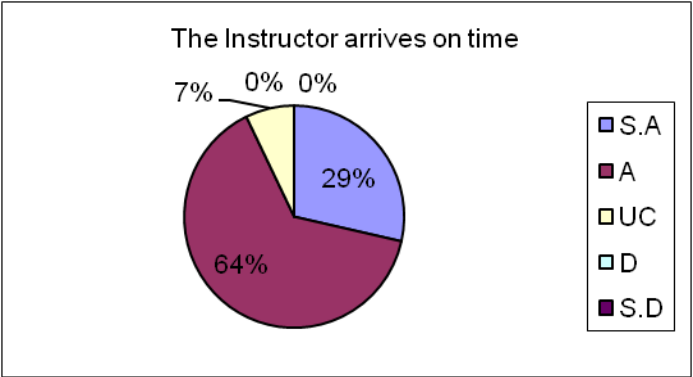
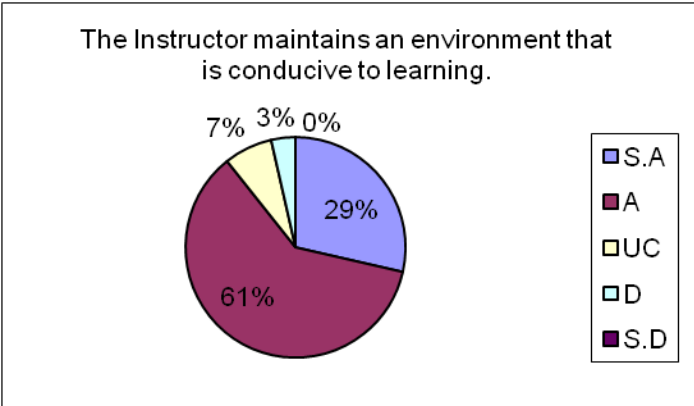
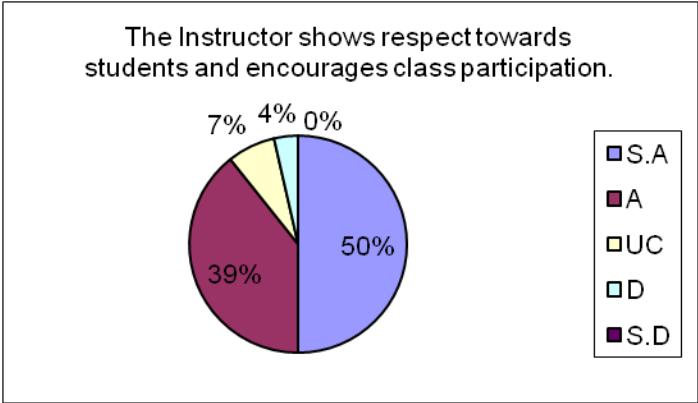
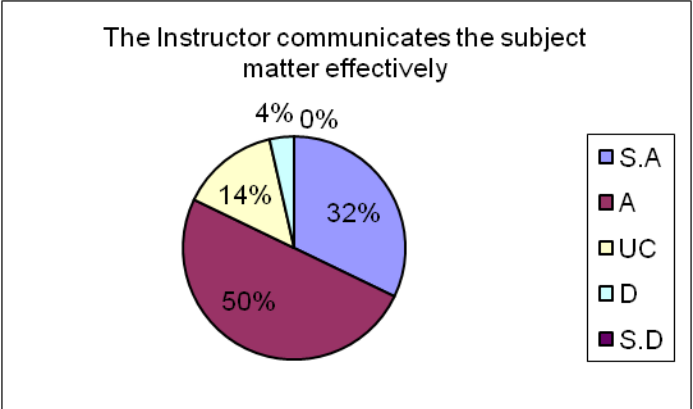
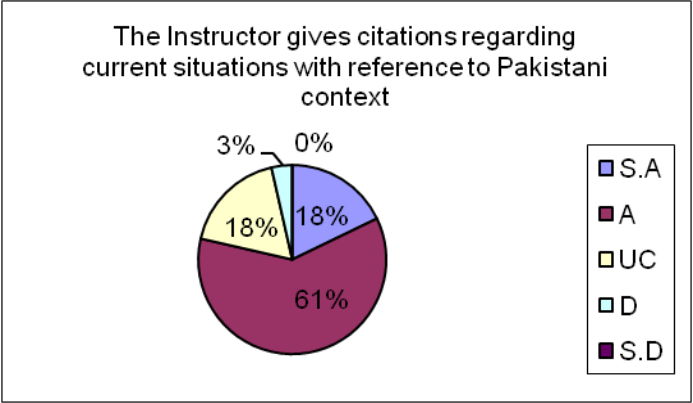


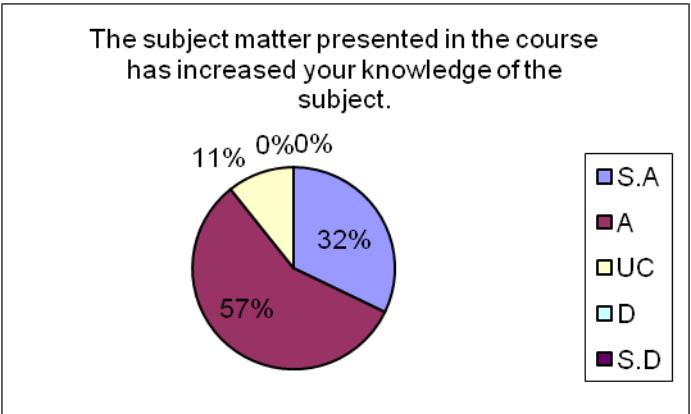
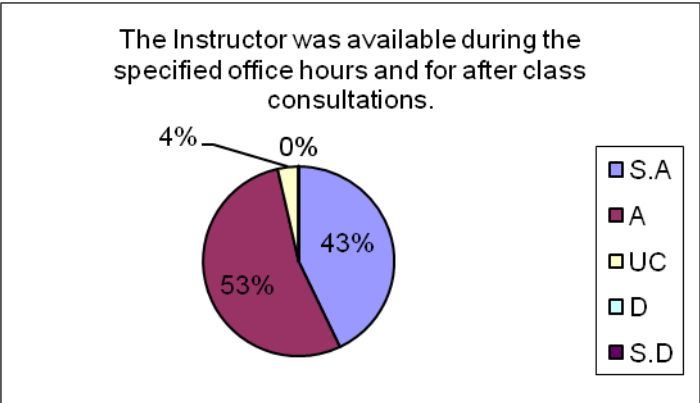
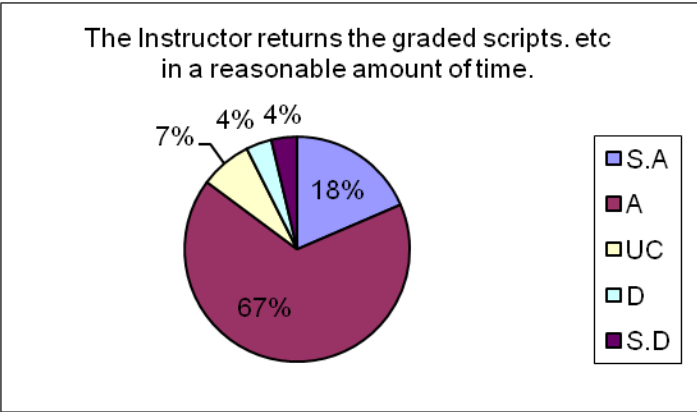
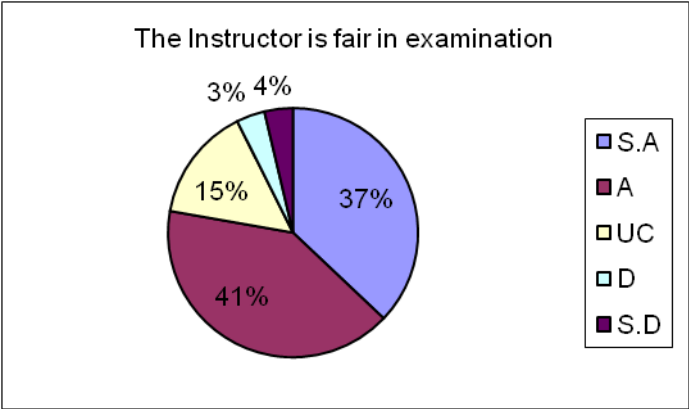
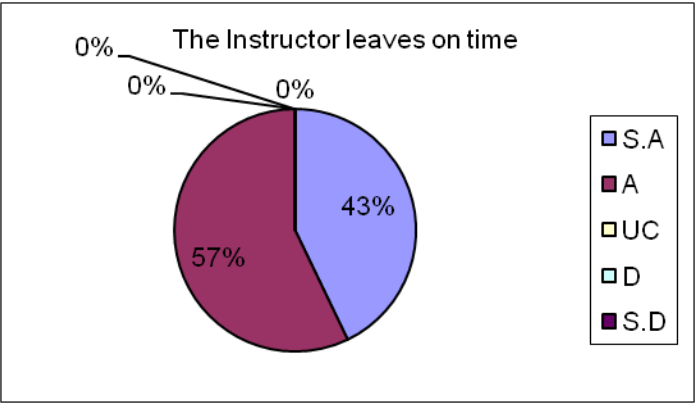


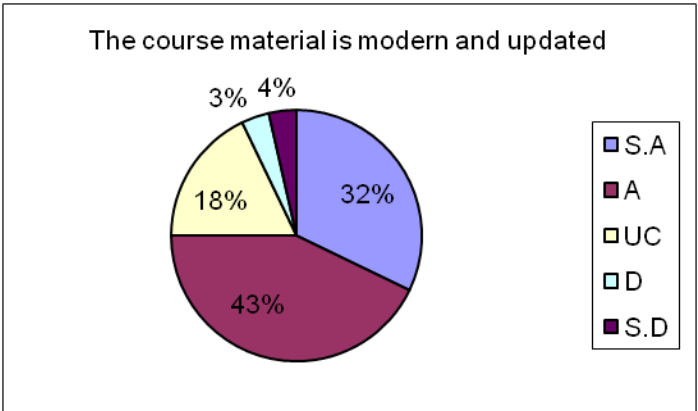
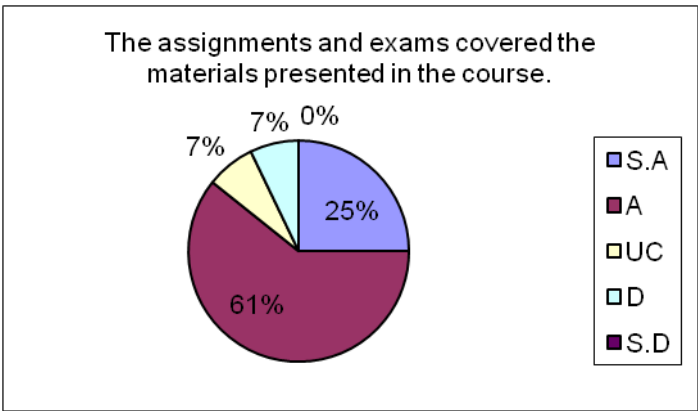
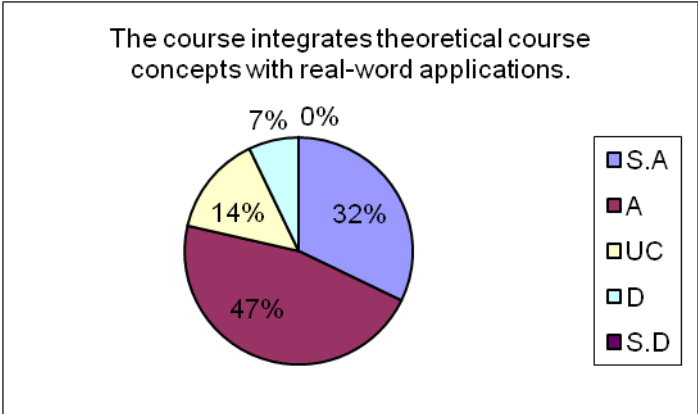
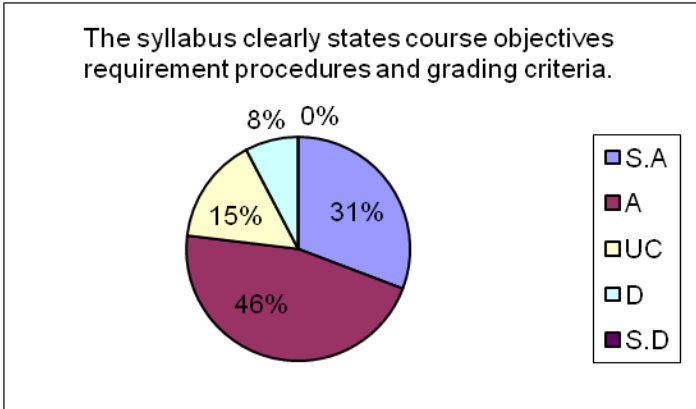
Result of Proforma 10 of Teacher 2- (BIOL-711)

The over all compiled results of Teacher 2 show that the studentns were satisfied with the performance of Teacher. In almost half of the parameters, approximately 67% students have either agreed or storngly agreed which shows that Instructor returns the graded scripts etc in a reasonable amount of time. More than 57% of the students have either agreed or strongly agreed with the subject matter presented inthe course has increased your knowledge of the subject.



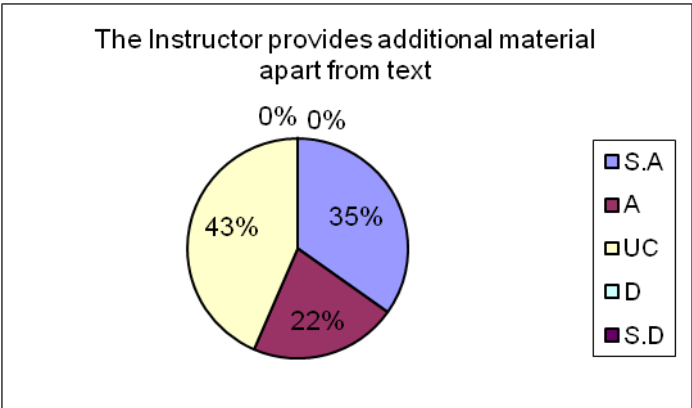
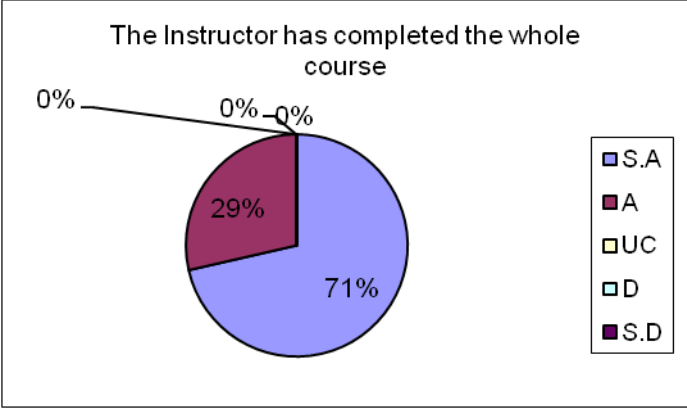
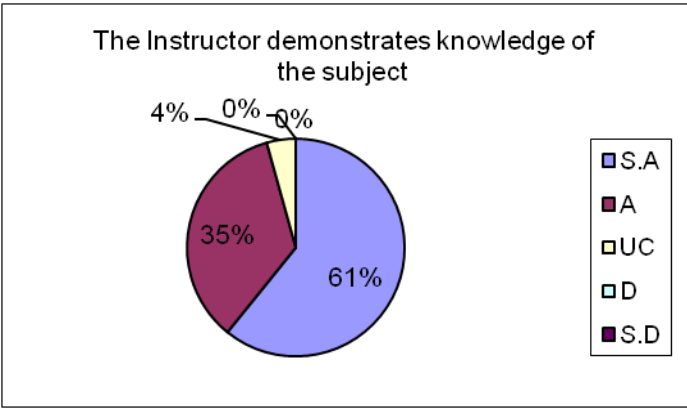
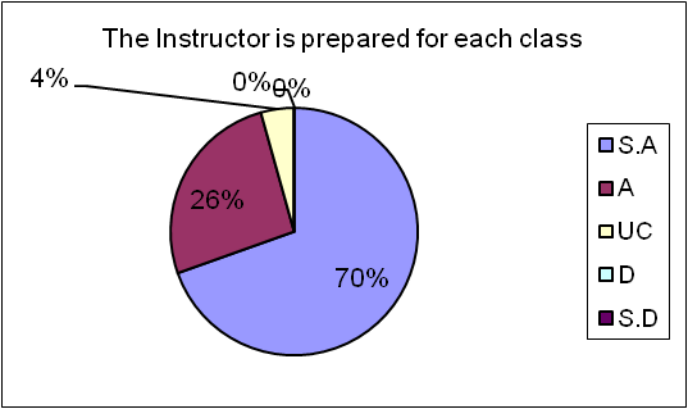


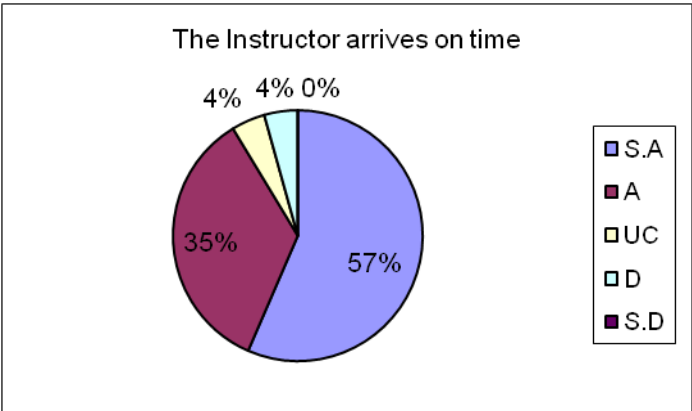
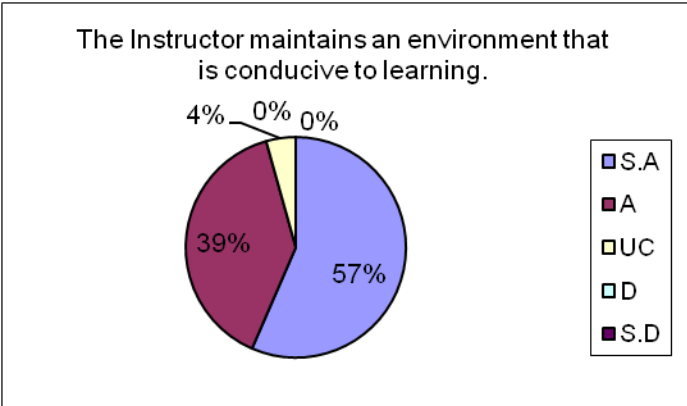
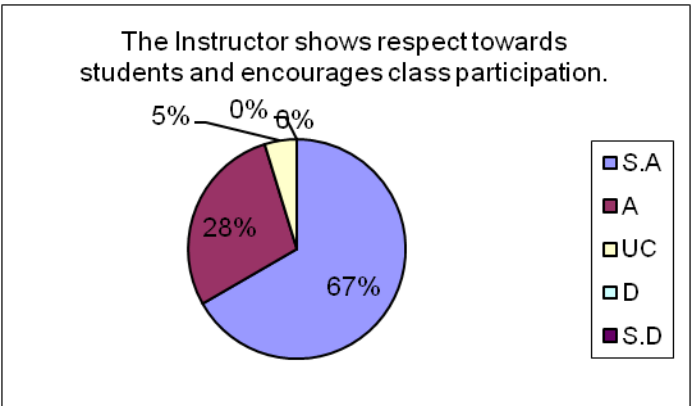
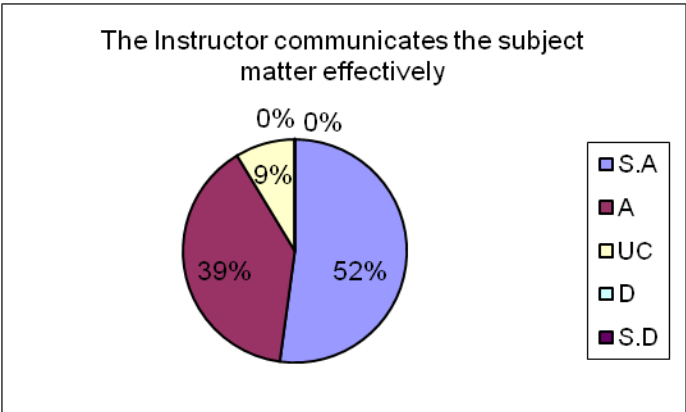
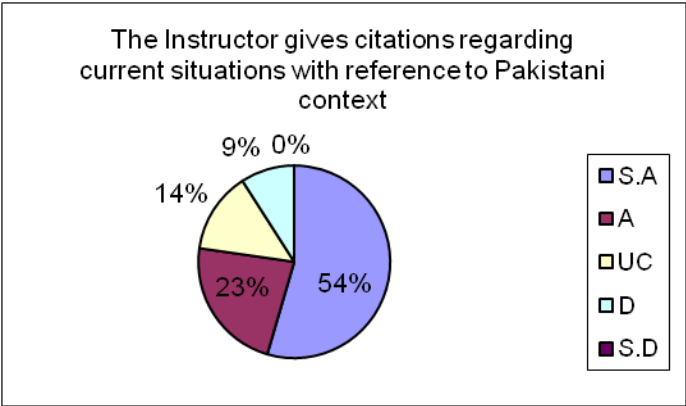


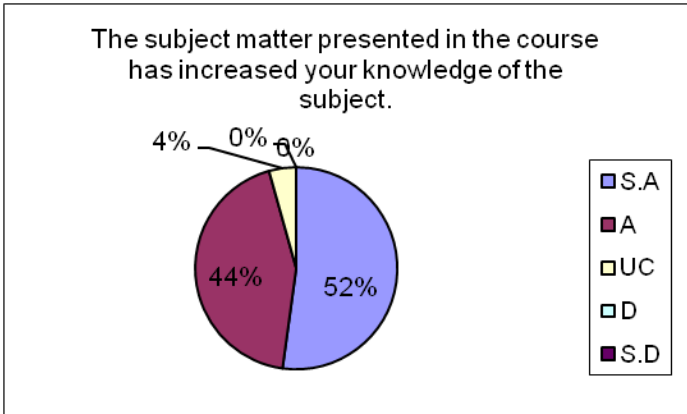
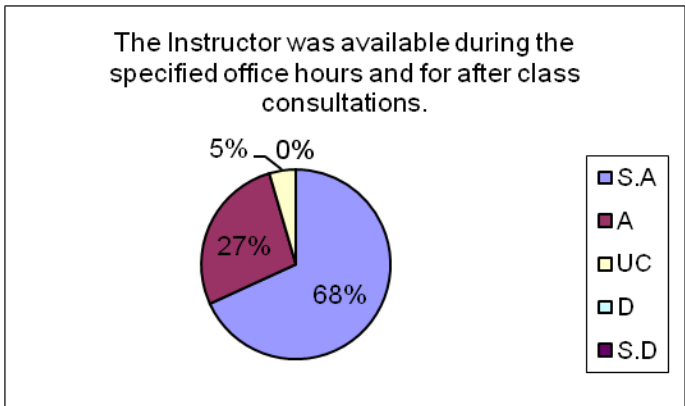
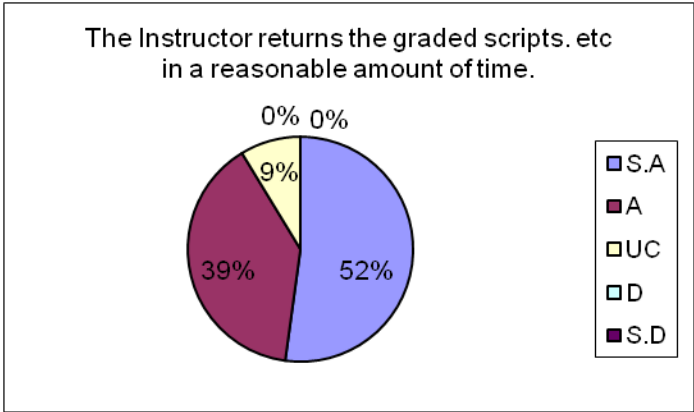
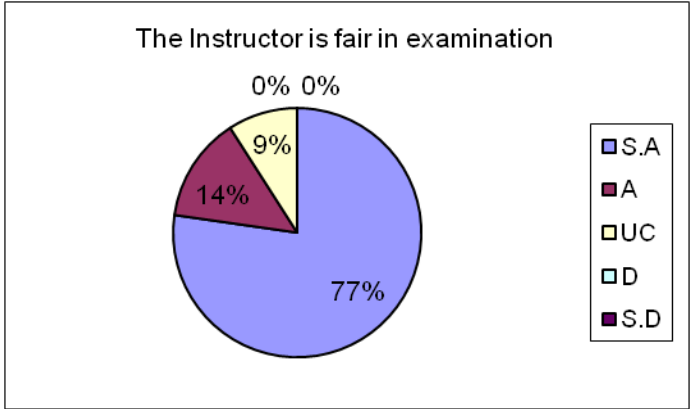
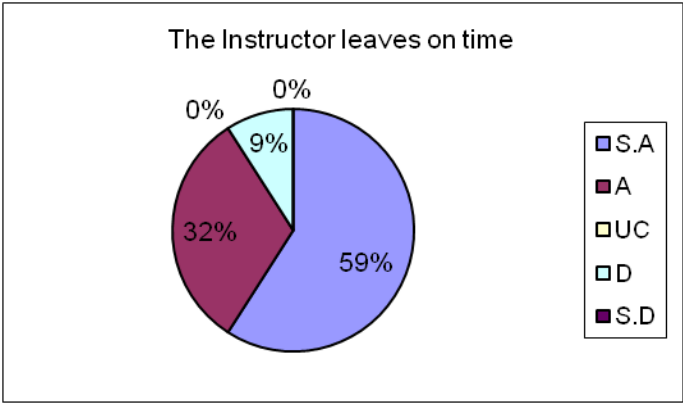


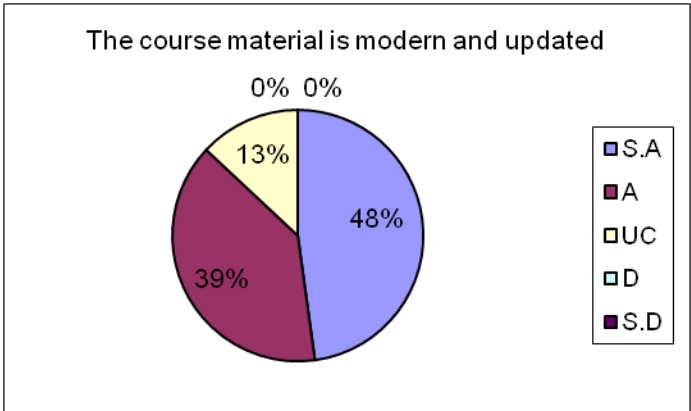
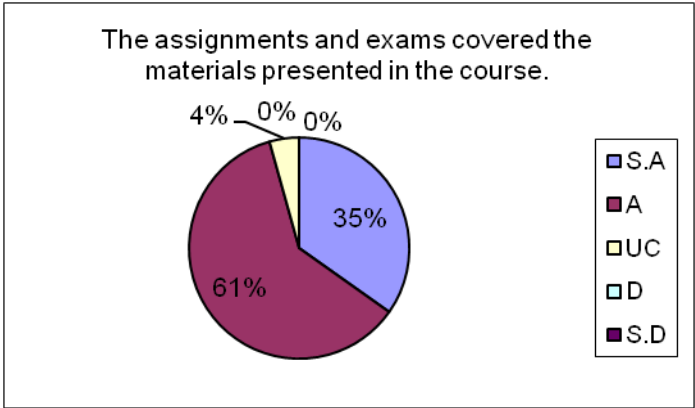
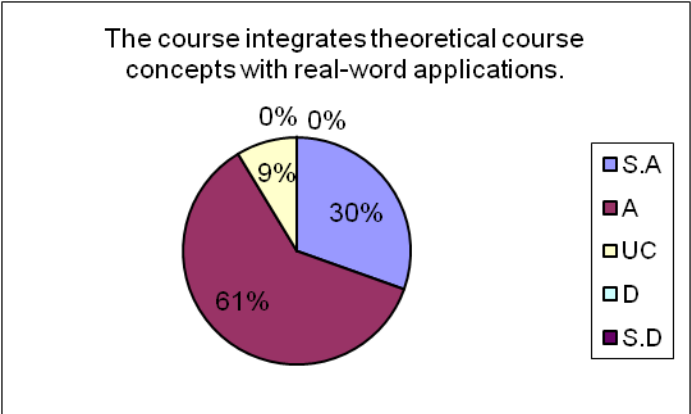
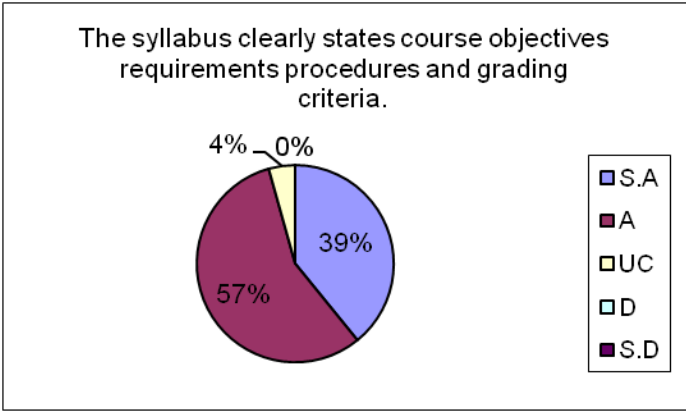
Result of Proforma 10 of Teacher 3 – (BCH-710)

The results of proforma no. 10 for teacher 3 clearly shows that 70-77% studnts either strogly agreed or agreed regarding the Instructue is fair in examination.



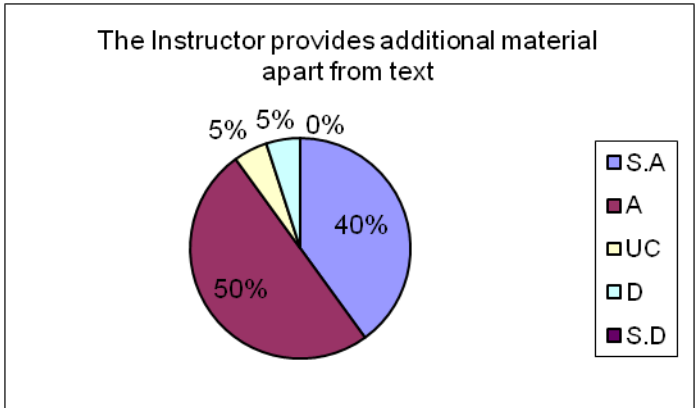
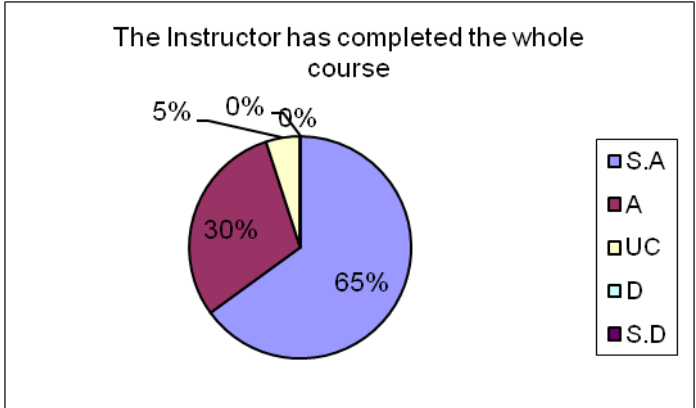
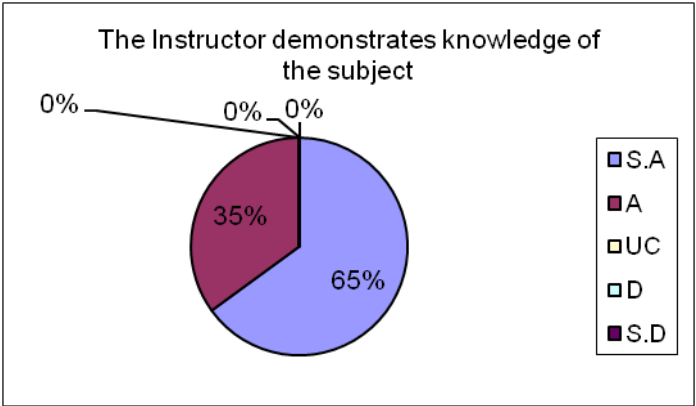
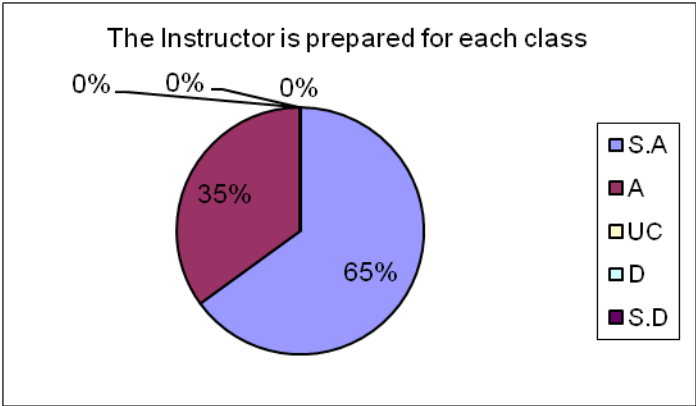


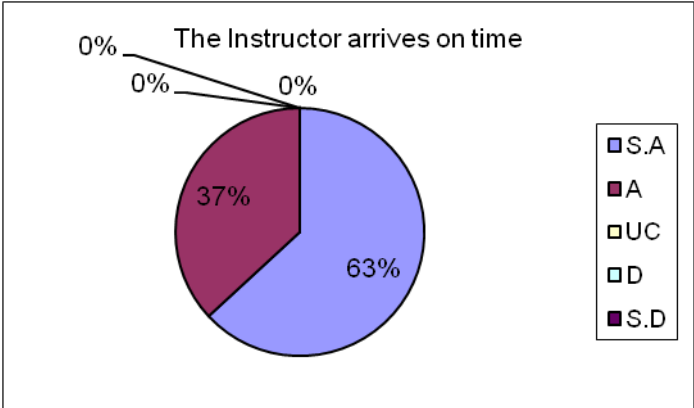
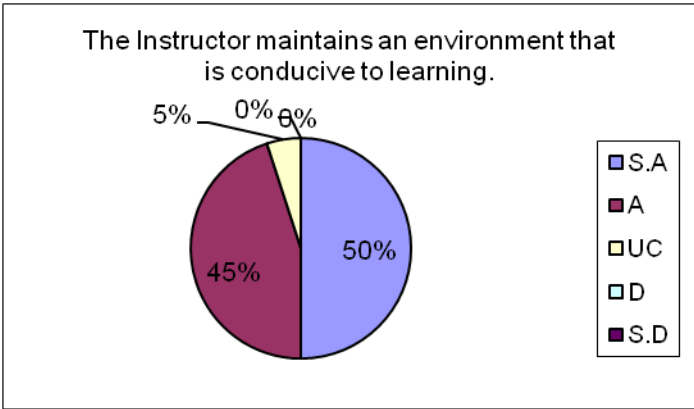
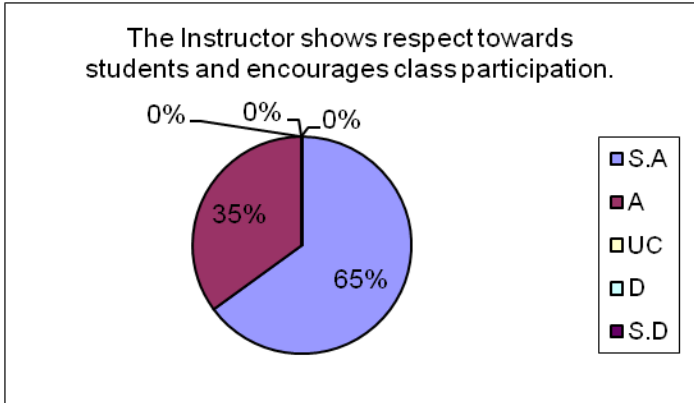
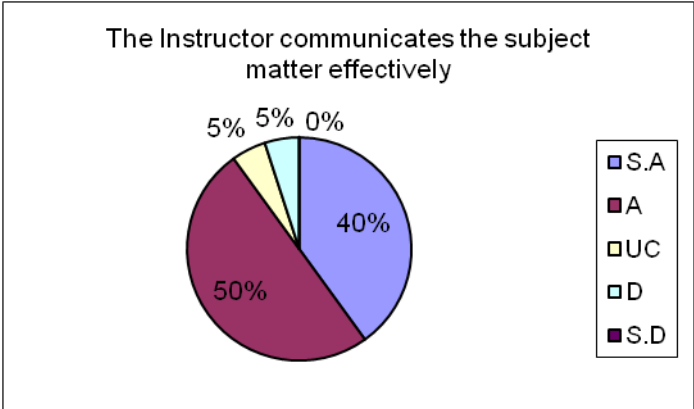
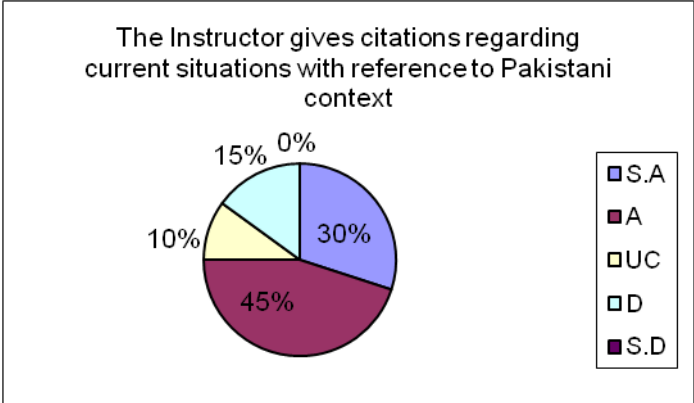


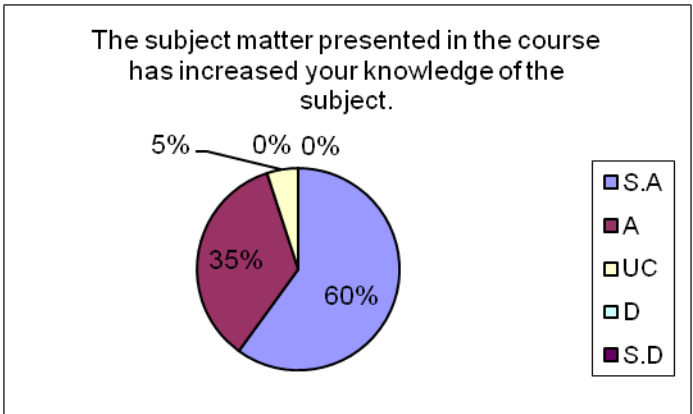
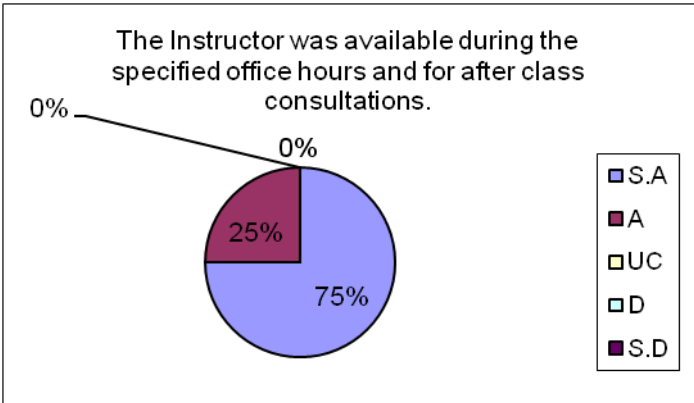
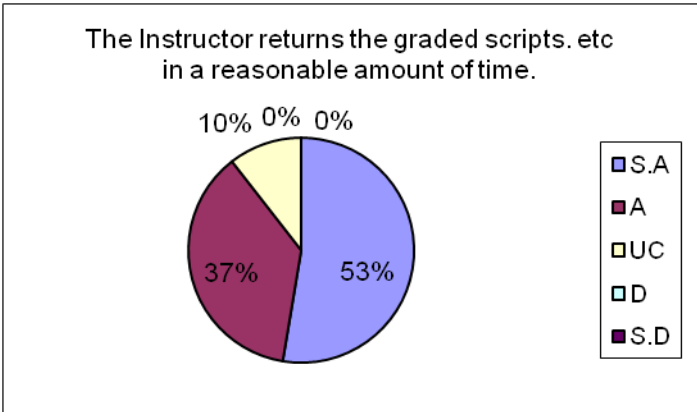
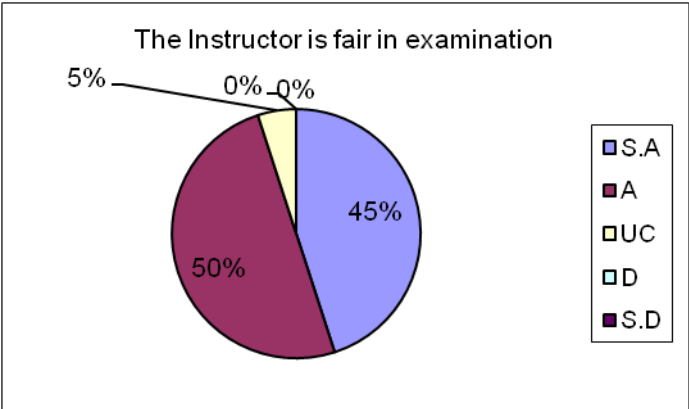
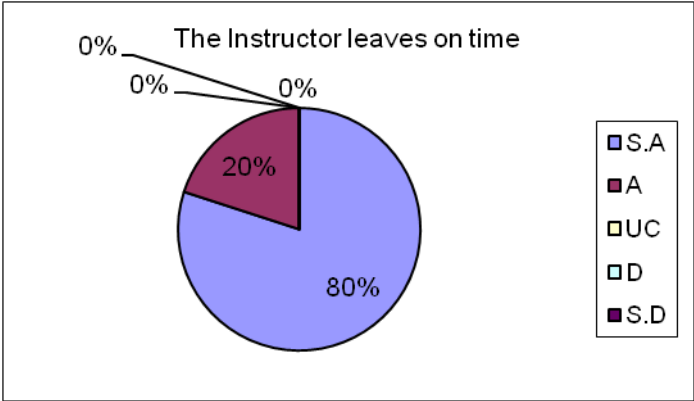


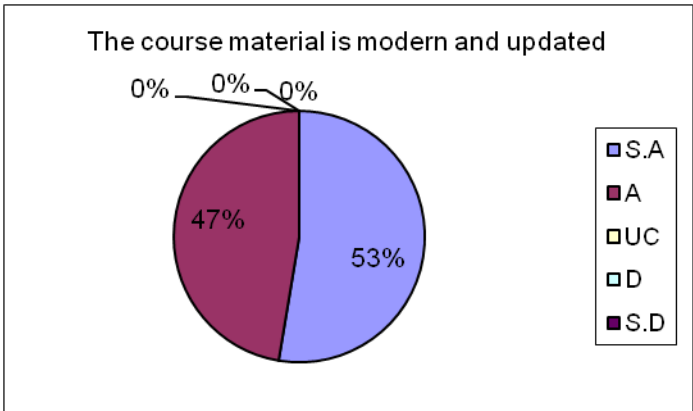
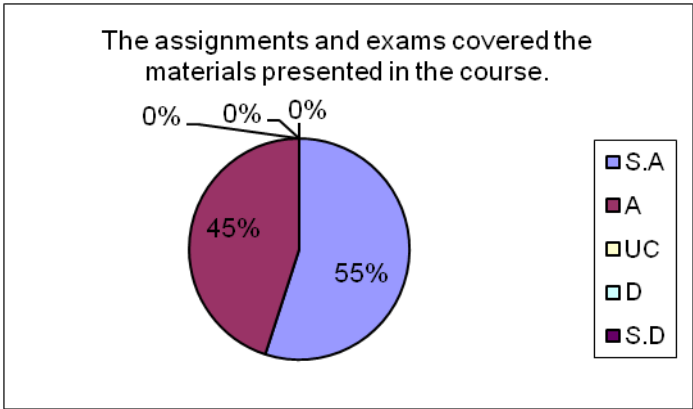
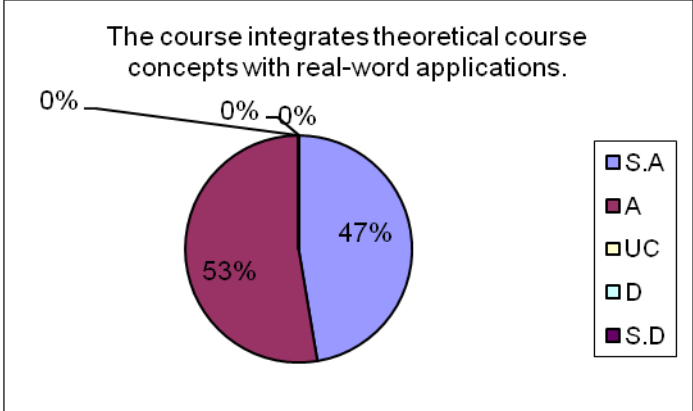
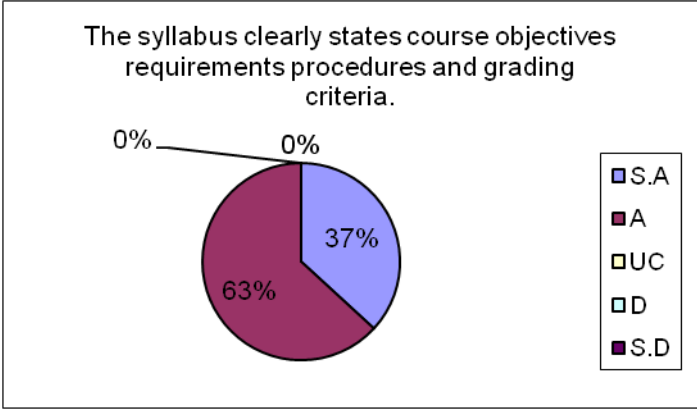
Result of Proforma 10 of Teacher 4- (BCH-732)

The overall compiled results of Teacher-4 showed that his best point is parameter 13 i.e. “The Instructor was available during the specified office hours ans for after class consultations” the teacher secured 77% (strongly agreed and agreed) in the favour and 0% have strongly disagreed towards this point.



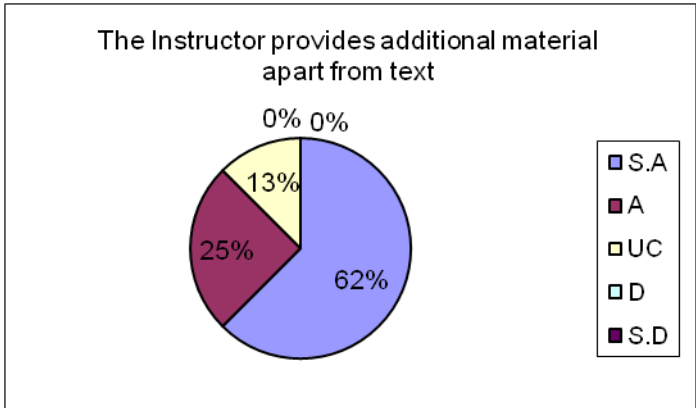
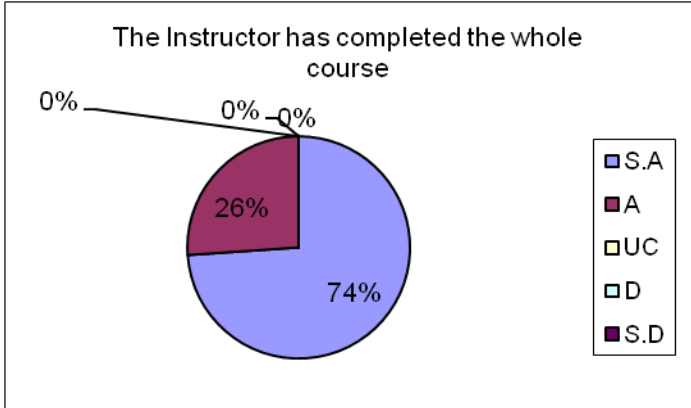
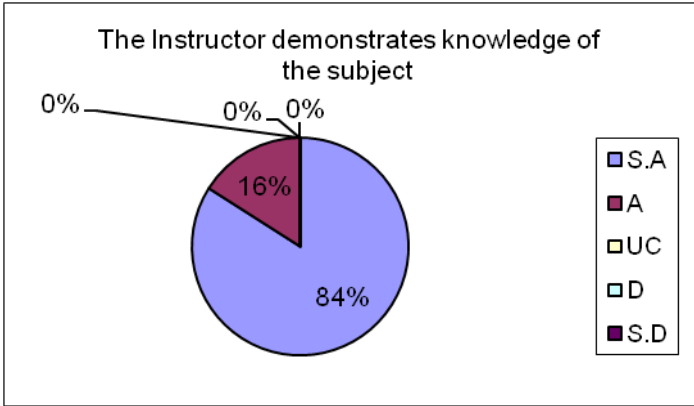
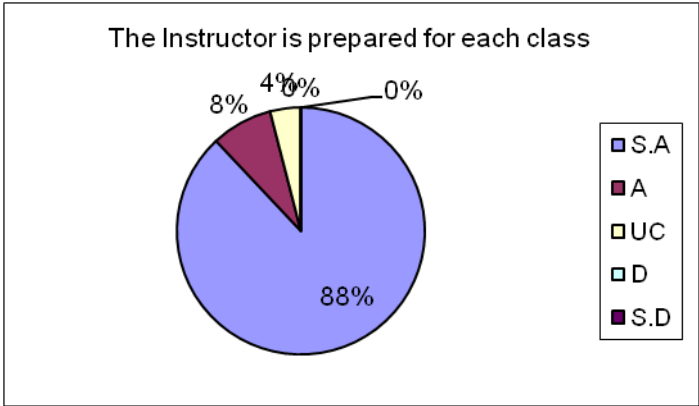


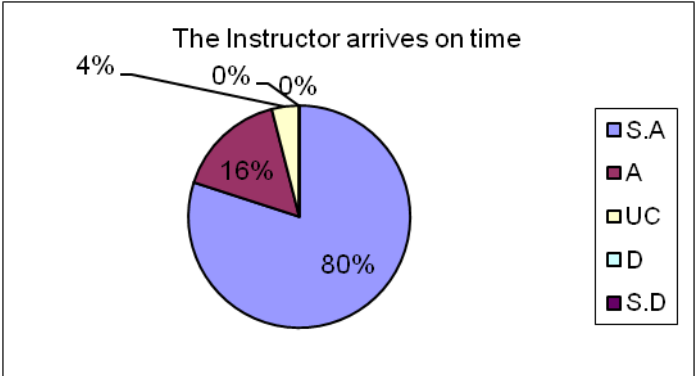
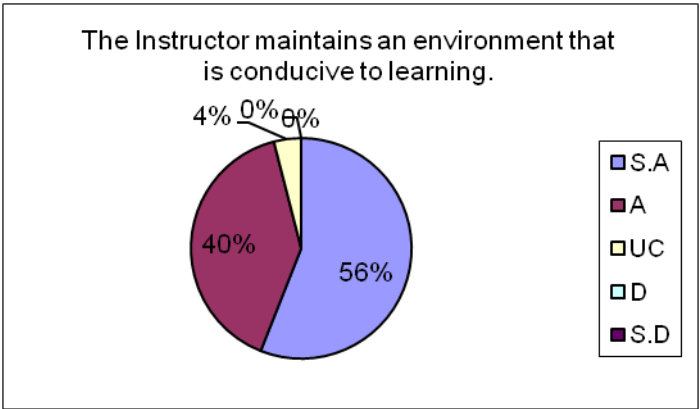
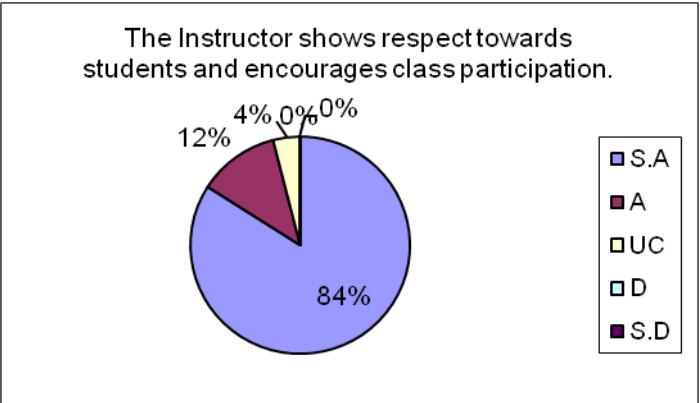
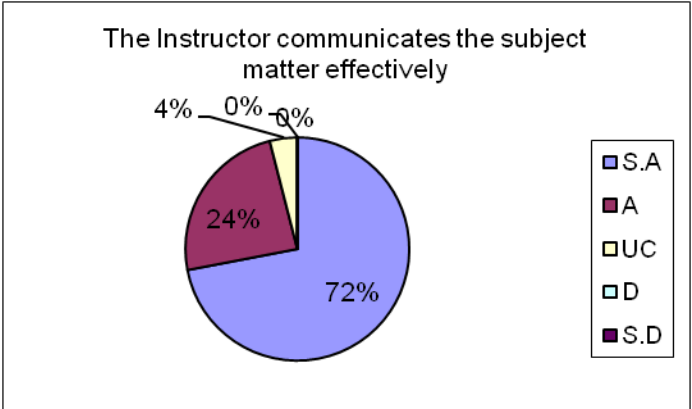
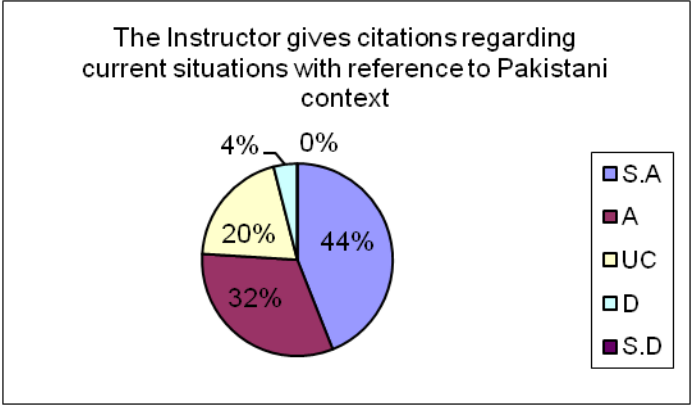


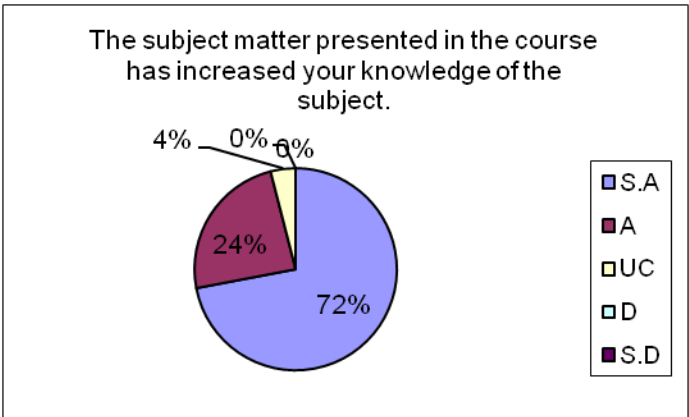
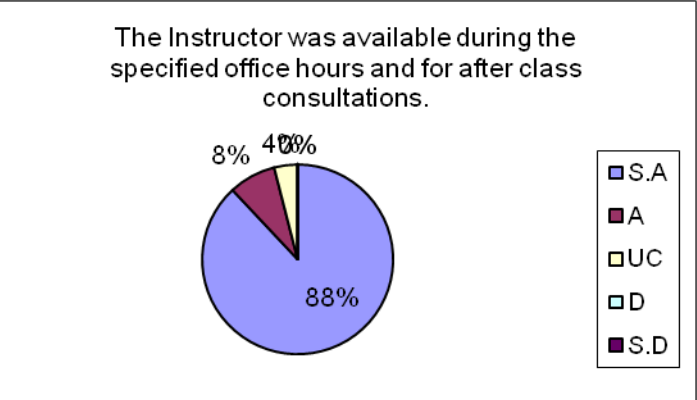
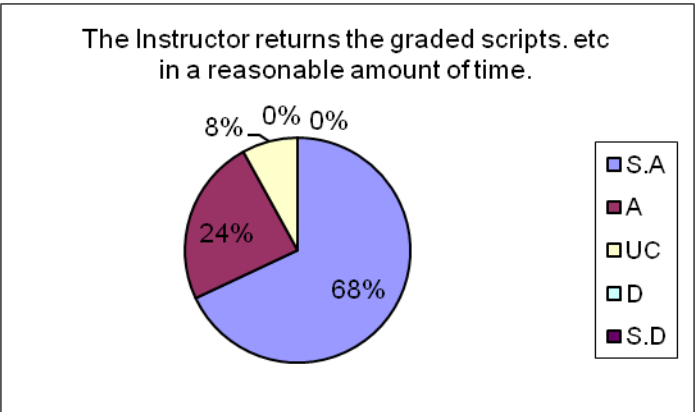
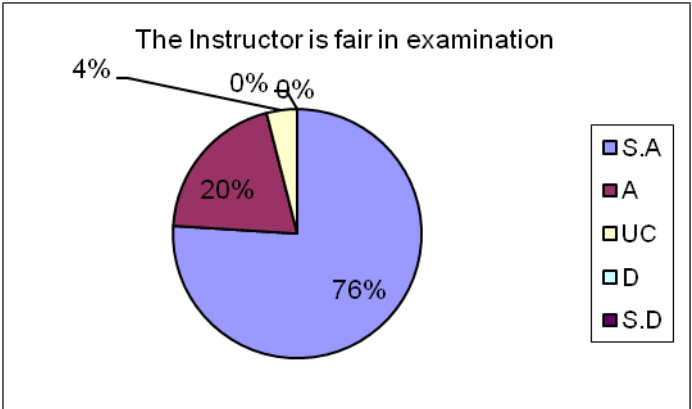
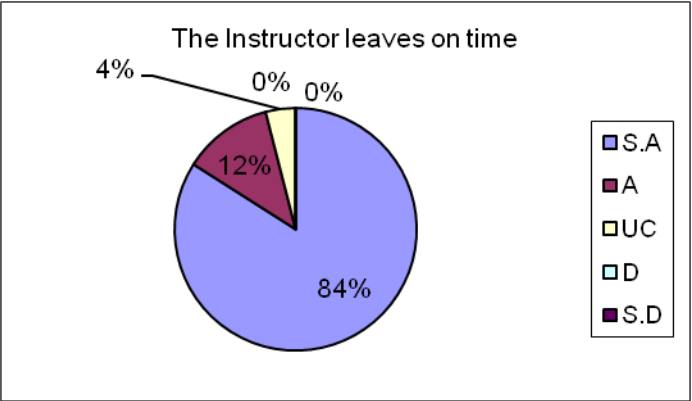


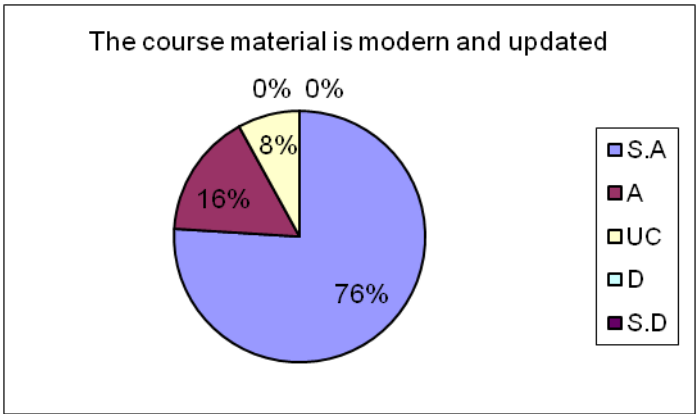
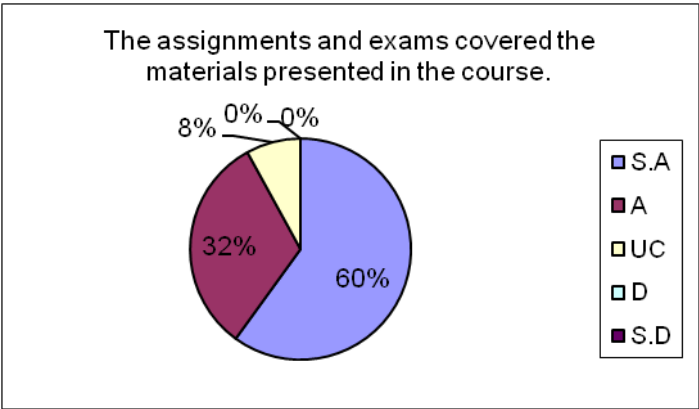
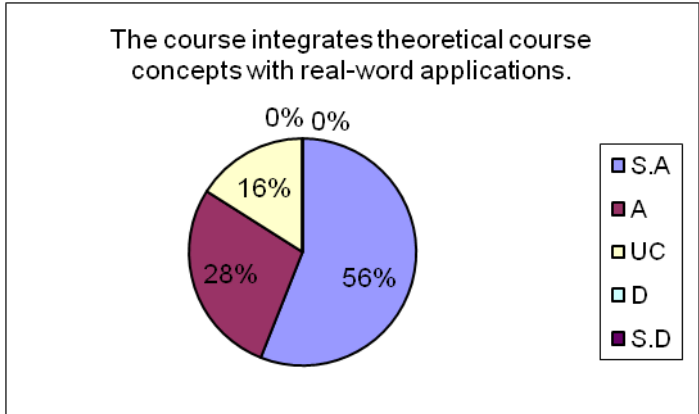
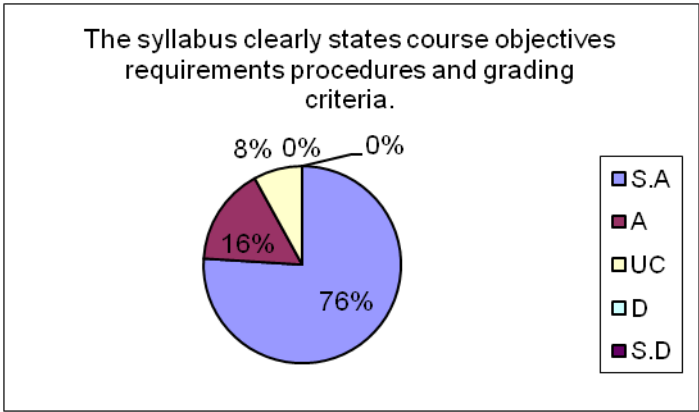
Result of Proforma 10 of Teacher 5 – (BCH-712)

Teacher performance assessment of Teacher 5 clearly indicates that 80-88% students were of view that instructor was well prepared for class, demonstrates knowledge of the subject, shows respect towards students and encourages class participation, arrives on time, leaves on time, available during the specified office hours and for after class consultations.





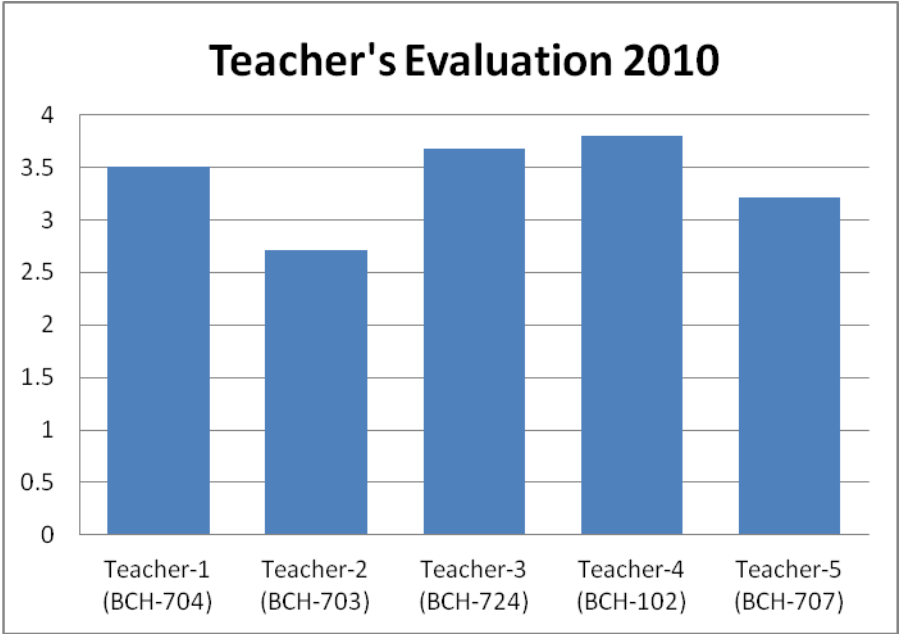




Teachers Evaluation 2010

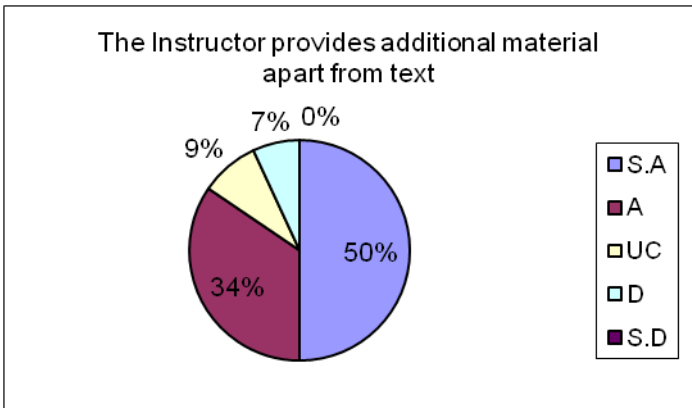
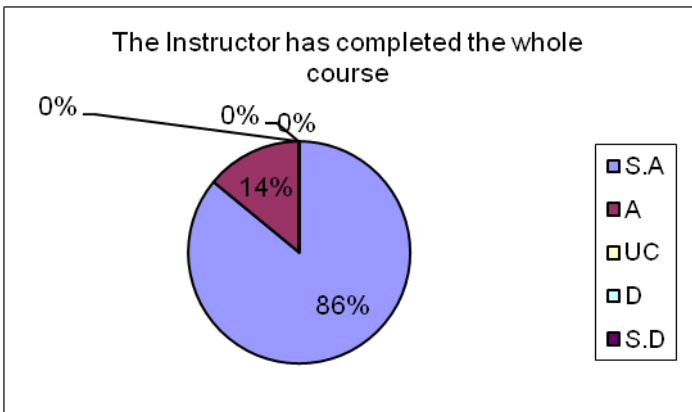
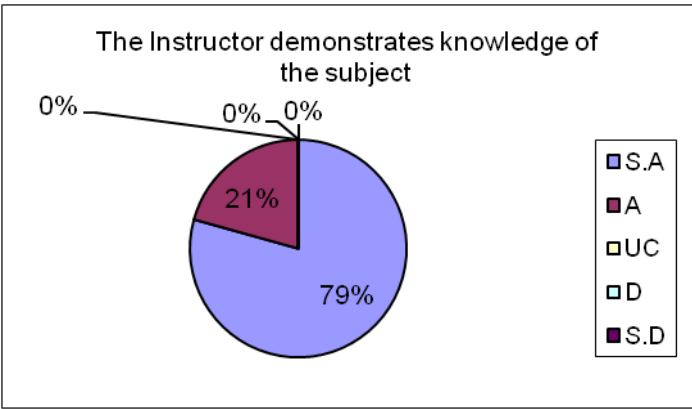
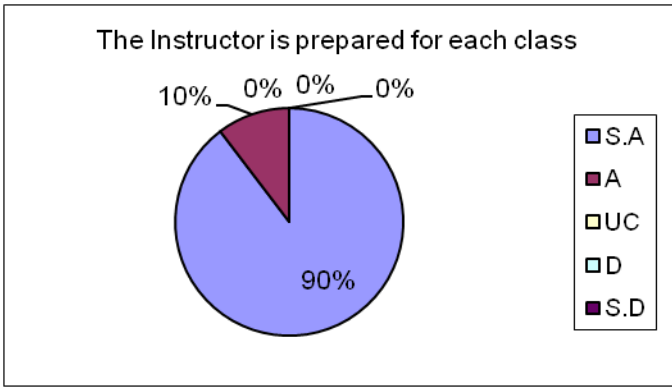
Overall Results of Performa 10 of Teacher 1, 2, 3, 4 and 5

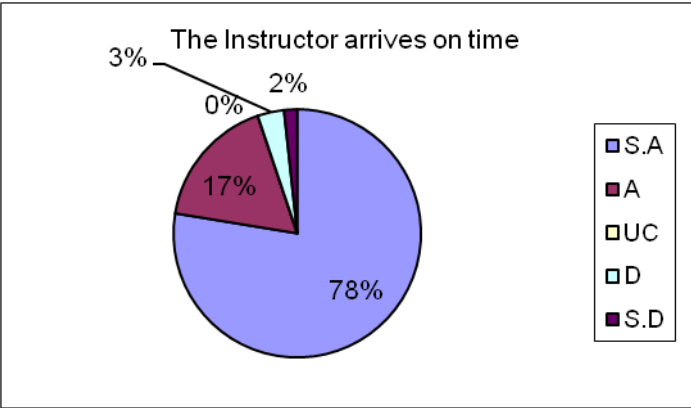
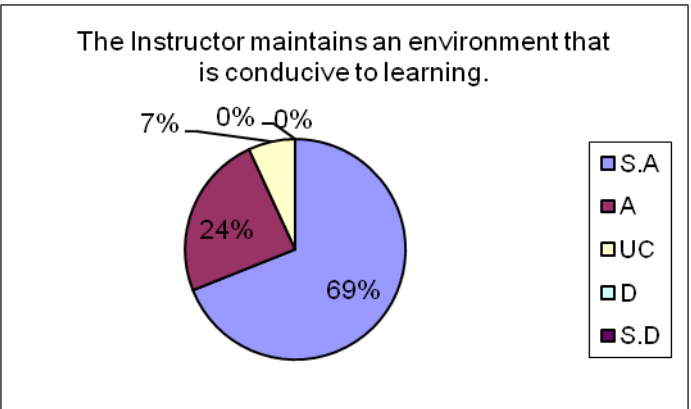
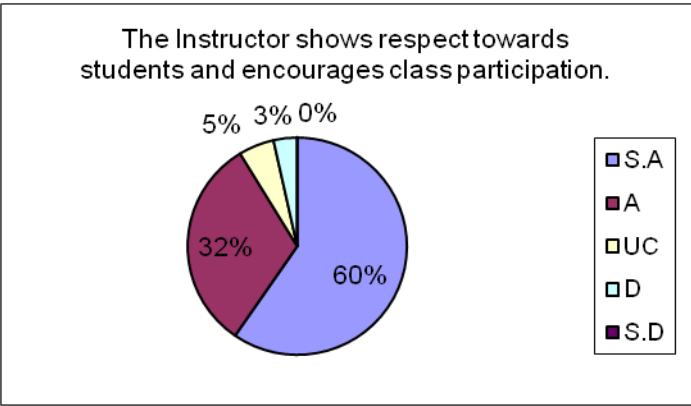
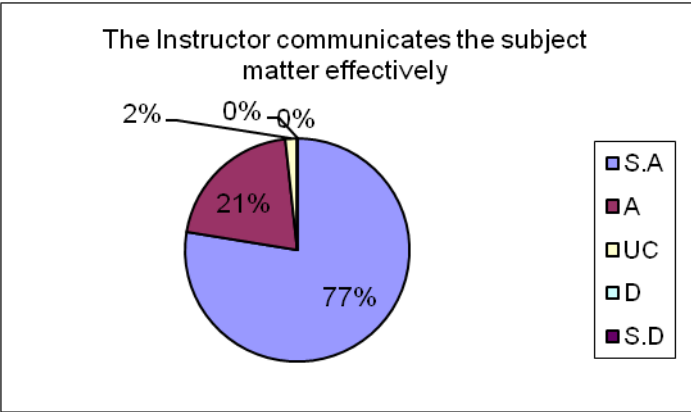
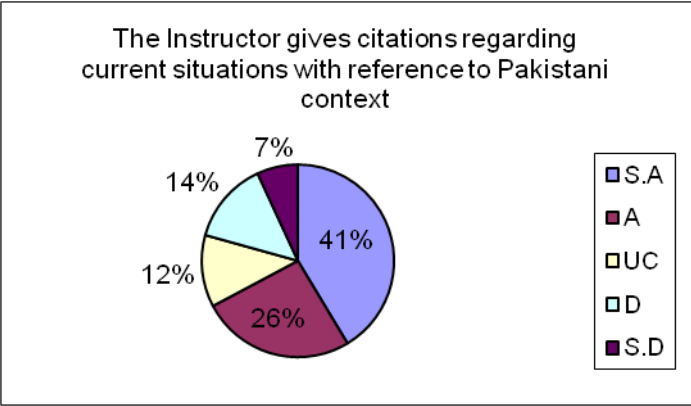
The teachers were evaluated by the students at the end of the semester in accordance with Proforma-10. In the graph teachers are represented as 1, 2, 3..., instead of mentioning their names. The graphs shows that most of the teachers have scored above 70% which may safely be considered as quite satisfactory. Results and performance of individual teachers will follow.

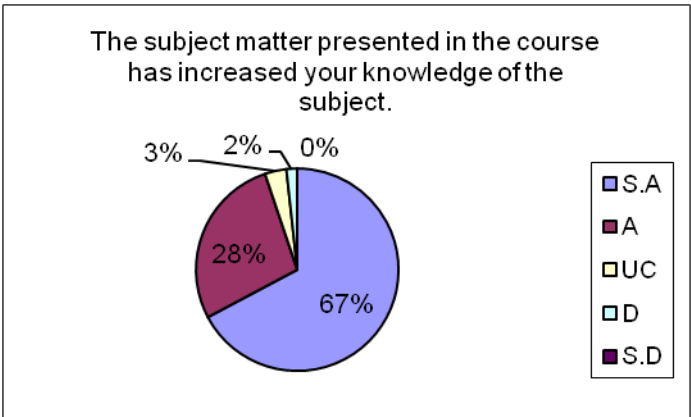
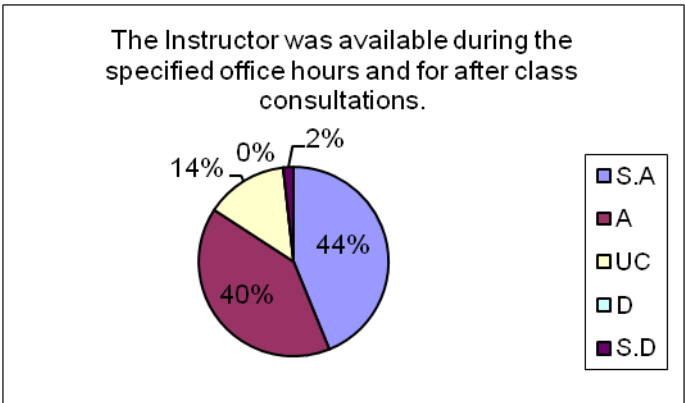
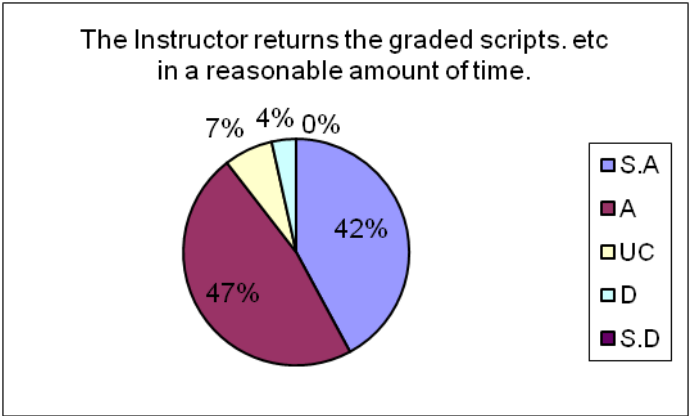
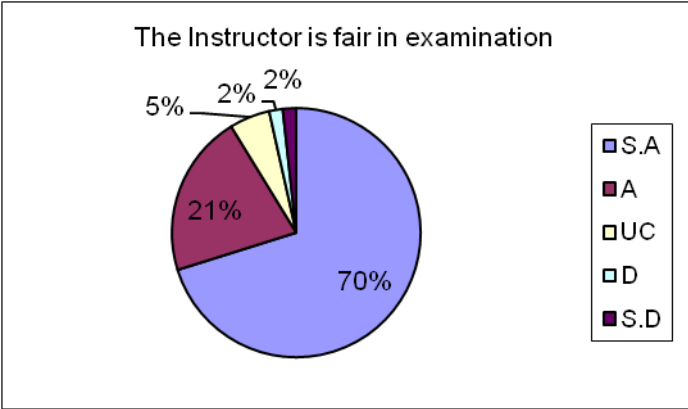
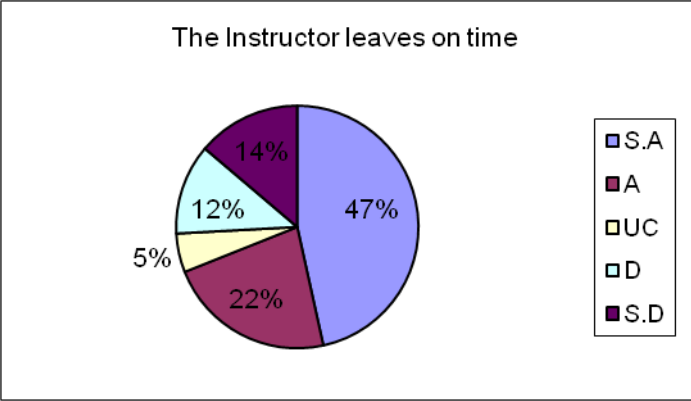


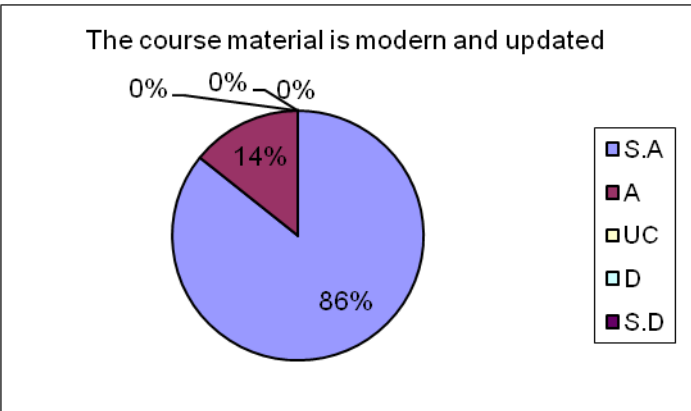
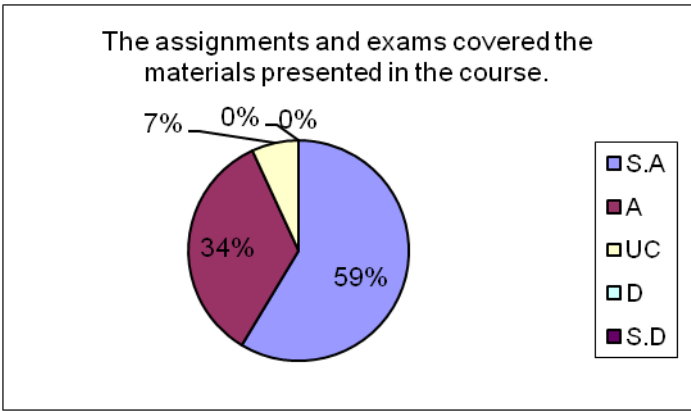
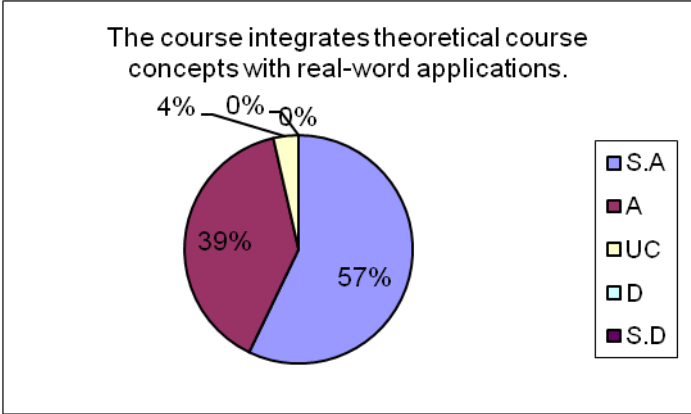
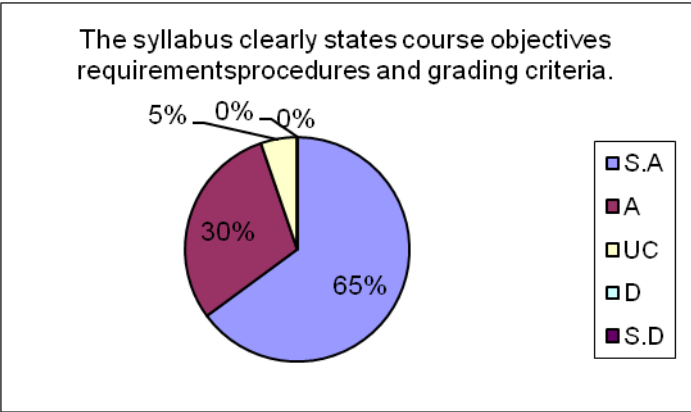
Result of Proforma 10 of Teacher 1- (BCH-704)

The over all compiled results of Teacher 1 show that the studetns were satisfied with the performance of Teacher. In almost half of the parameters, approximately 85% students have either agreed or storngly agreed which shows good acceptability of the teacher. More than 90% of the students have either agreed or strongly agreed that Instructor is prepared for each class.



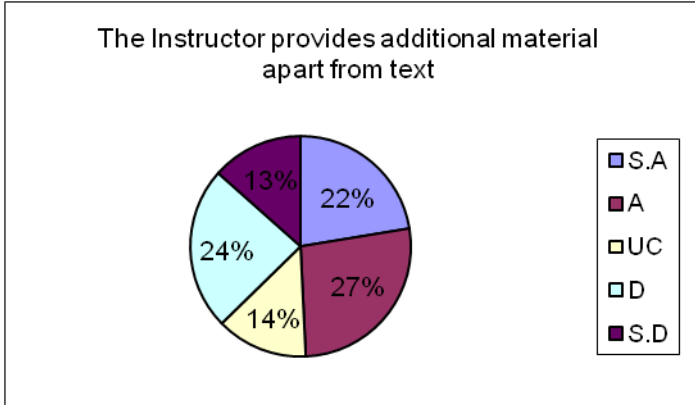
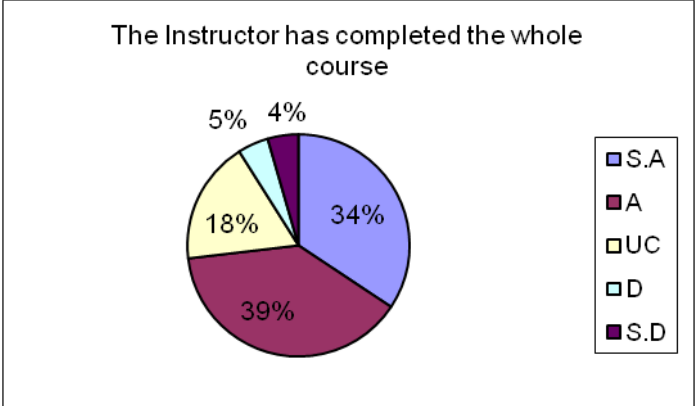
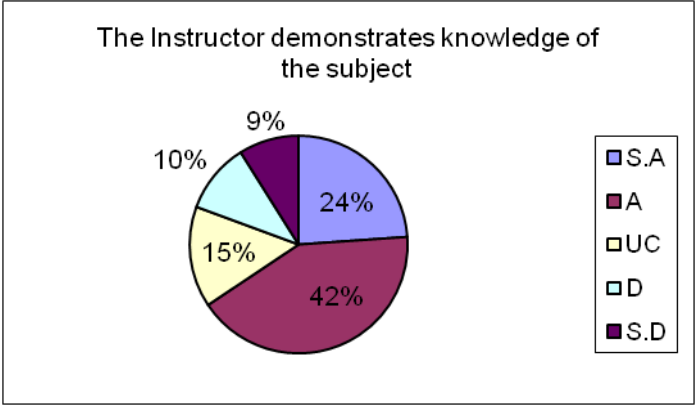
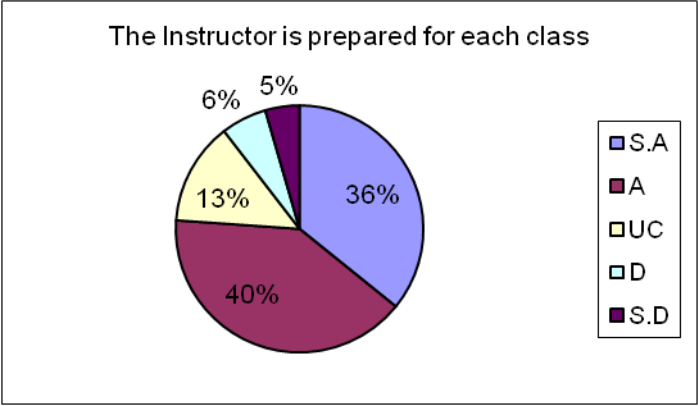


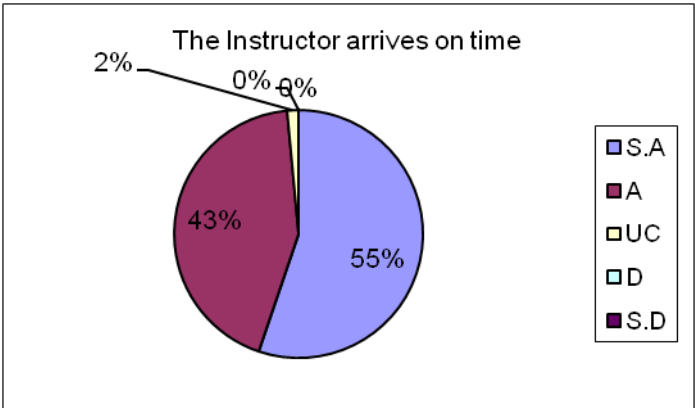
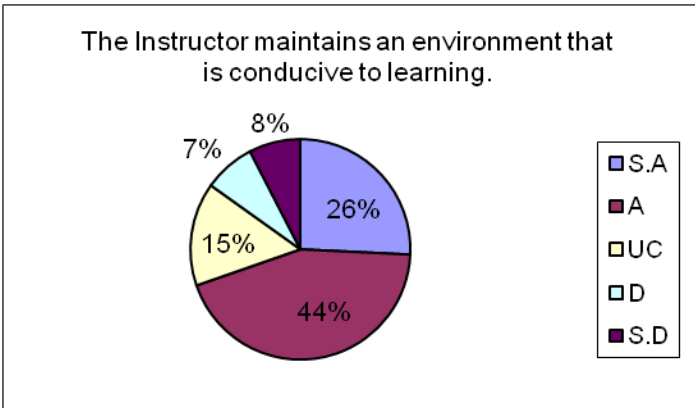
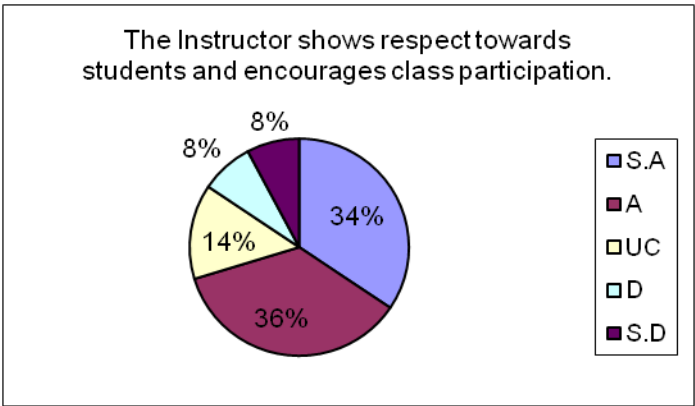
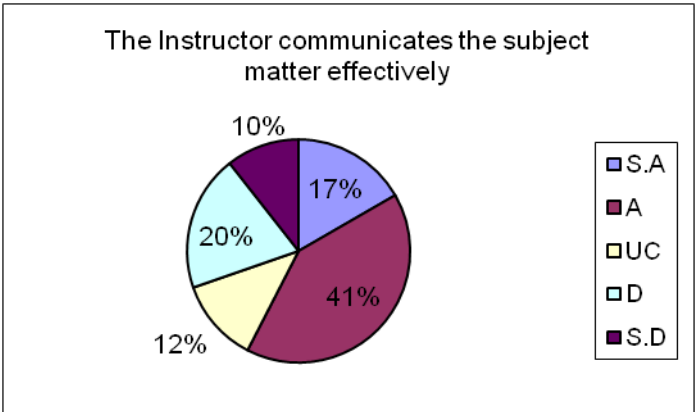
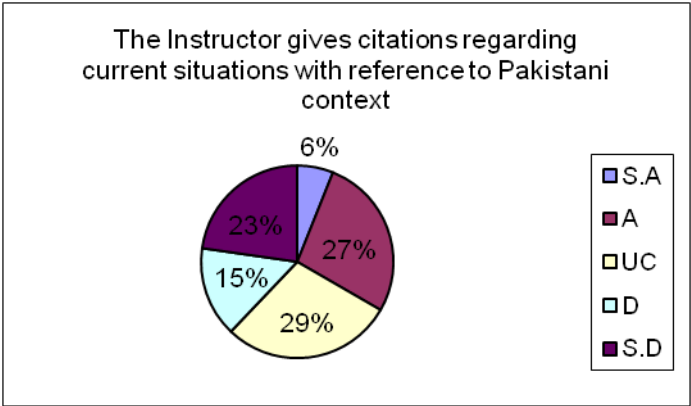


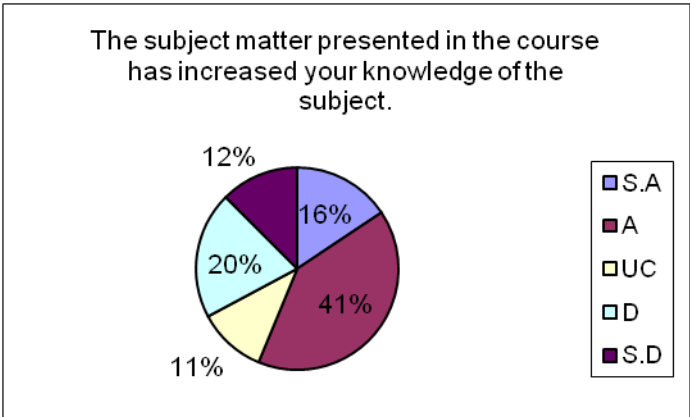
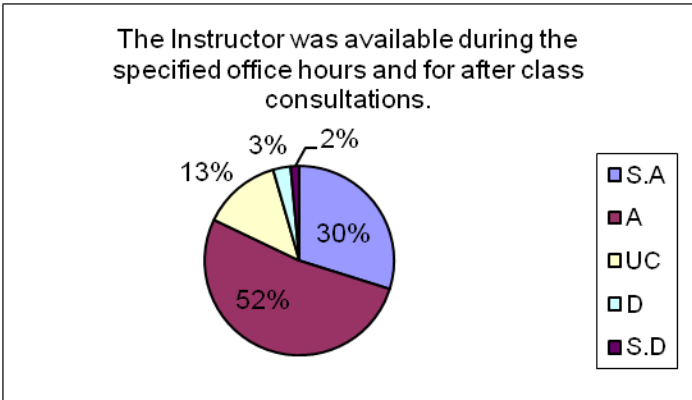
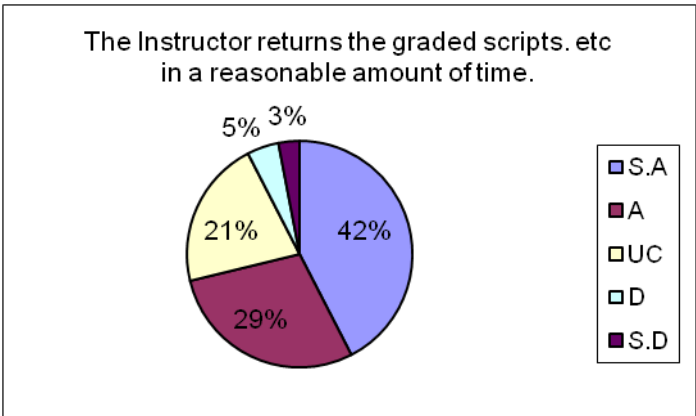
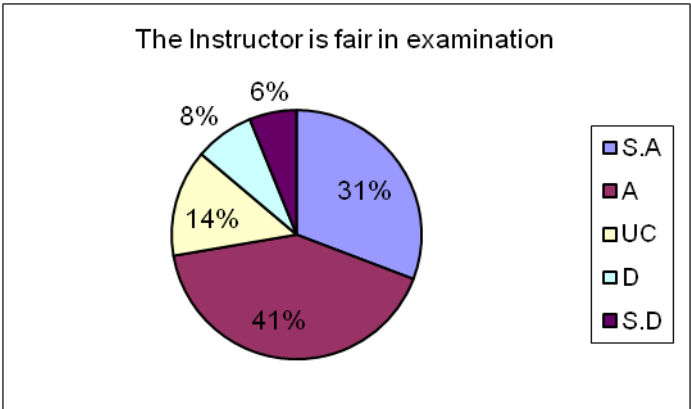
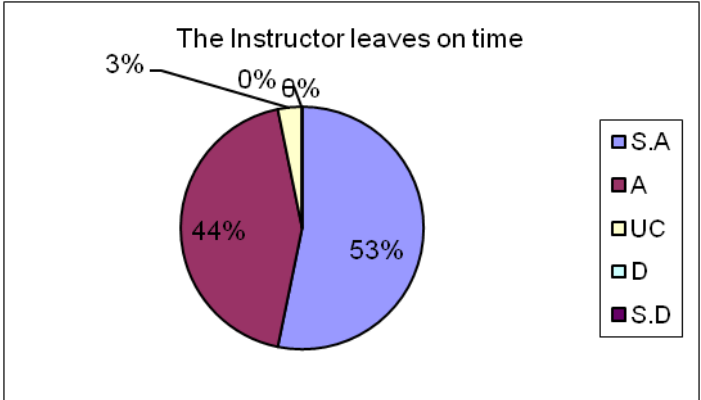


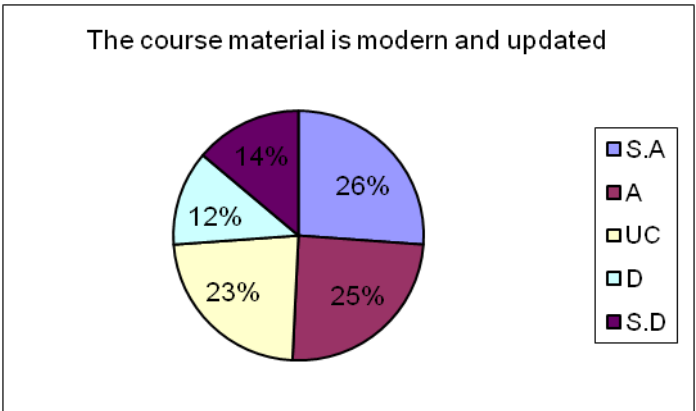
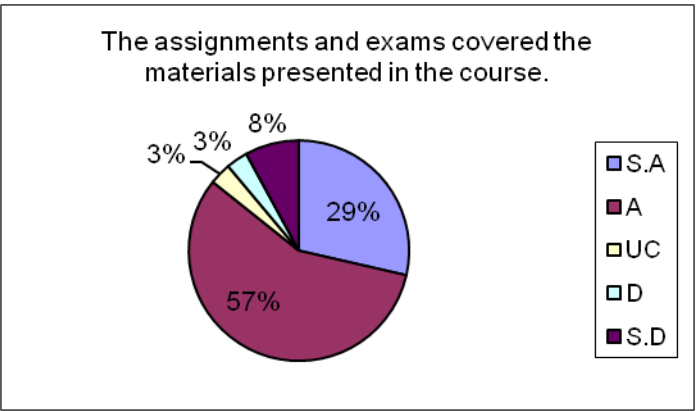
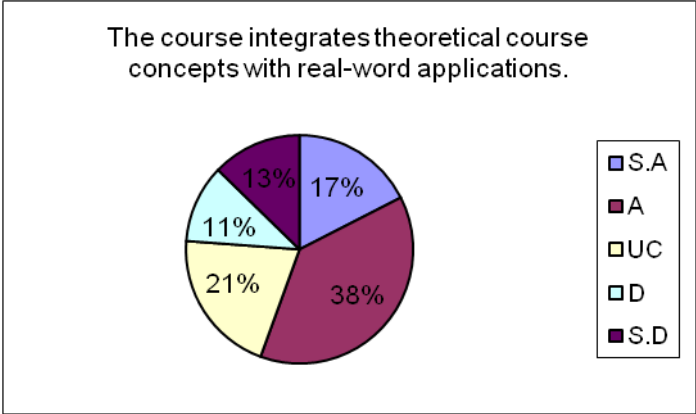
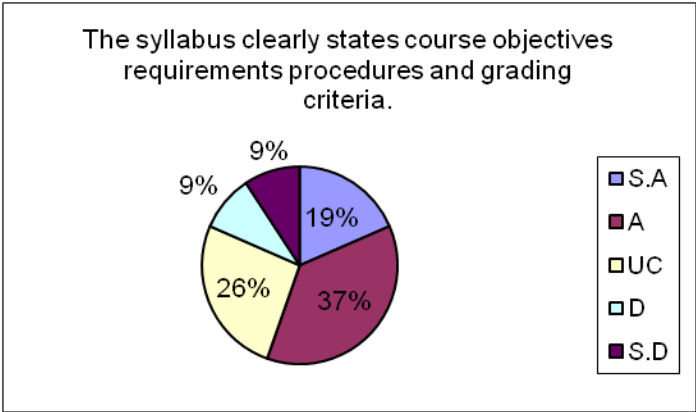
Result of Proforma 10 of Teacher 2 – (BCH-703)

The results of proforma no. 10 for teacher 2 clearly shows that 50-57% studnts either strogly agreed or agreed regarding insturctur's over all performance as a assignments and exams covered the materials presented in the, availability during the specified house and after class and leaves the class on time .



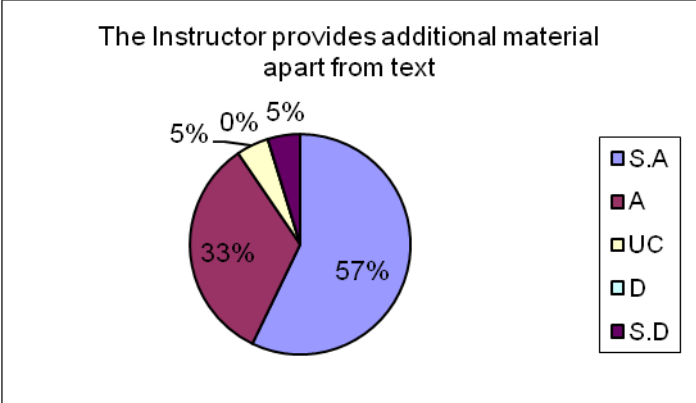
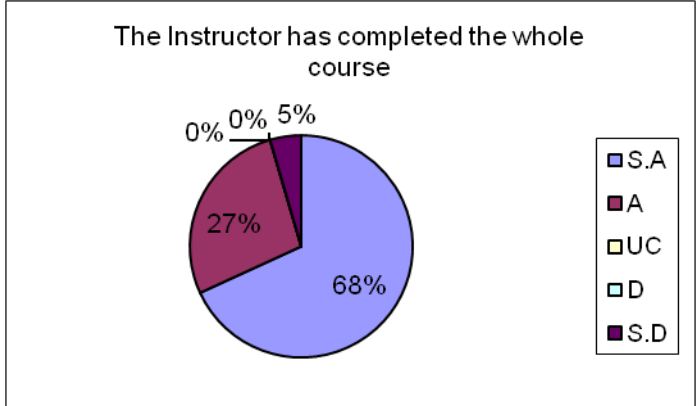
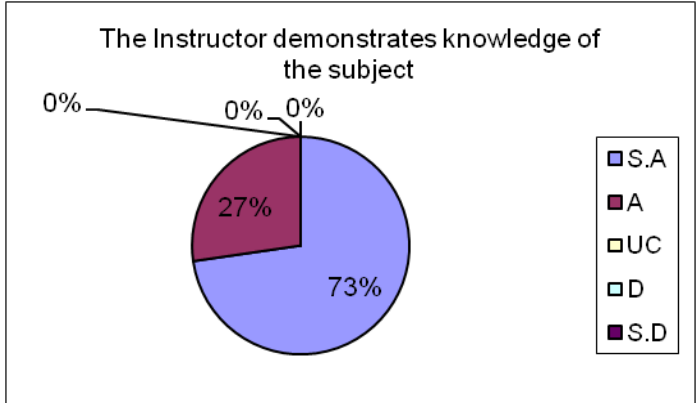
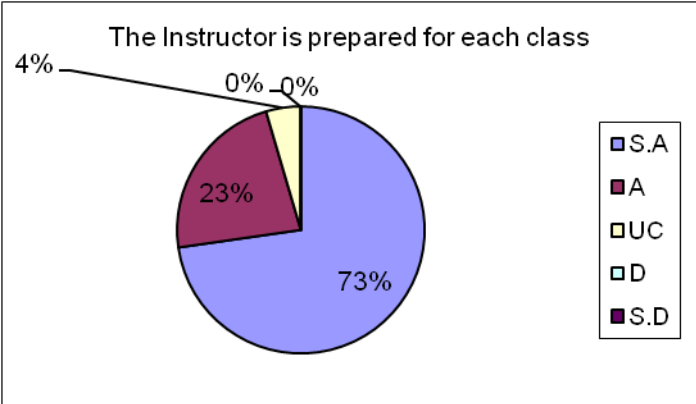


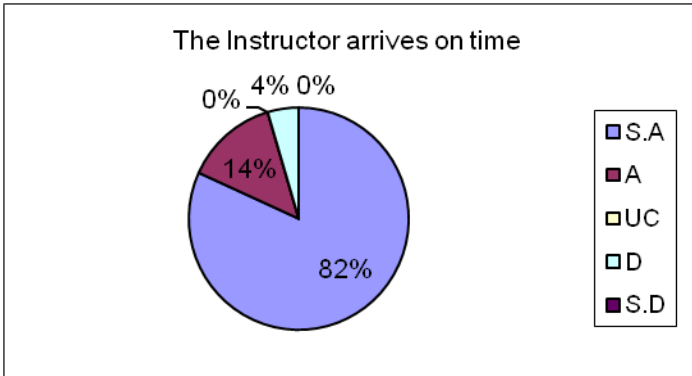
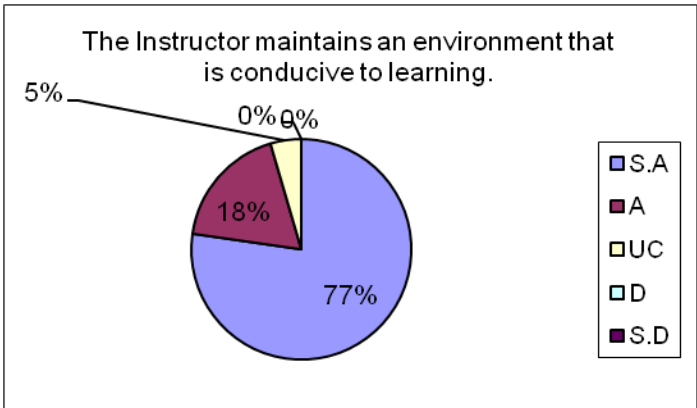
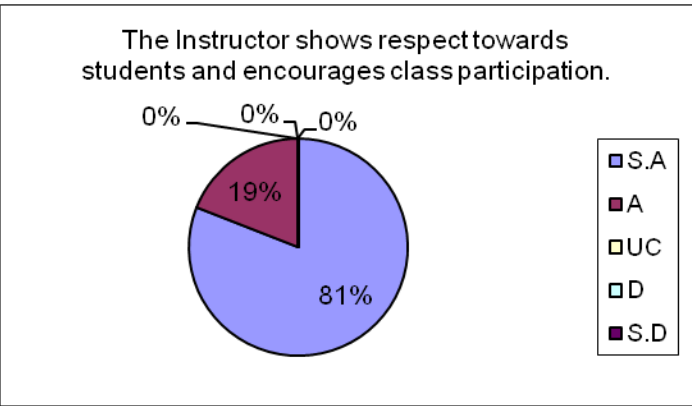
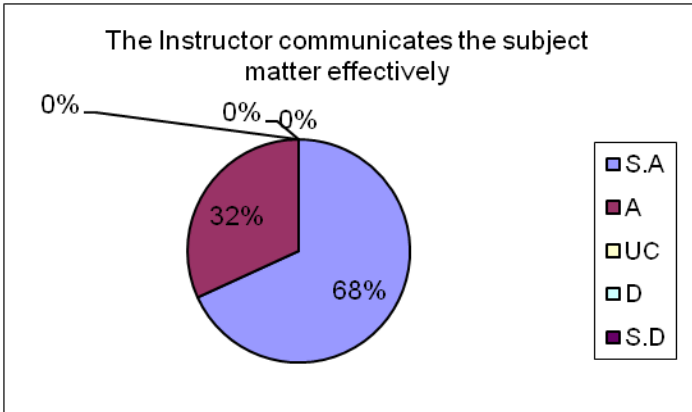
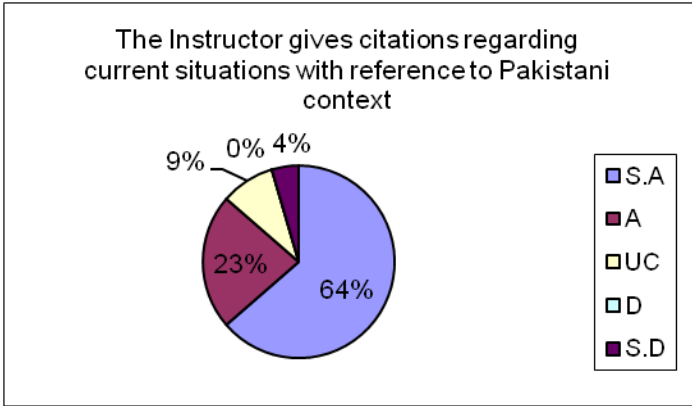


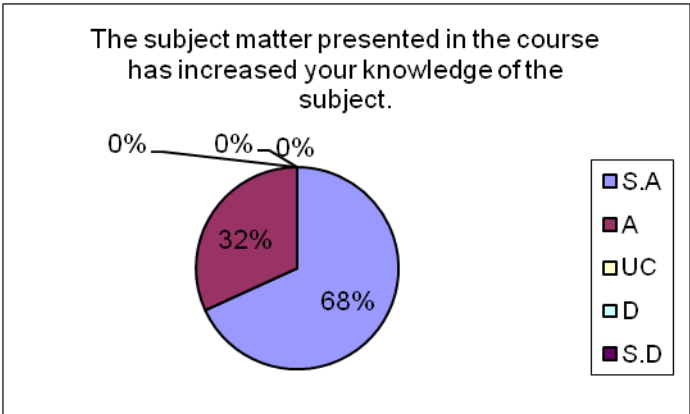
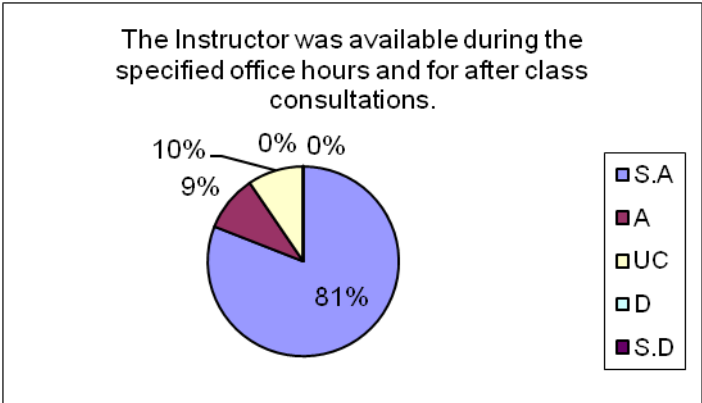
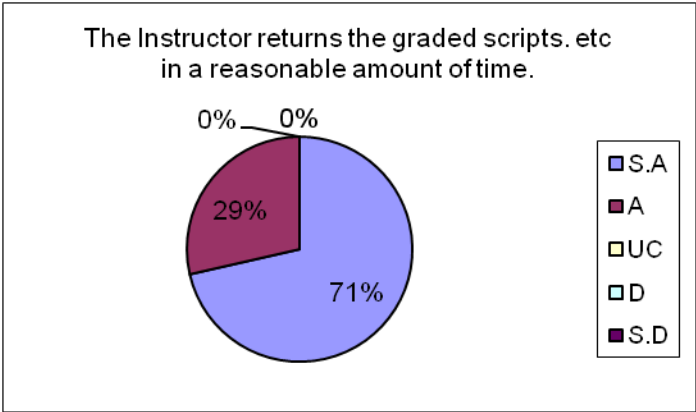
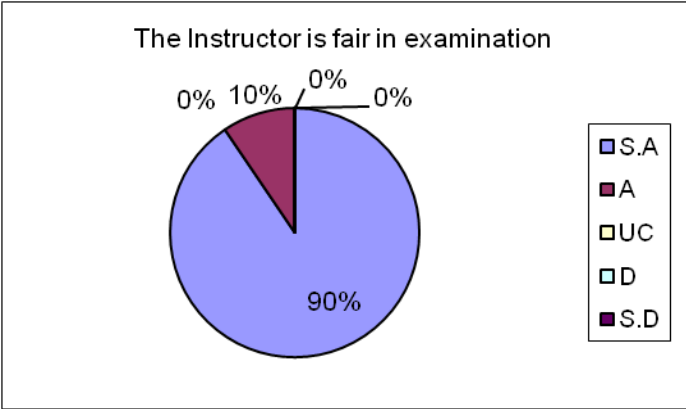
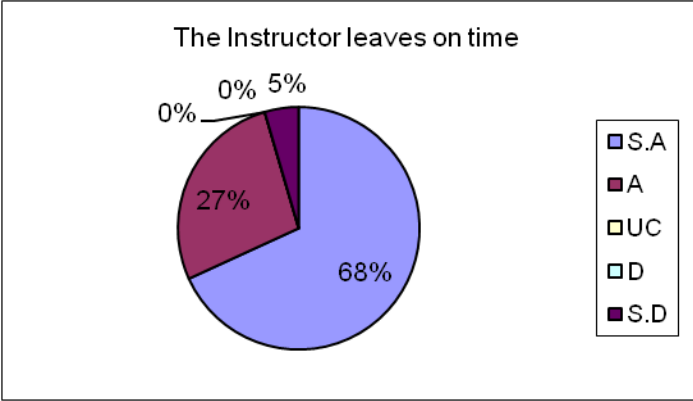


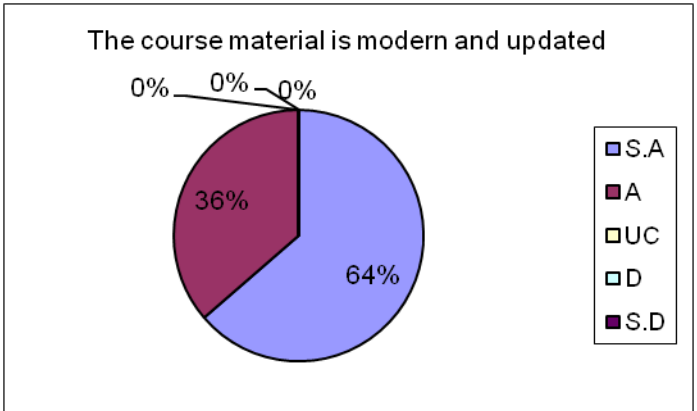
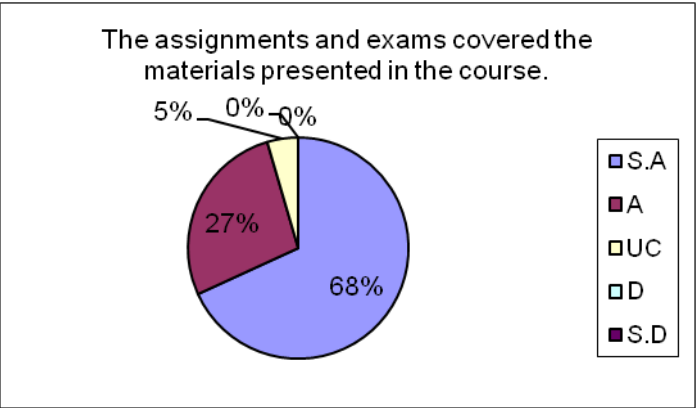
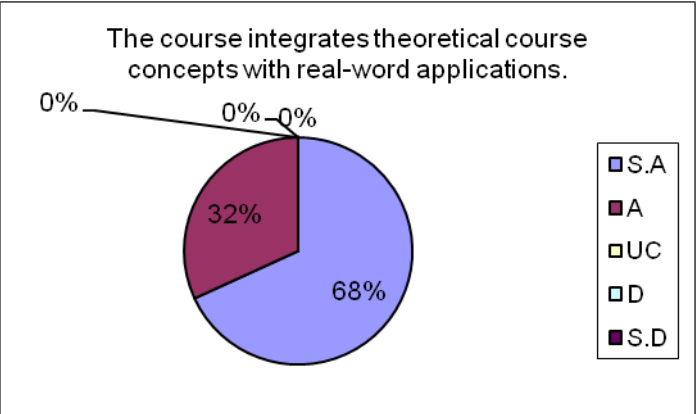
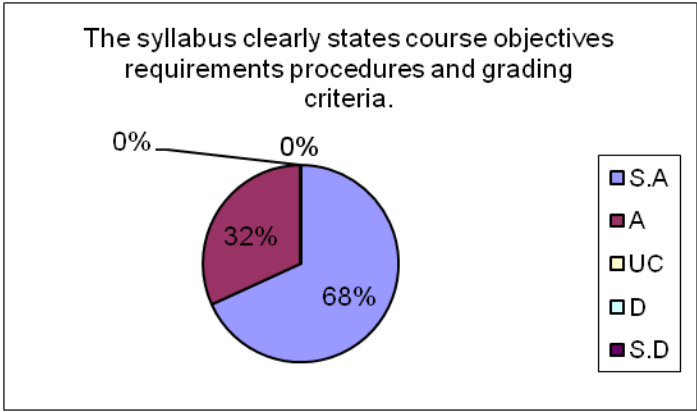
Result of Proforma 10 of Teacher 3- (BCH-724)

The overall compiled results of Teacher-3 showed that his best point is parameter 11 i.e. “The Instructor is fair in examination” the teacher secured 60% (strongly agreed and agreed) in the favour and 10% have agreed towards this point.



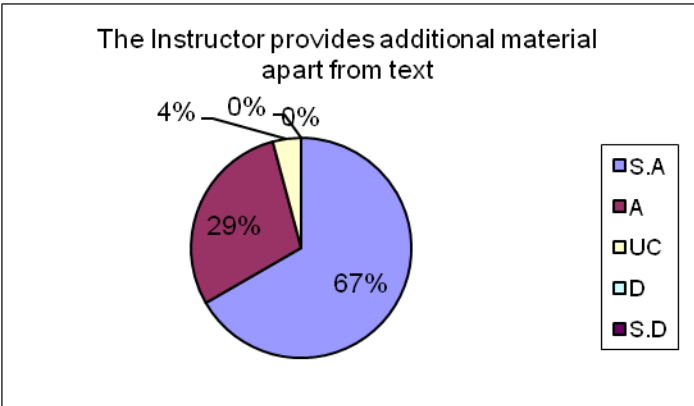
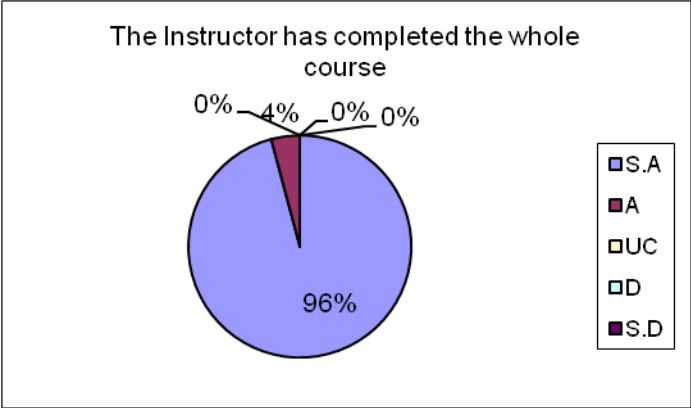
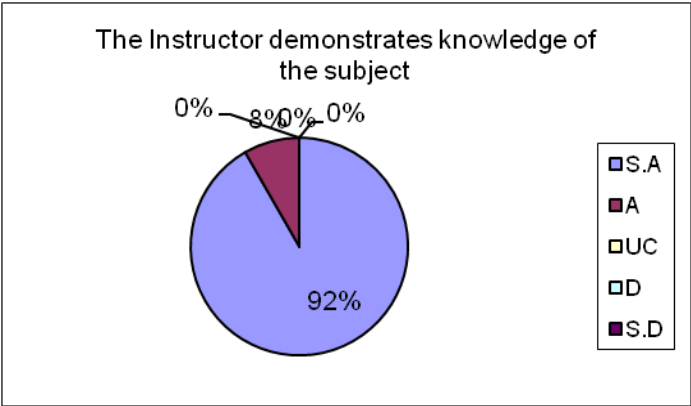
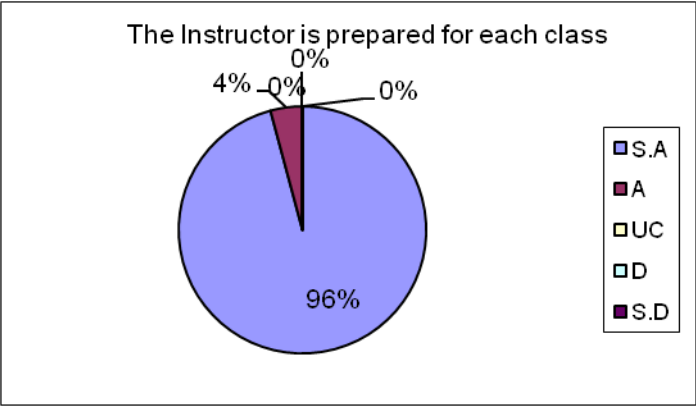


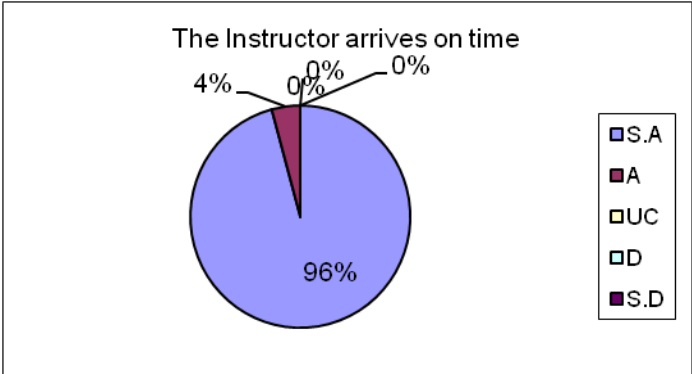
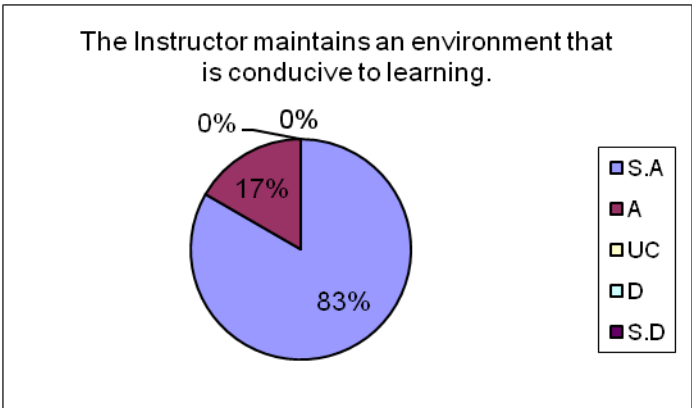
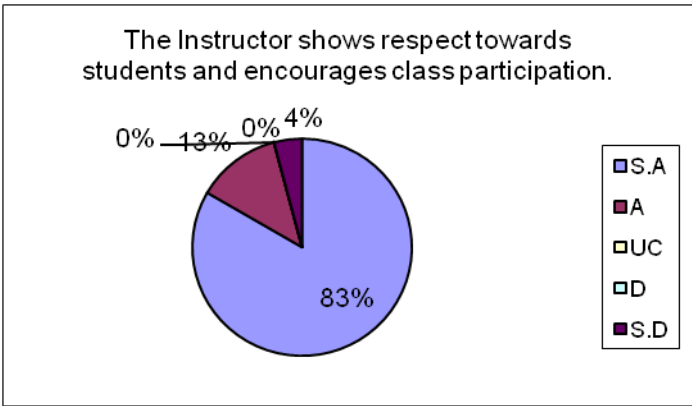
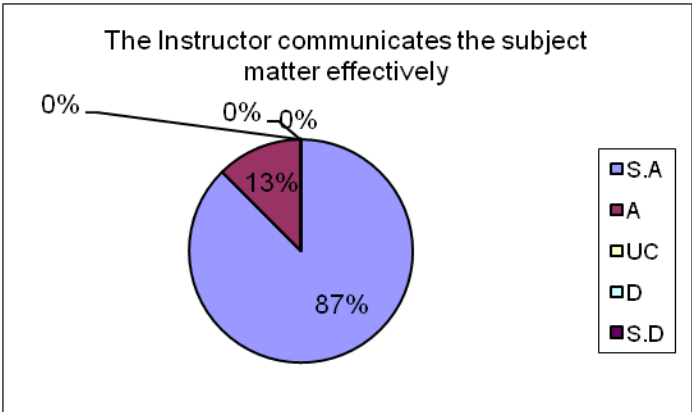
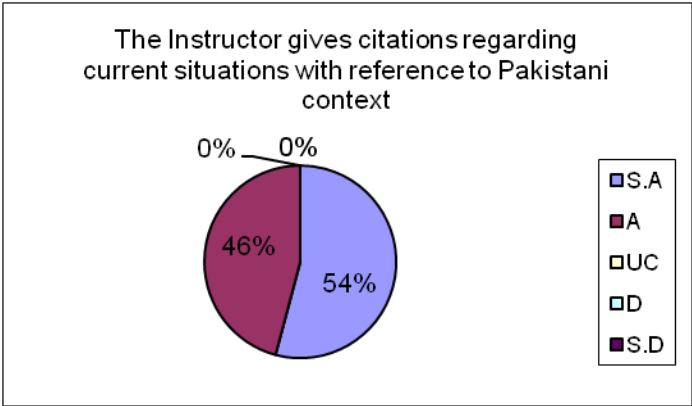


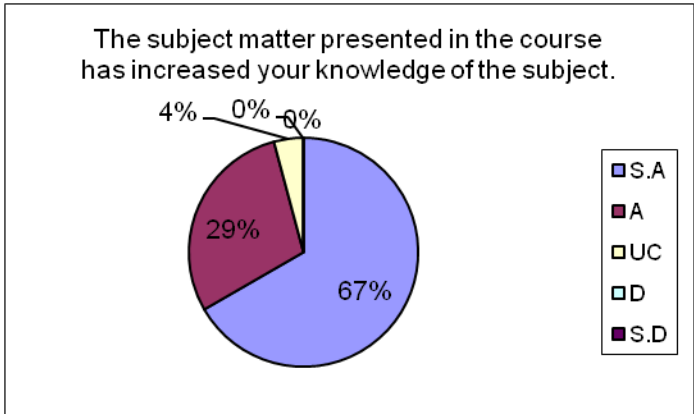
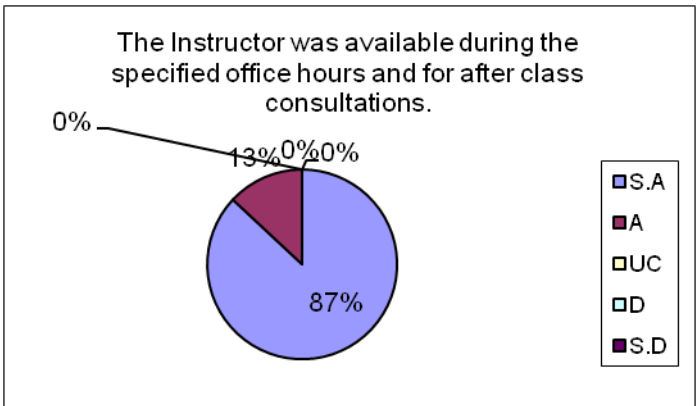
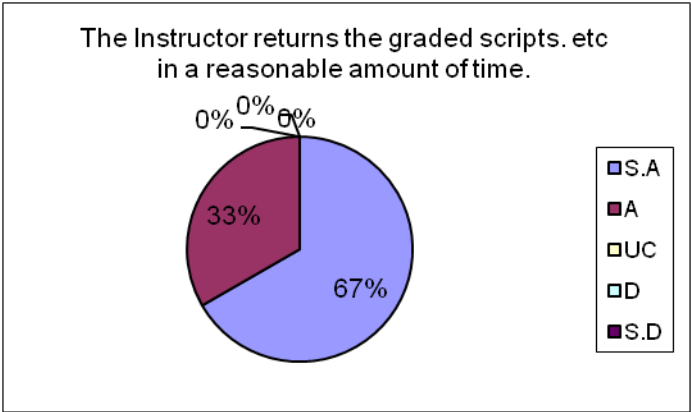
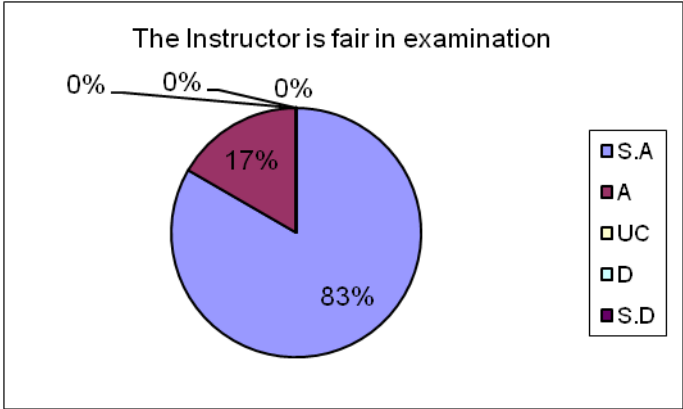
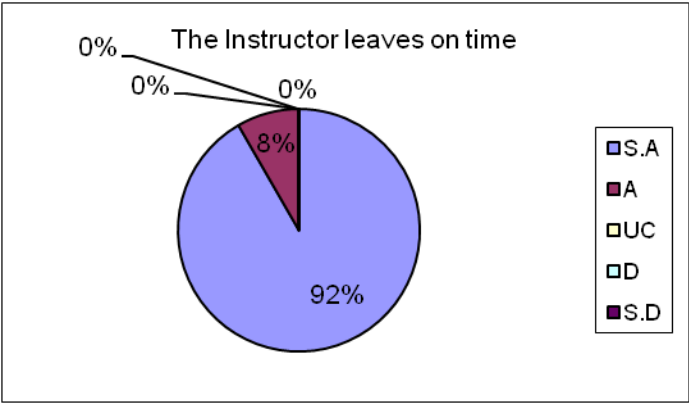


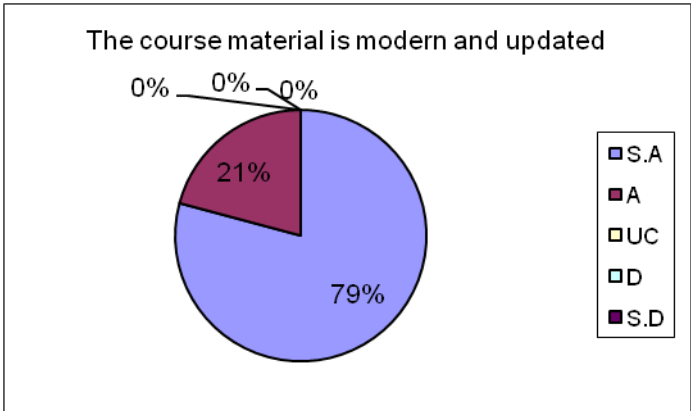
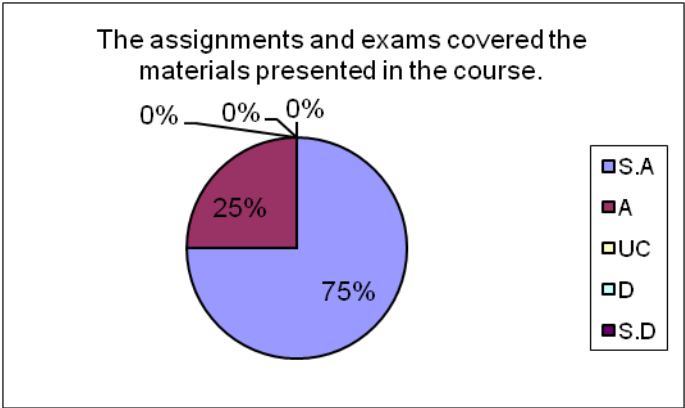
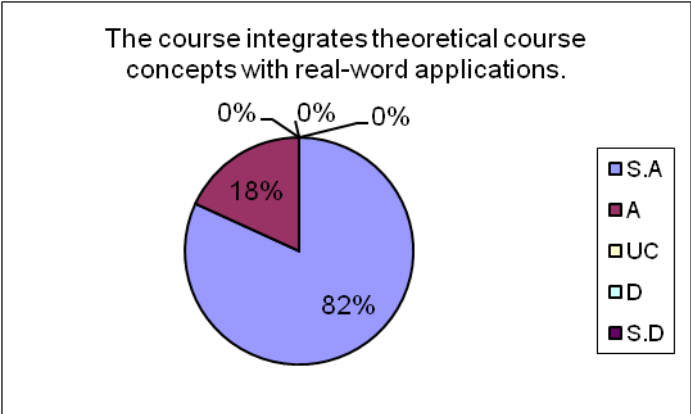
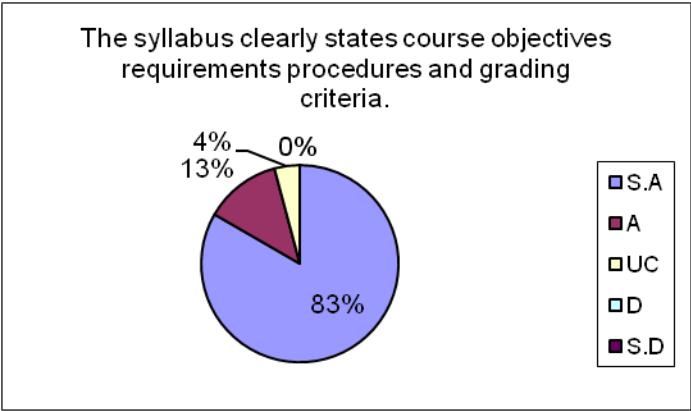
Result of Proforma 10 of Teacher 4 – (BCH-102)

Teacher performance assessment of Teacher 5 clearly indicates that 90-96% students were of view that instructor was well prepared for class, demonstrates knowledge of the subject and completed the whole course.



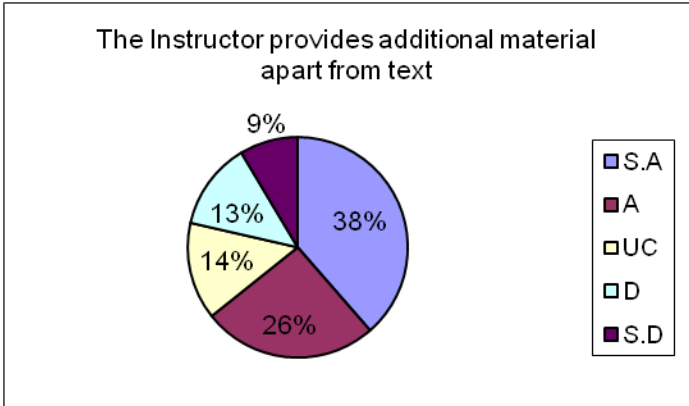
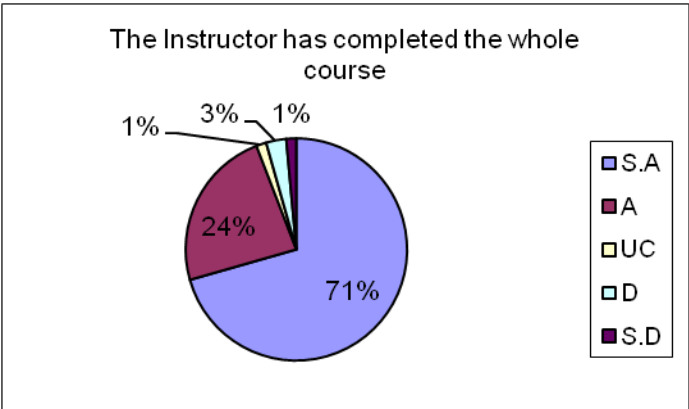
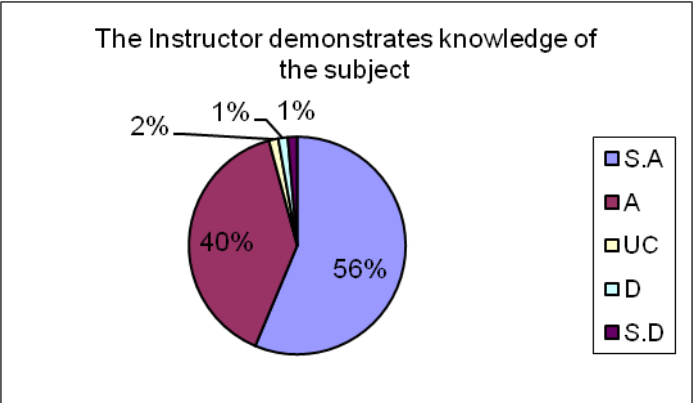
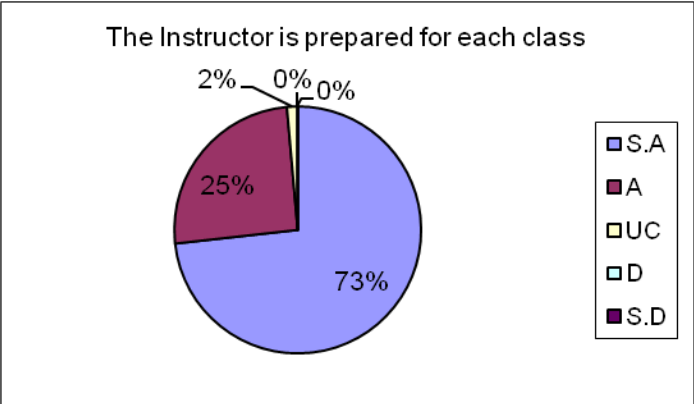


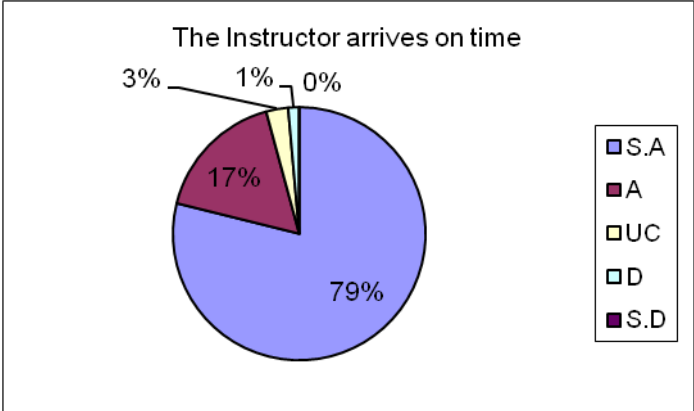
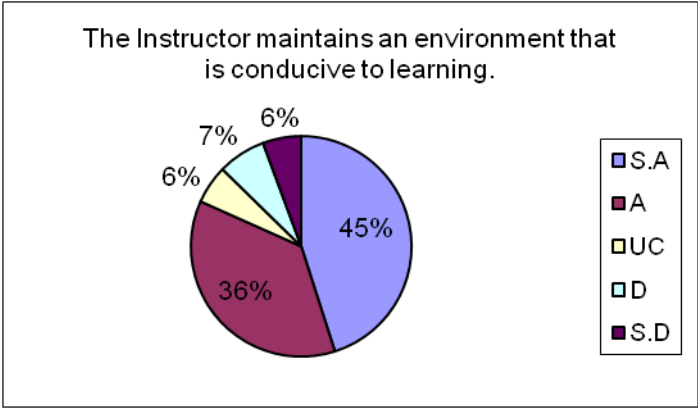
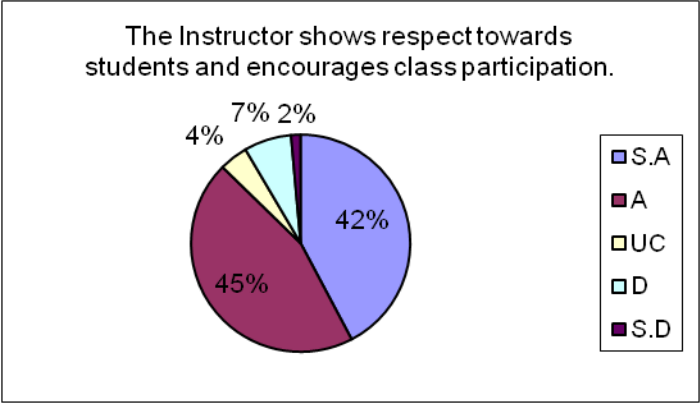
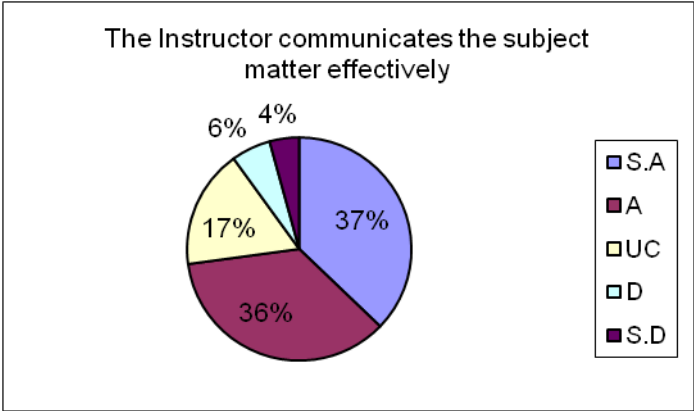
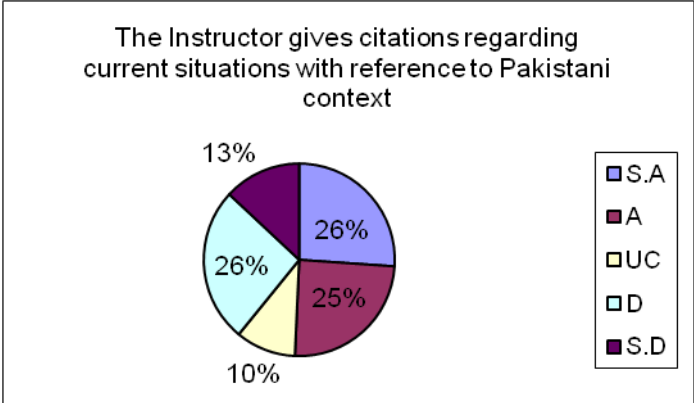


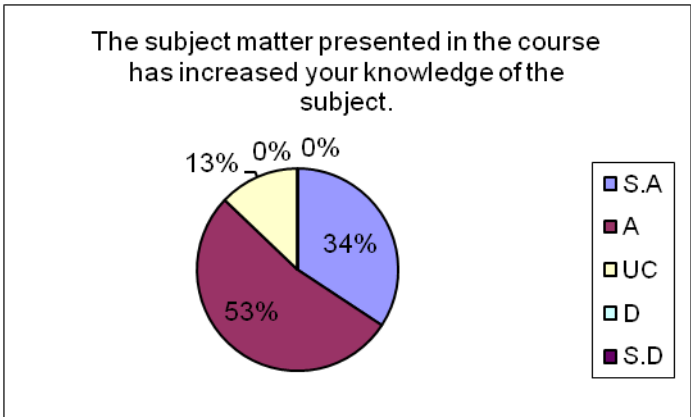
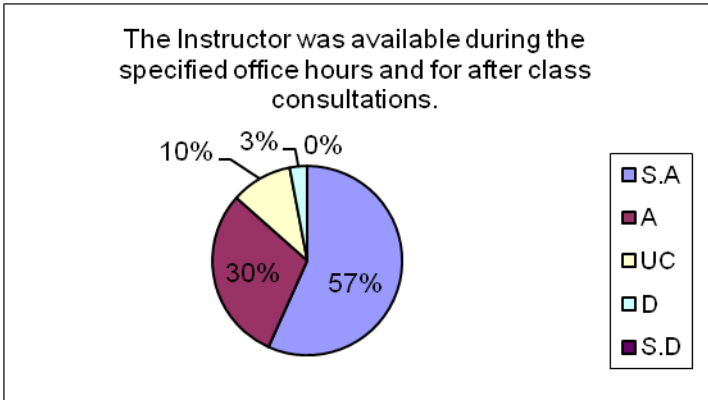
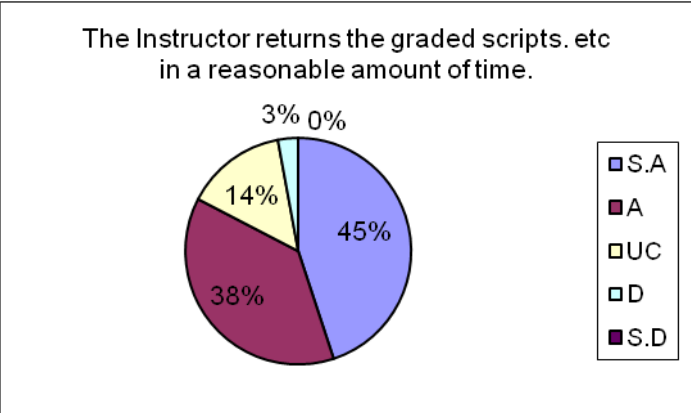
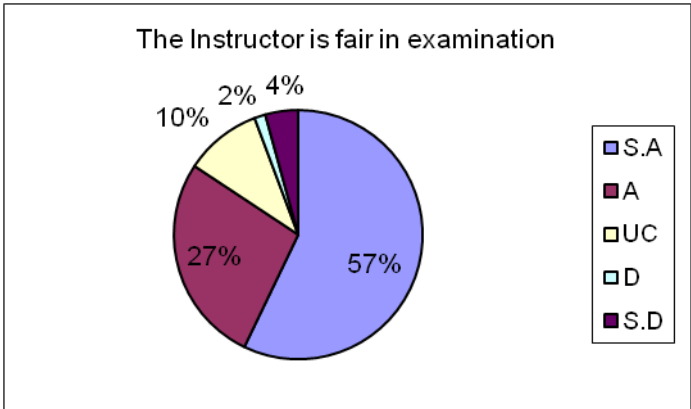
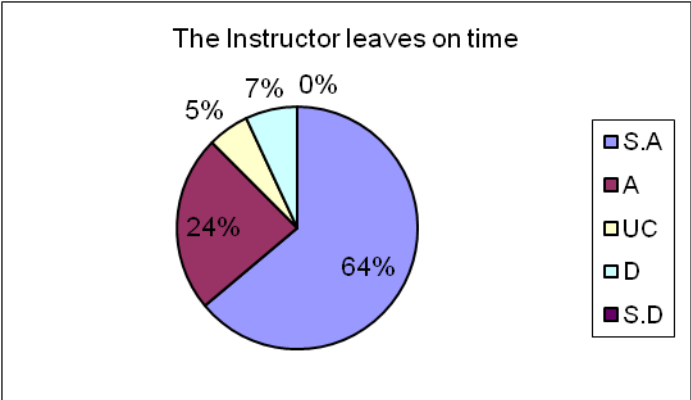


Result of Proforma 10 of Teacher 5 – (BCH-707)

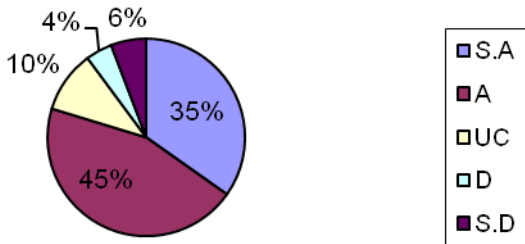
Teacher performance assessment of Teacher 5 clearly indicates that 70-79% students were of view that instructor was well prepared for class, complete the whole couser, arrive on time and course material is modern and updated



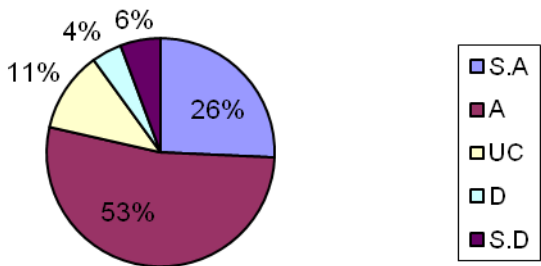




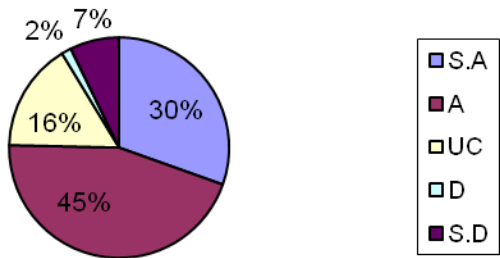
The syllabus clearly states course objectives requirements procedures and grading criteria.



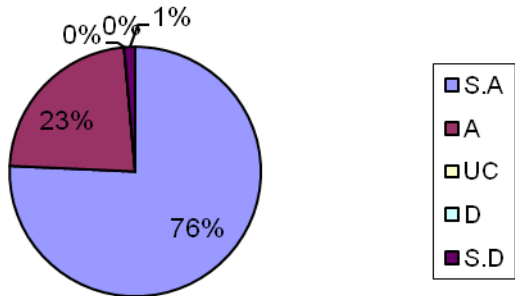
The course integrates theoretical course concepts with real-word applications.



The assignments and exams covered the materials presented in the course.



The course material is modern and updated

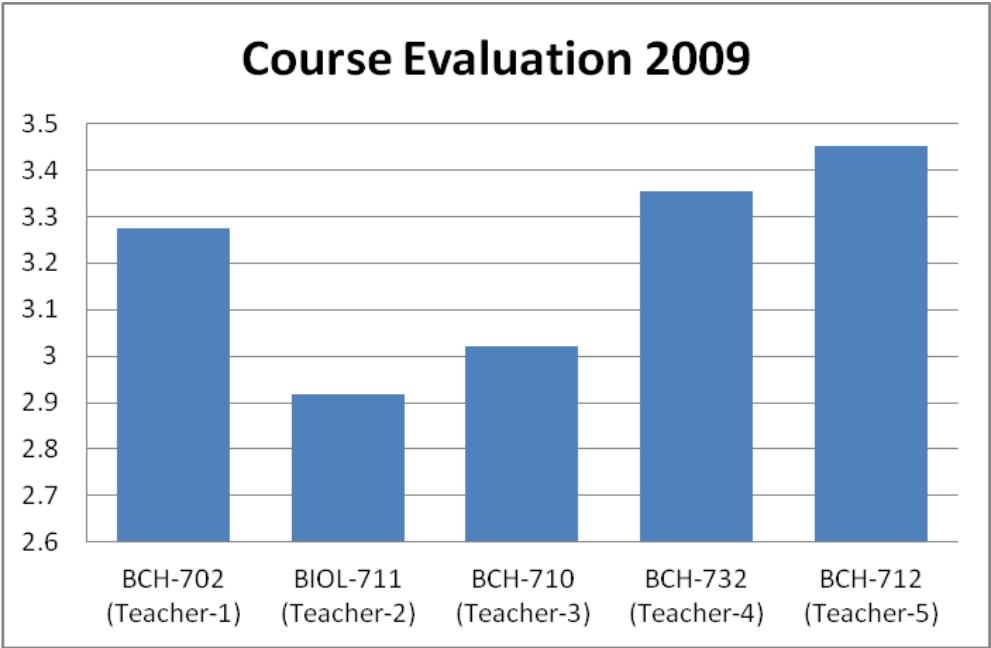


Student Course Evaluation:

Over all Results of Proforma No. 1 Teacher 1, 2, 3, 4 and 5

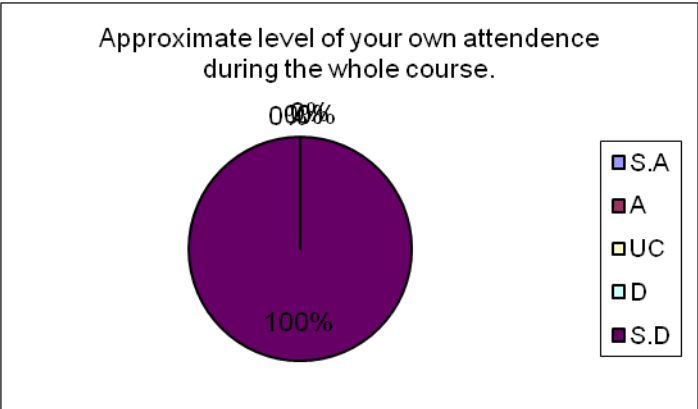
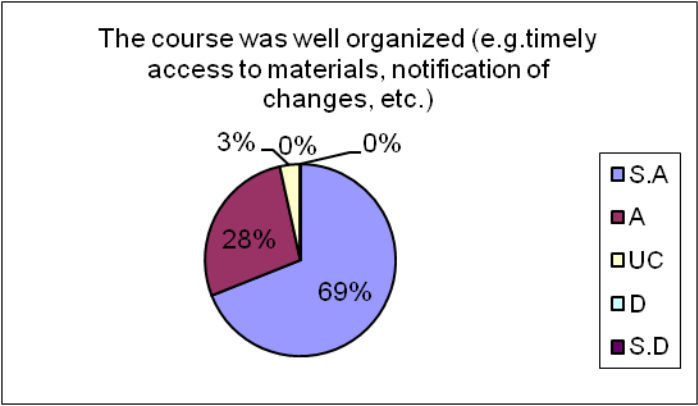
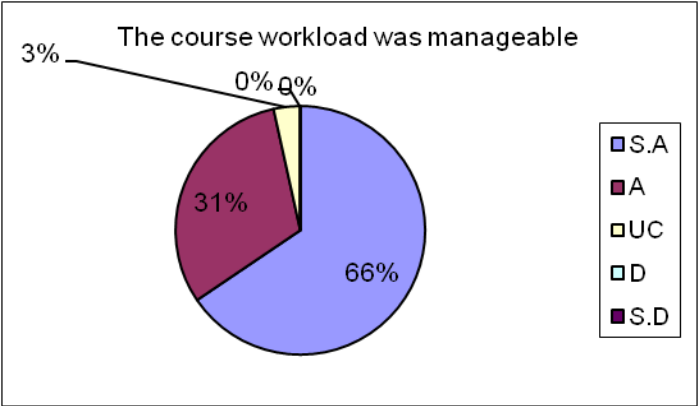
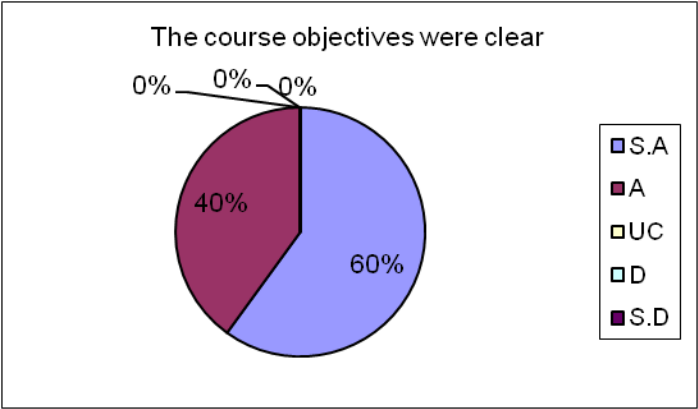
Performa No. 1, deals with study of course observation regarding design of course contents (both theoretical and practical), its relevance with subject and teaching material. It also emphasizes on instructor’s role in, not only completing course within given time frame, but how’ instructor developed student’s interest in this course, used updated literature and was fair in evaluation at the end of a study course.

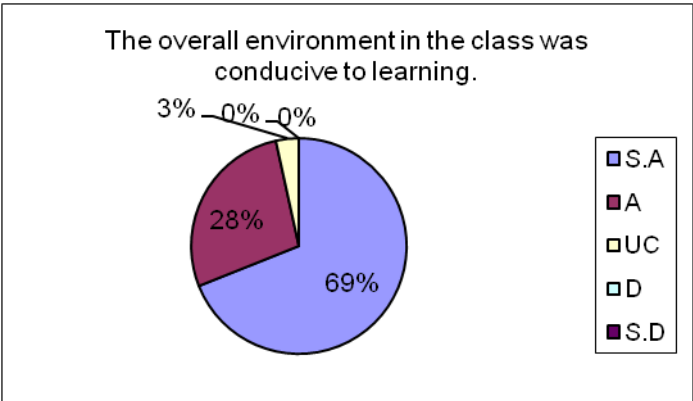
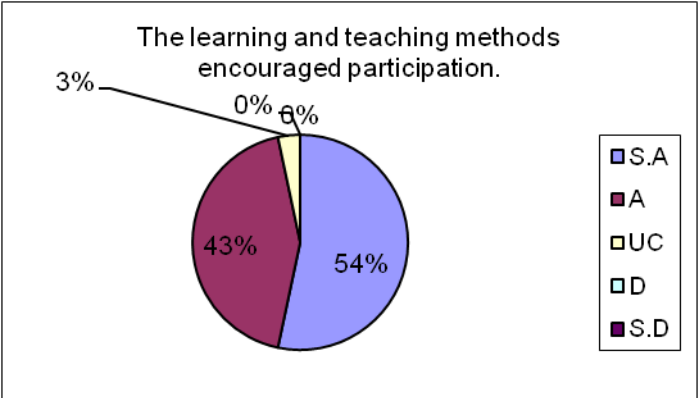
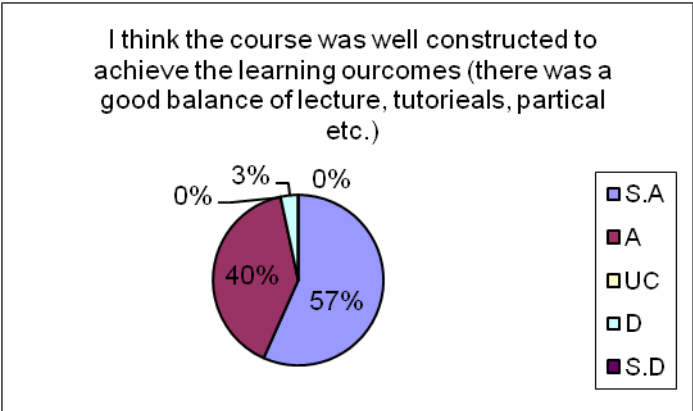
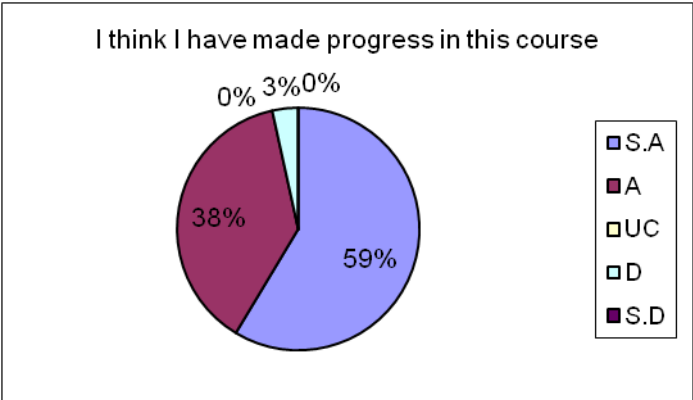
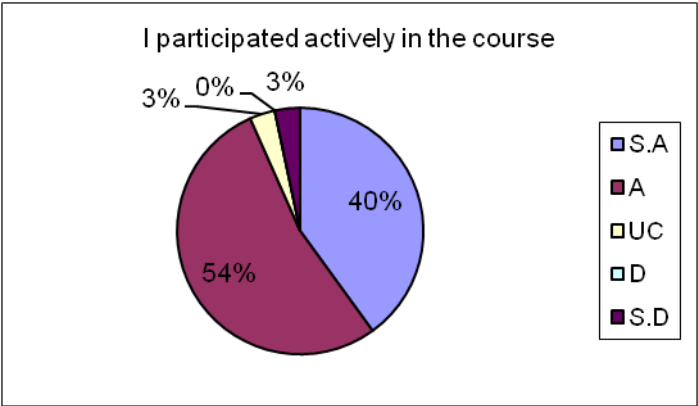
Overall results of Performa I evaluation performed for five teachers clearly show that on a scale of 3.5%, course evaluation ranged between 2.60-3.50. Teacher 1 averaged 3.20 as compared to Teacher 2 (2.90), Teacher 3 (3.00). Teacher 4 and 5 ranged between 3.30 and 3.40 respectively.

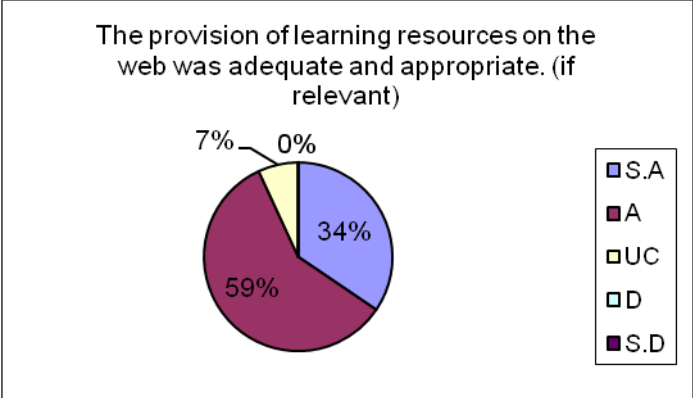
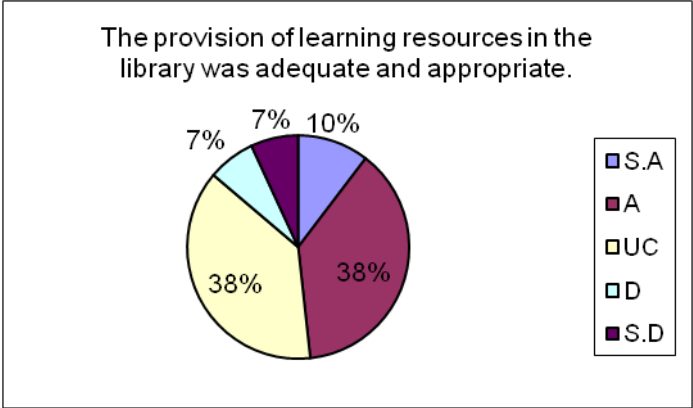
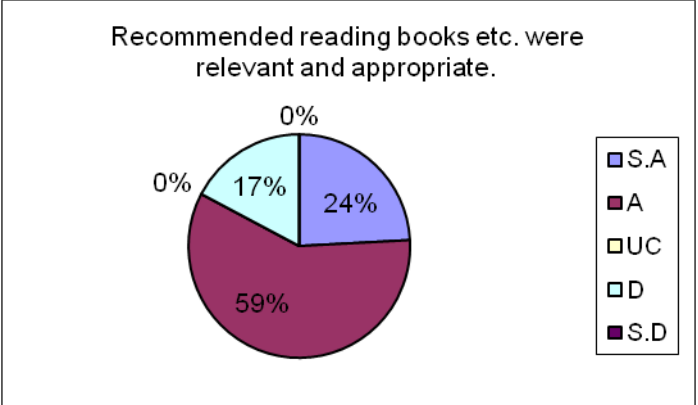
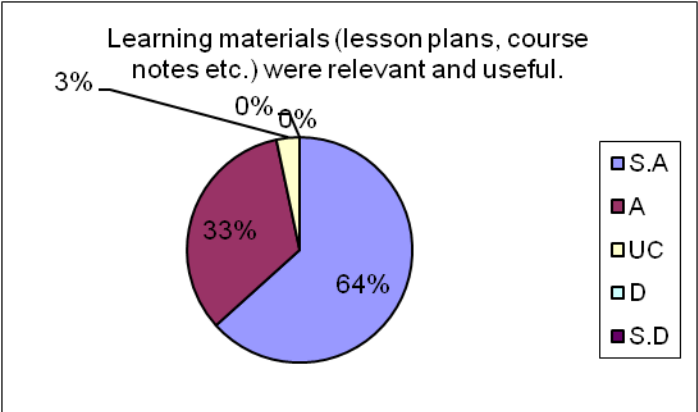
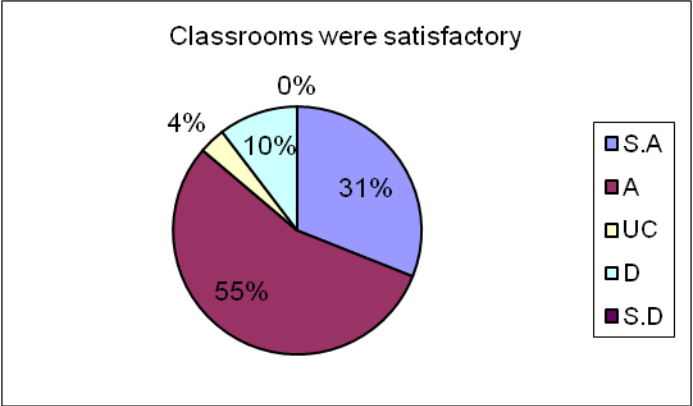


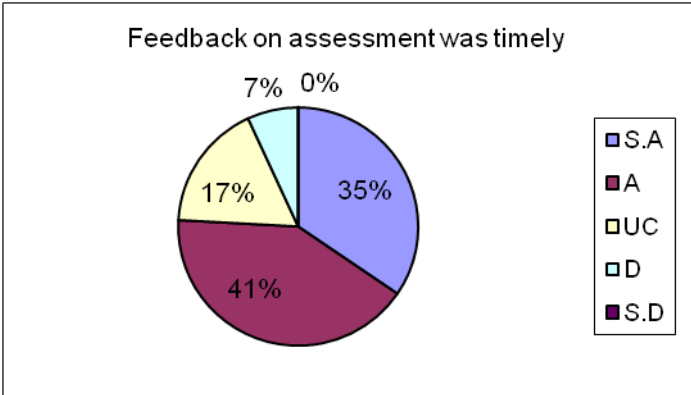
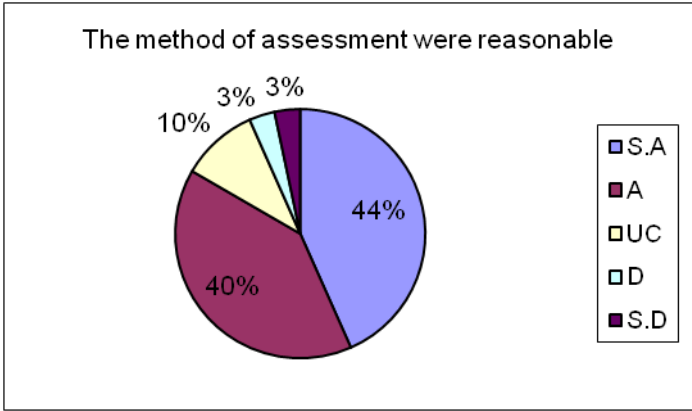
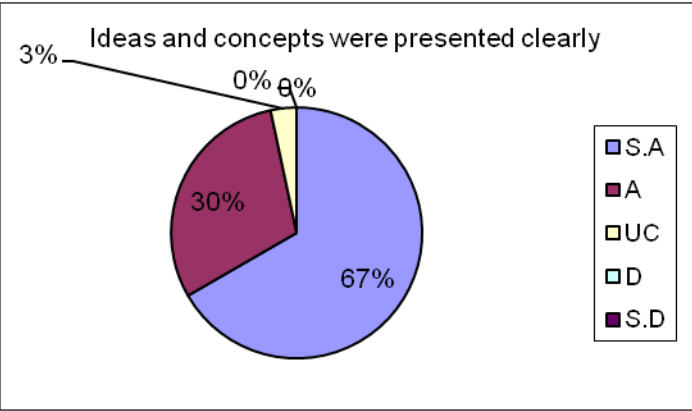
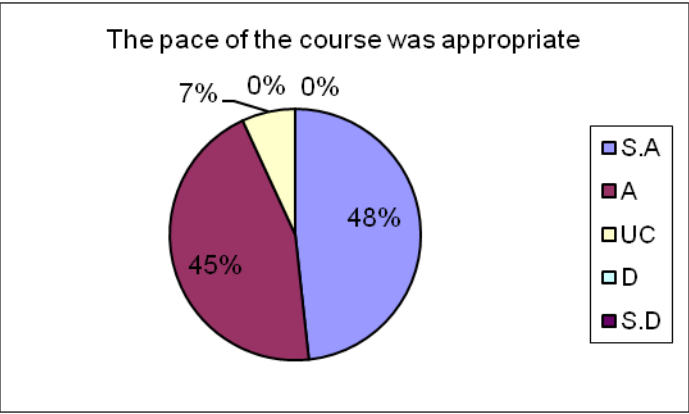
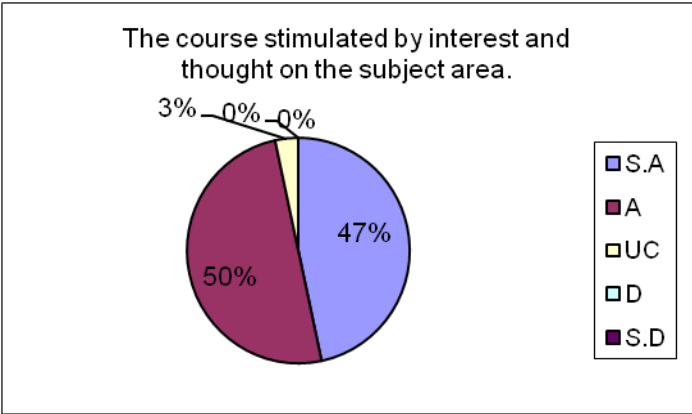
Results of Proforma No. 1 of BCH-702- (Teacher 1)

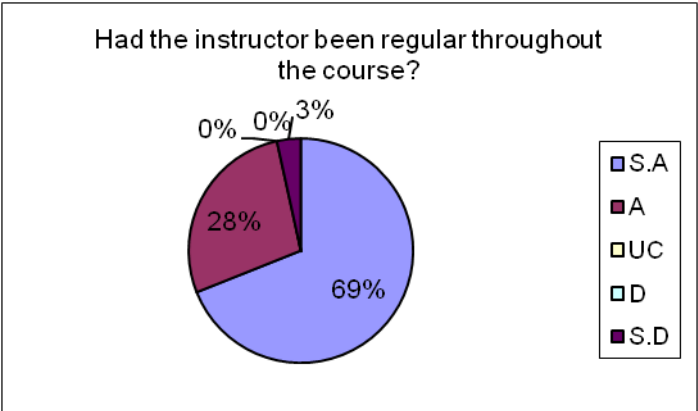
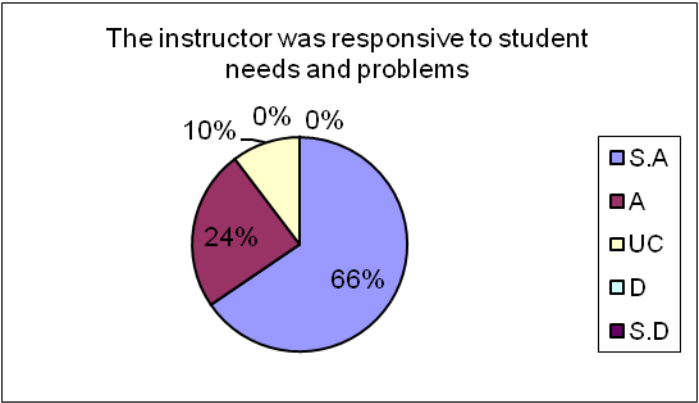
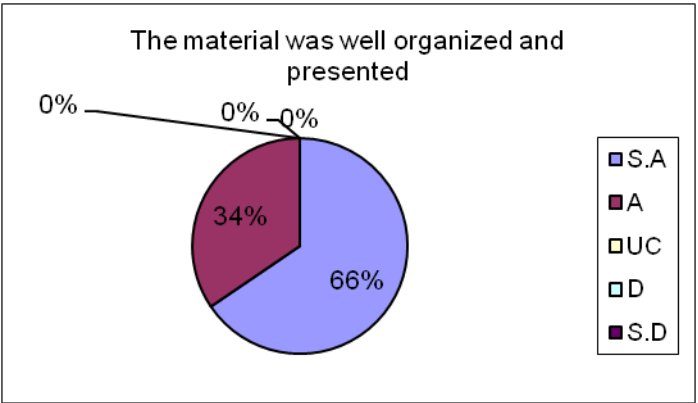
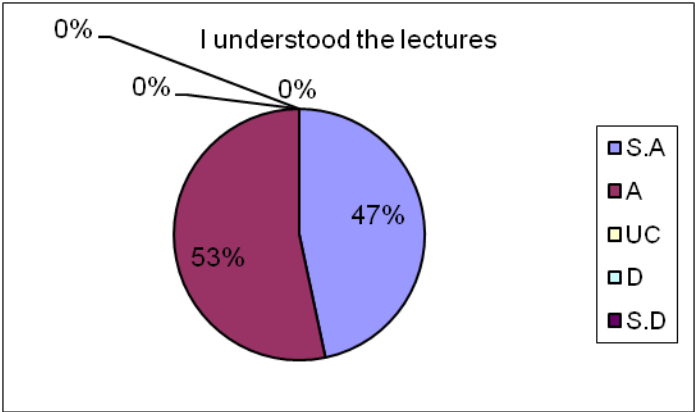
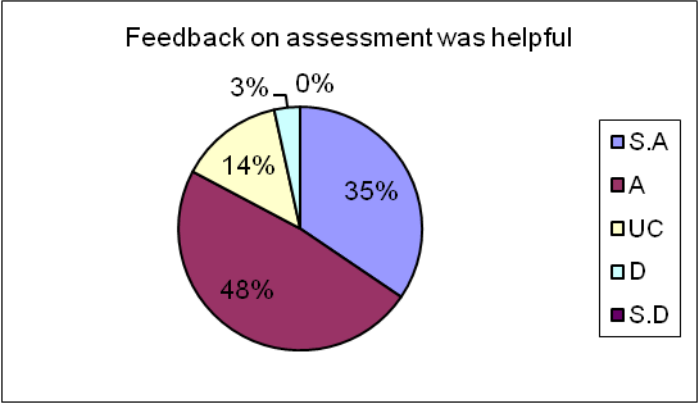
Depending upon the results of Performa.1, approximately 80-94% students either strongly agreed that materials in practical was useful 80% were of view that demonstrators dealt effectively with my problems. On the other hand 6% students either strongly disagreed/disagreed regarding the above mentioned criteria in Performa I evaluated for Teacher 1.

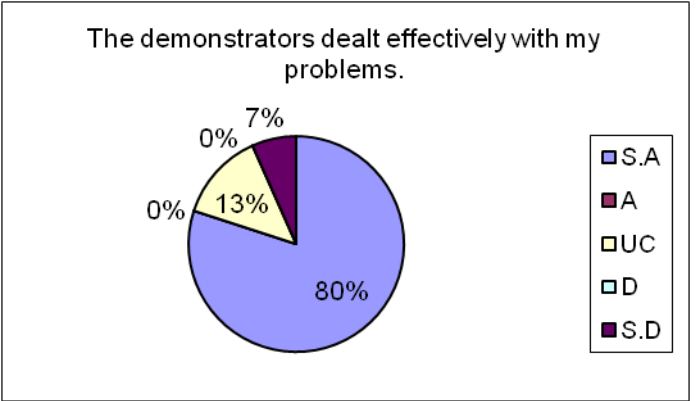
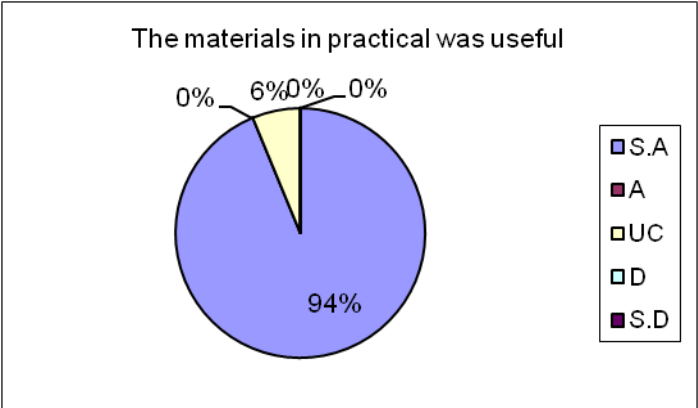
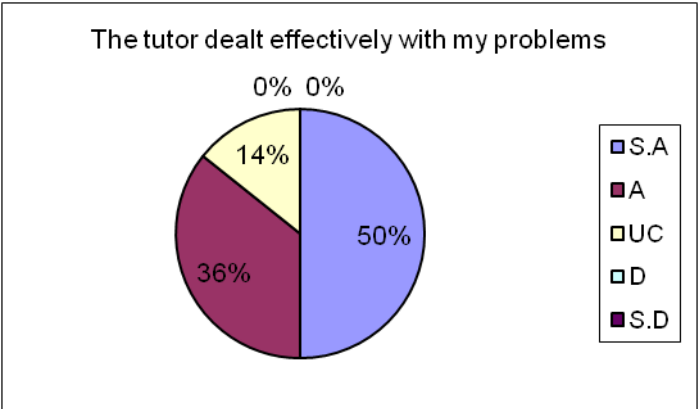
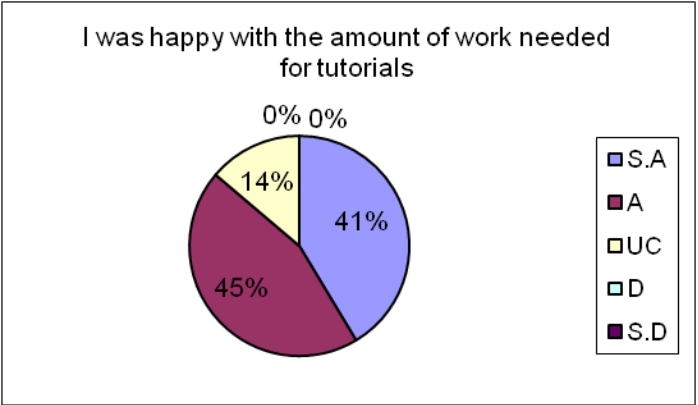
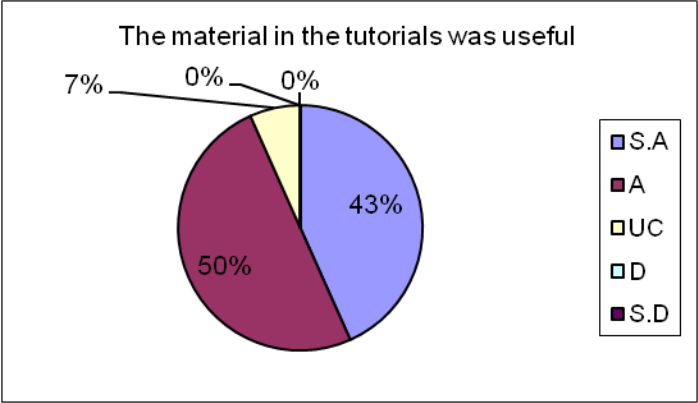






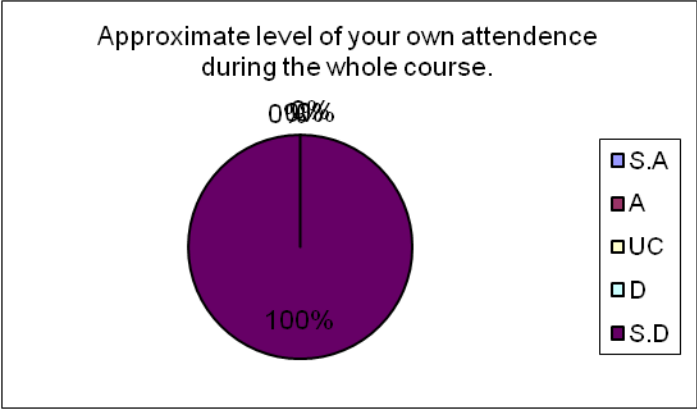
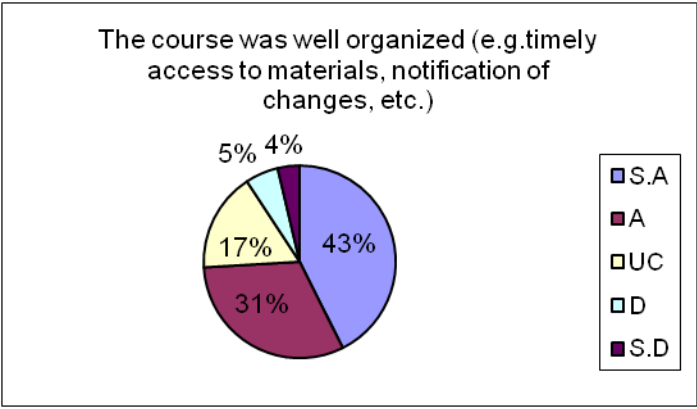
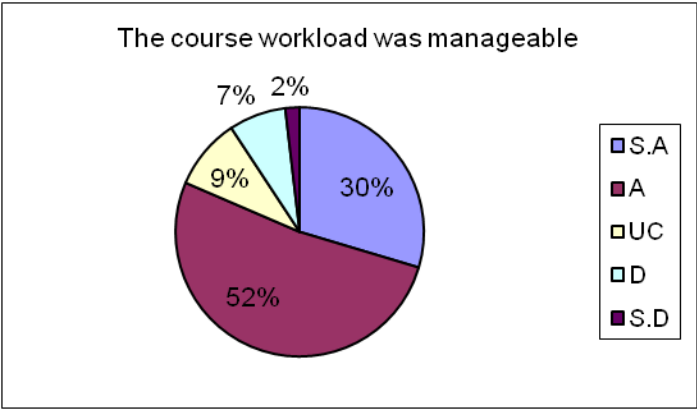
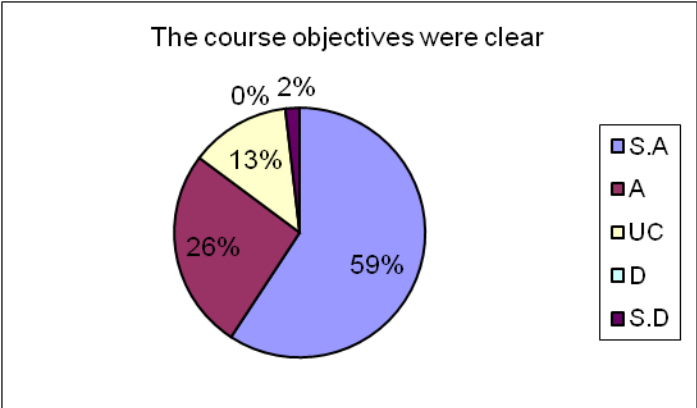


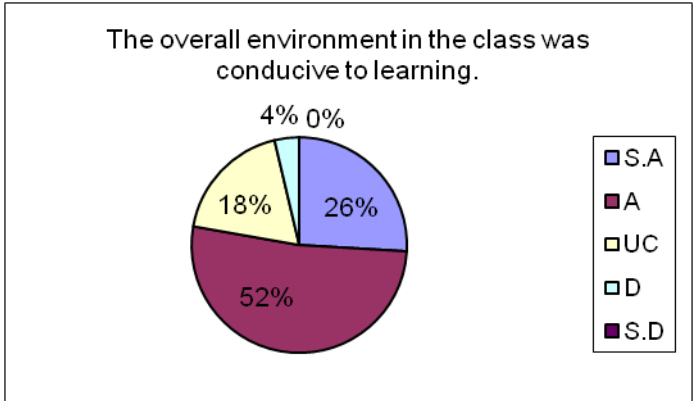
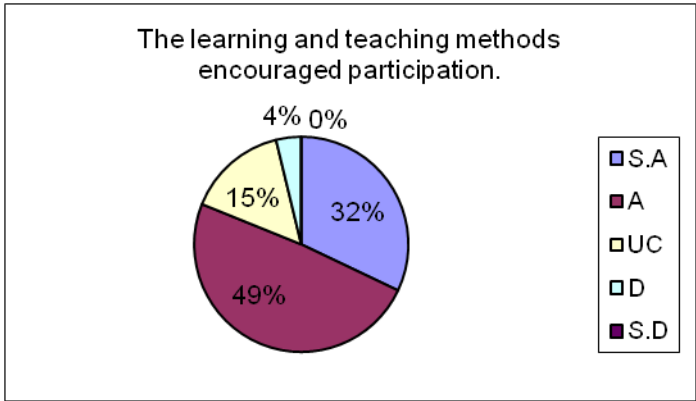
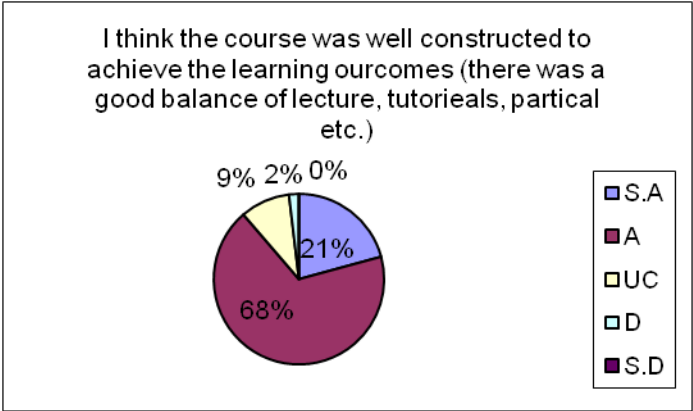
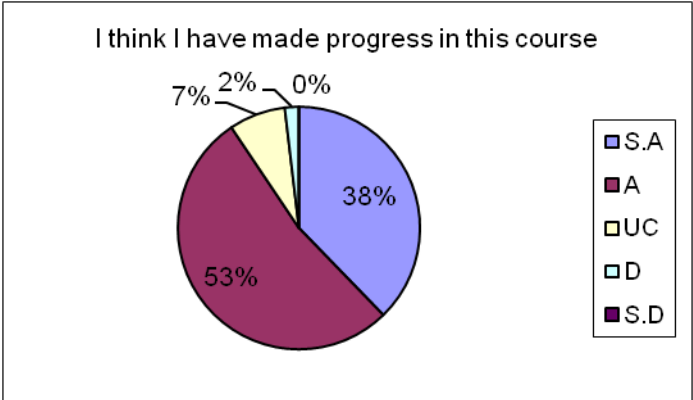
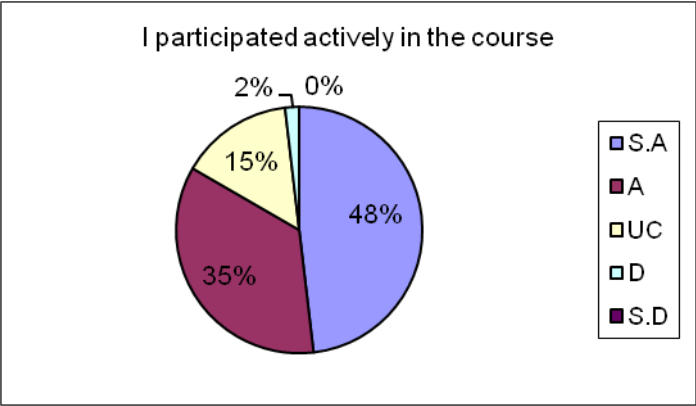


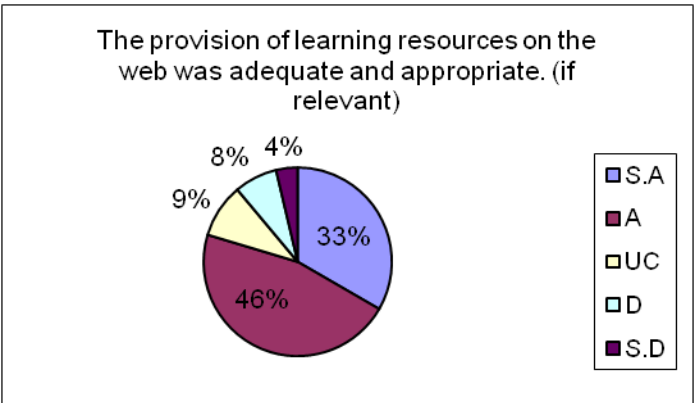
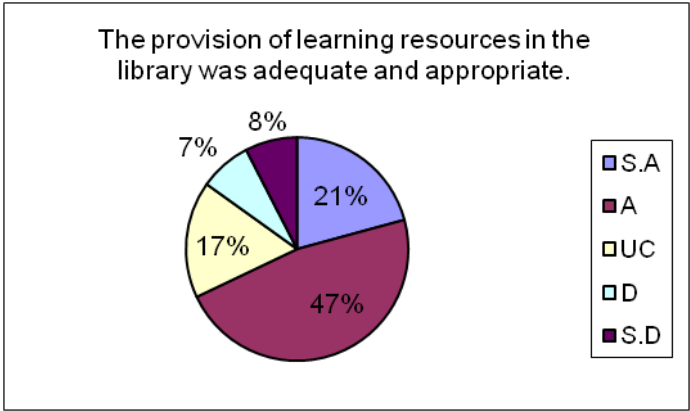
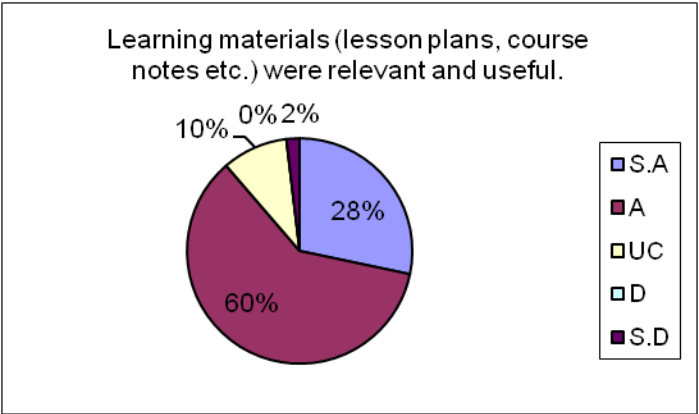
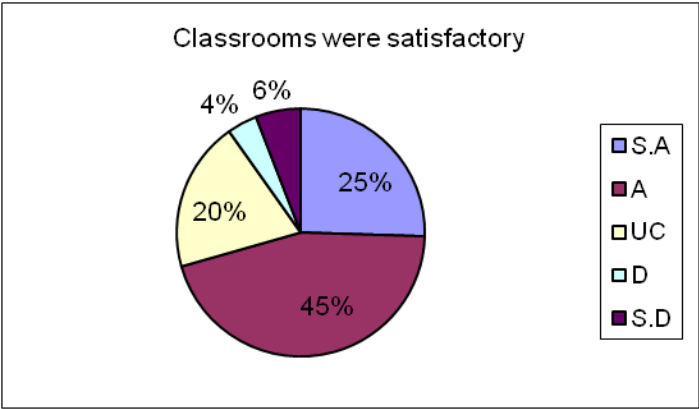


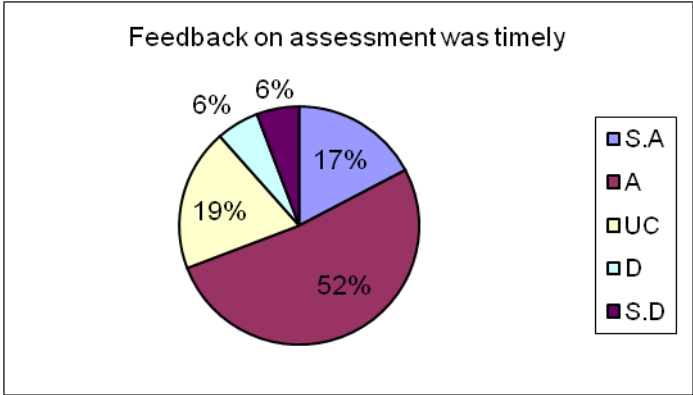
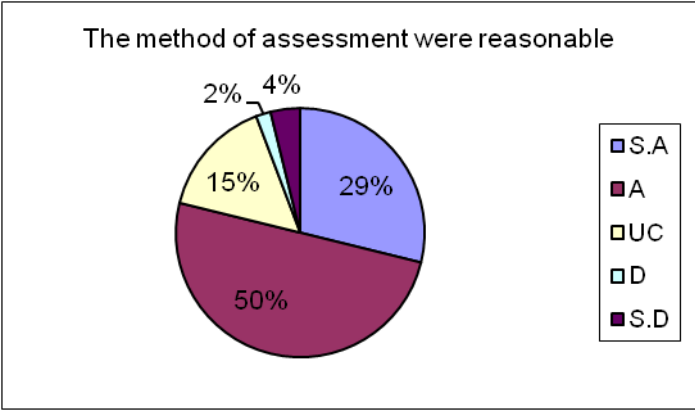
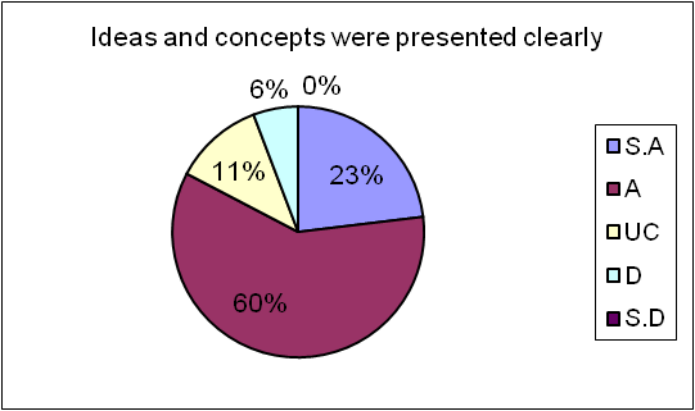
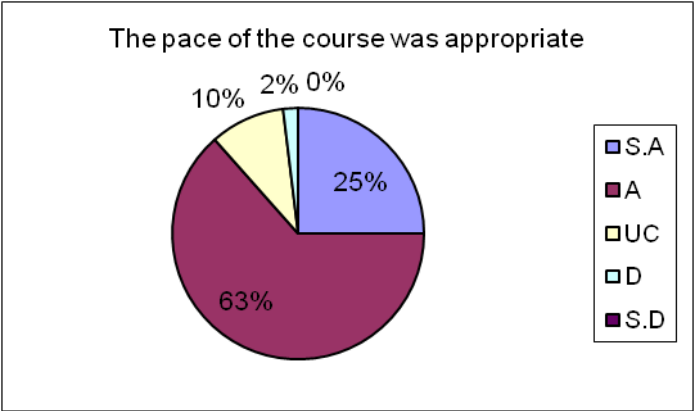
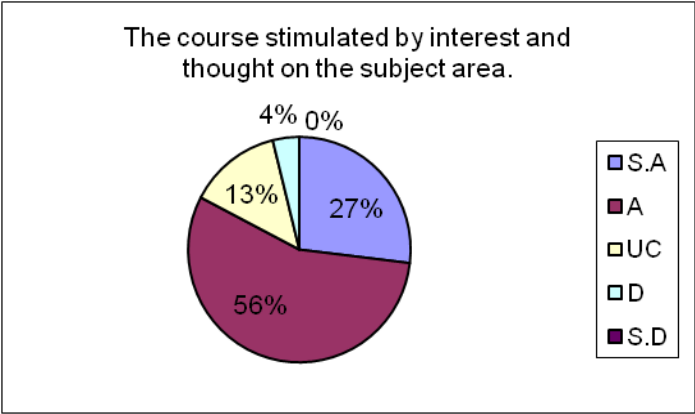
Results of Proforma No. 1 of BIOL-711 (Teacher 2)

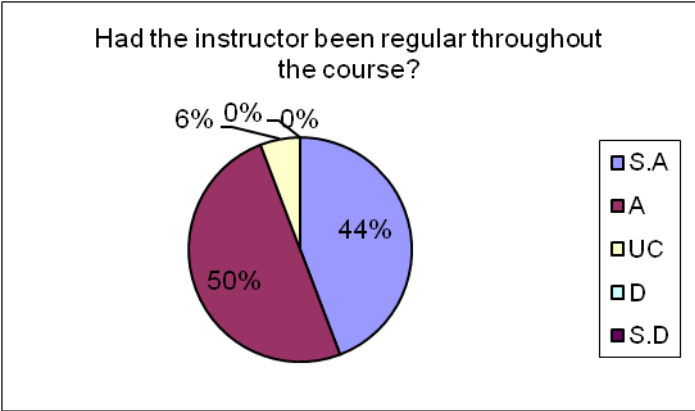
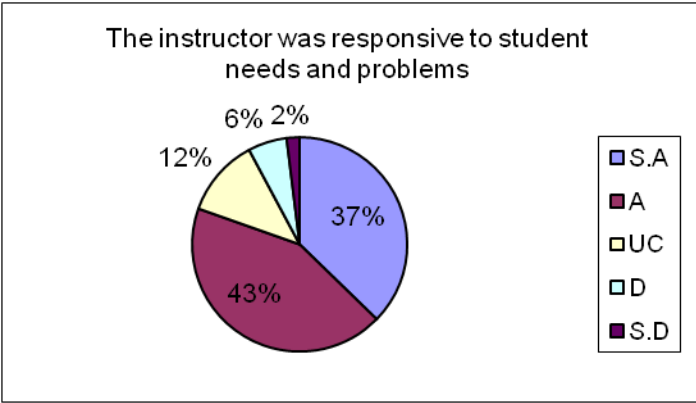
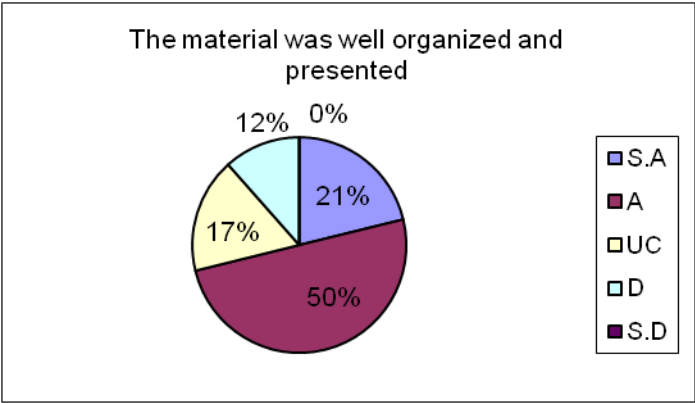
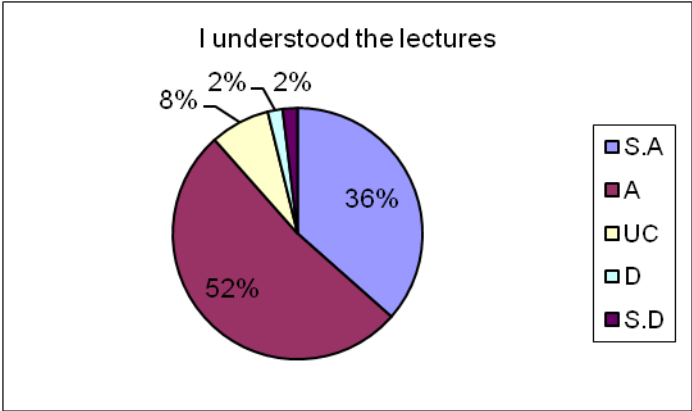
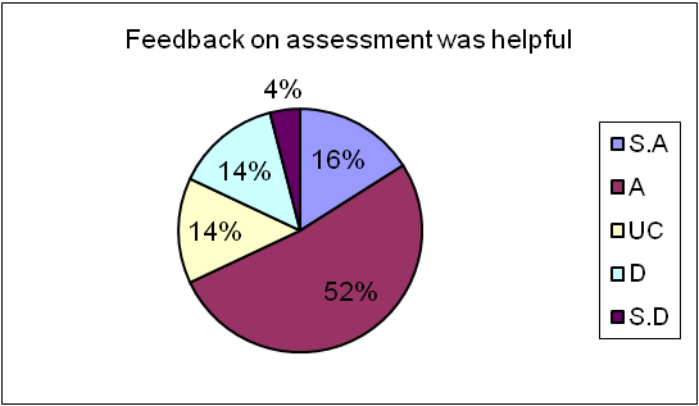
Course assessment based on Performa 1 thought by Teacher 2 yields that 60-68% students strongly agreed/agreed regarding the course was well constructed to achieve the learning outcomes (there was as good balance of lecture, tutorials practical etc. Whereas, 0% either strongly disagreed or disagreed with the above mentioned. Approximately 63% students were of the view that the pace of the course was appropriate. Whereas, 52% agreed regarding the course workload was manageable their active participation during course.

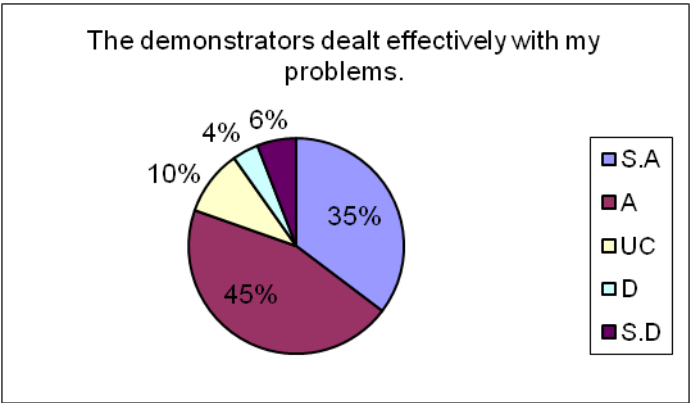
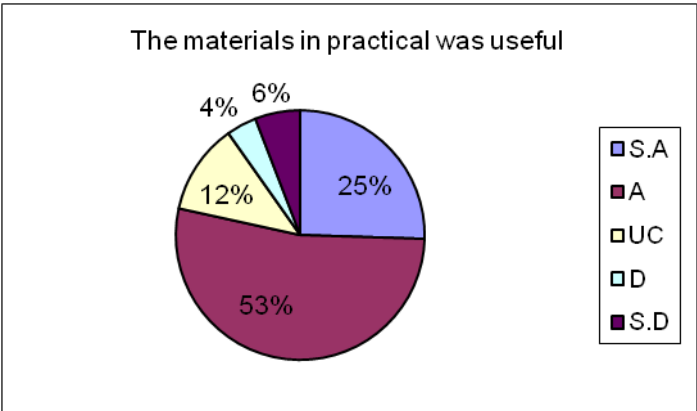
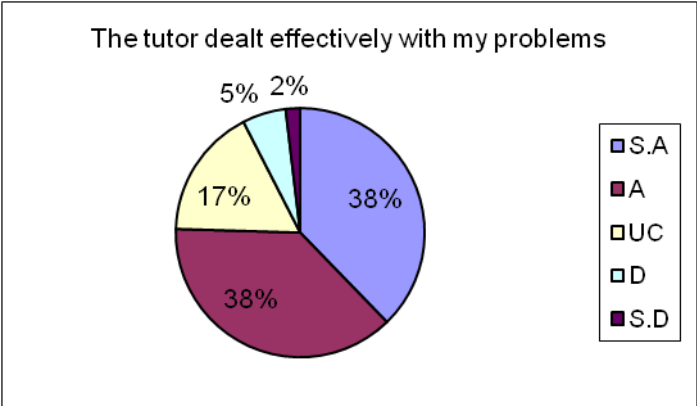
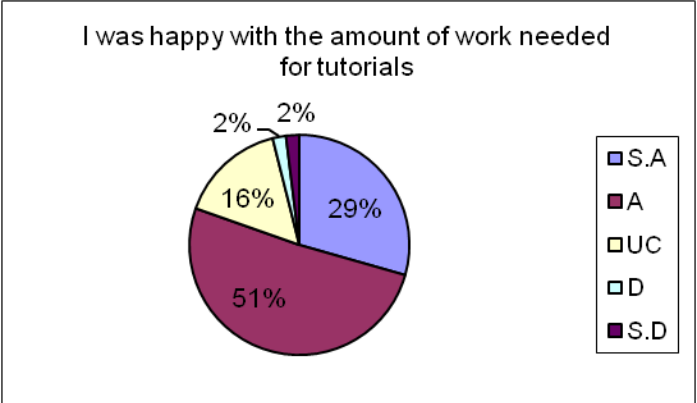
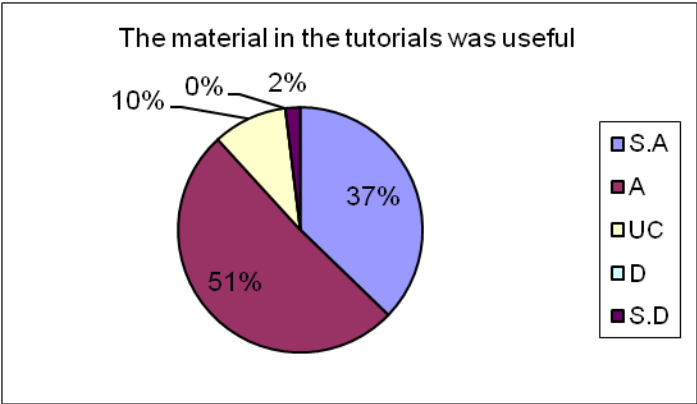






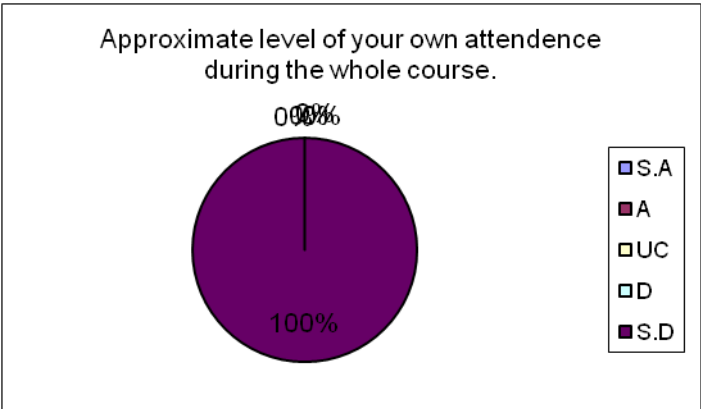
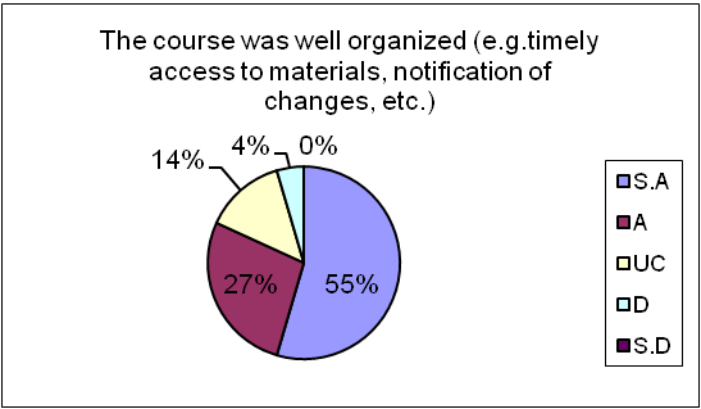
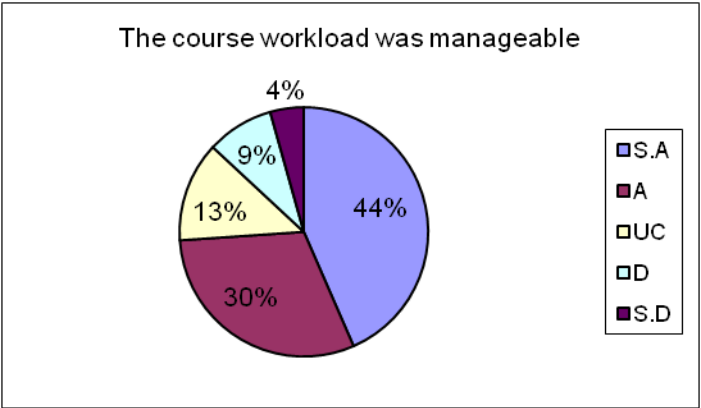
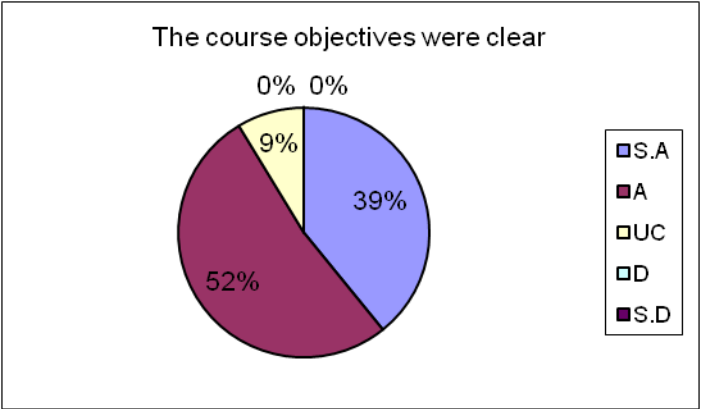


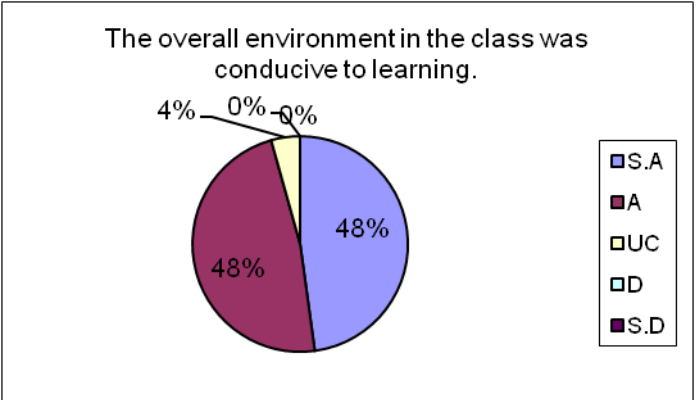
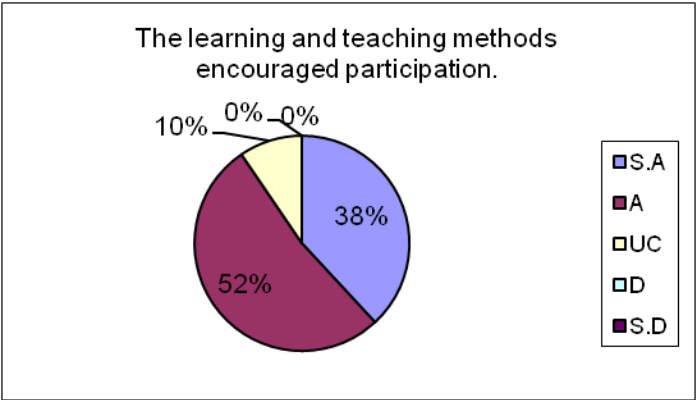
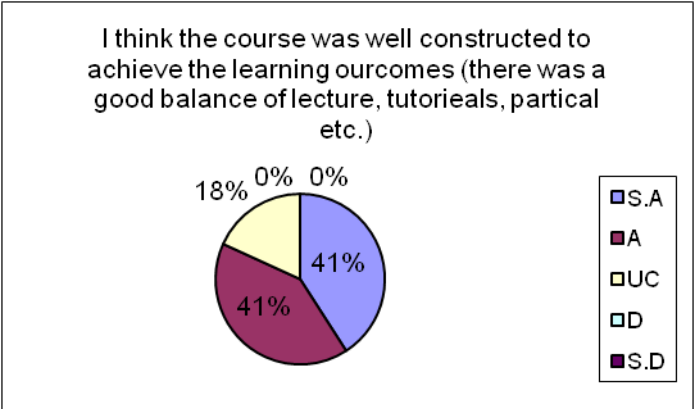
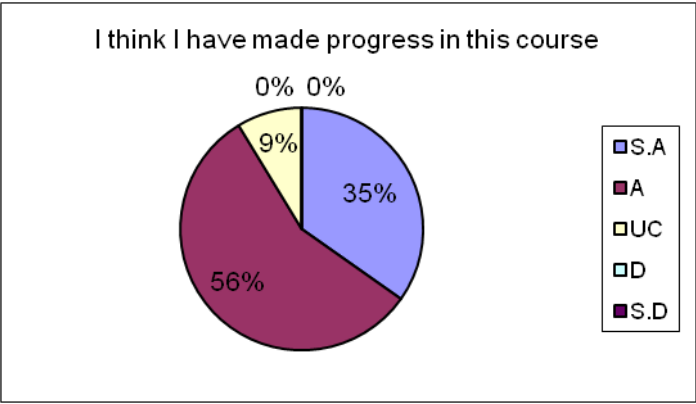
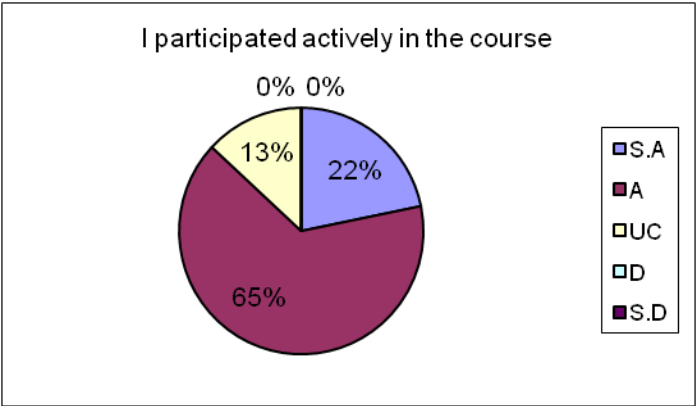


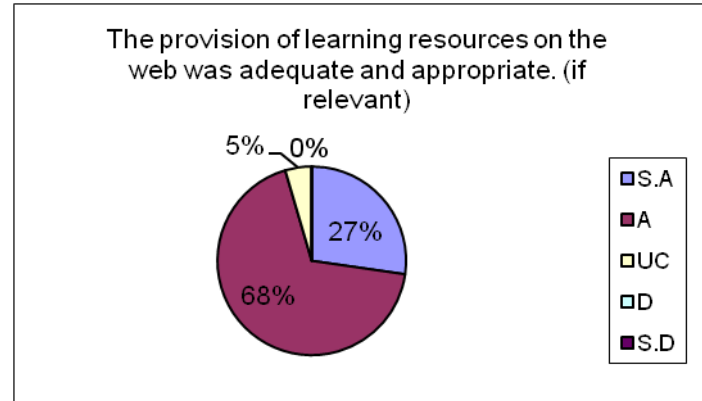
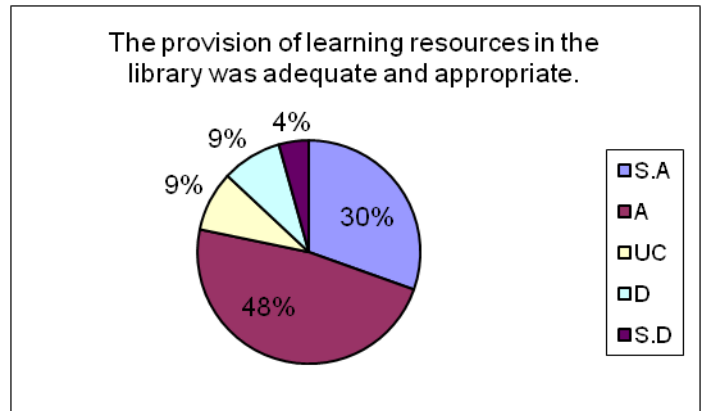
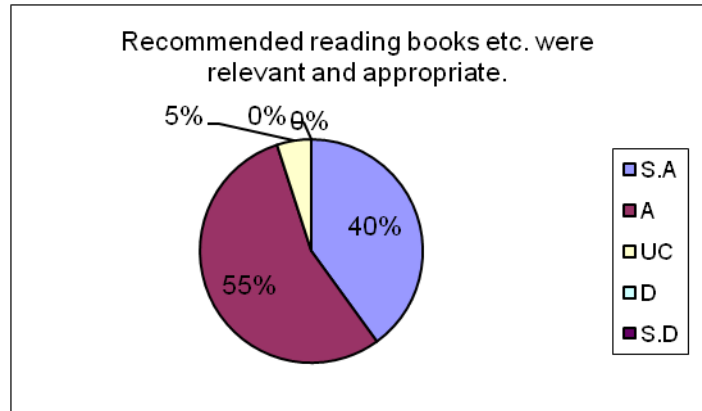
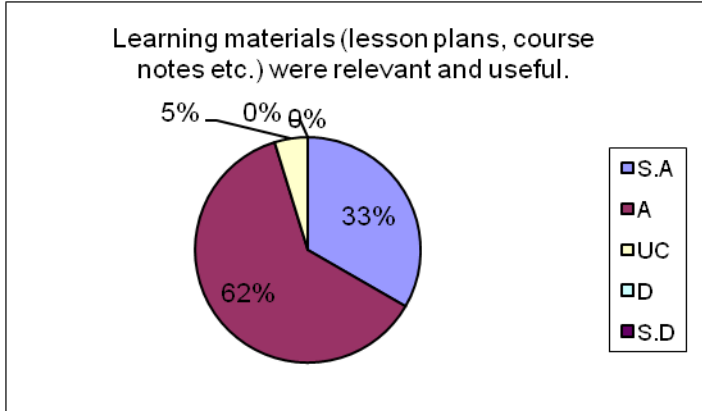
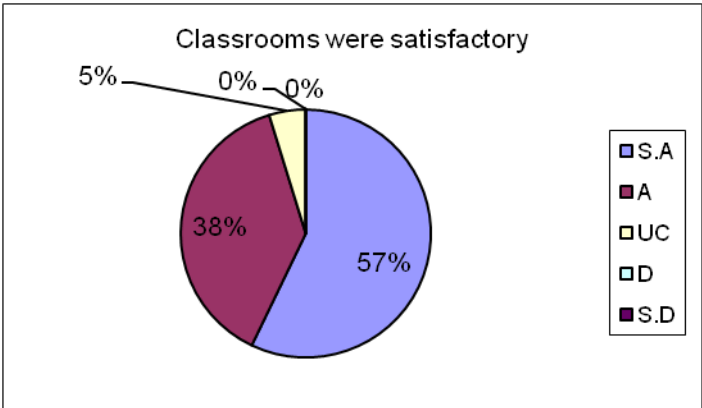


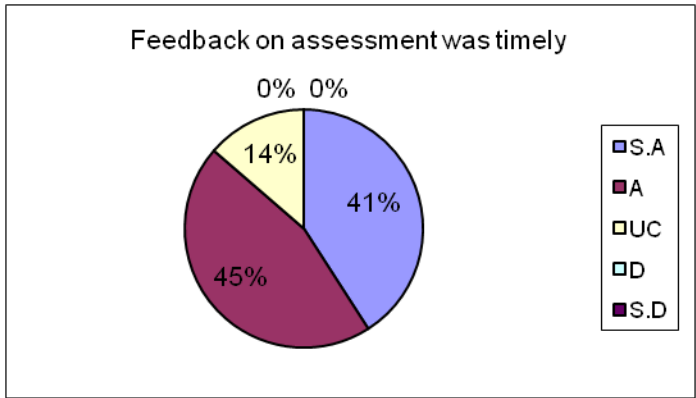
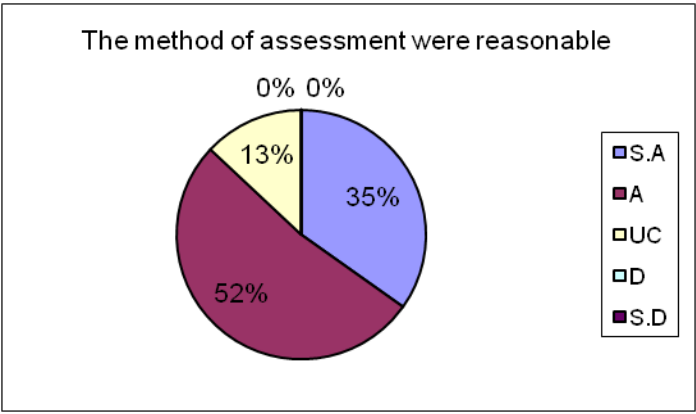
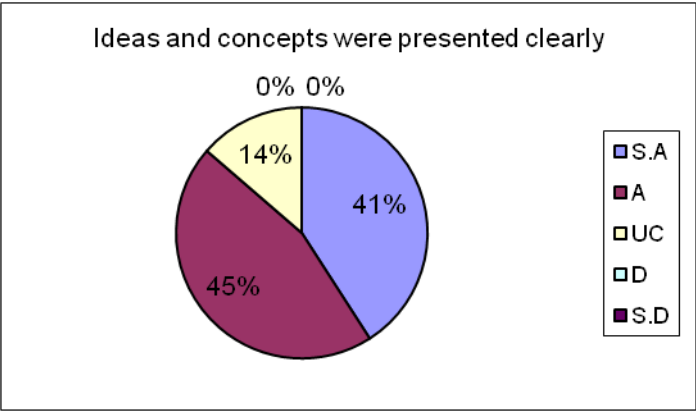
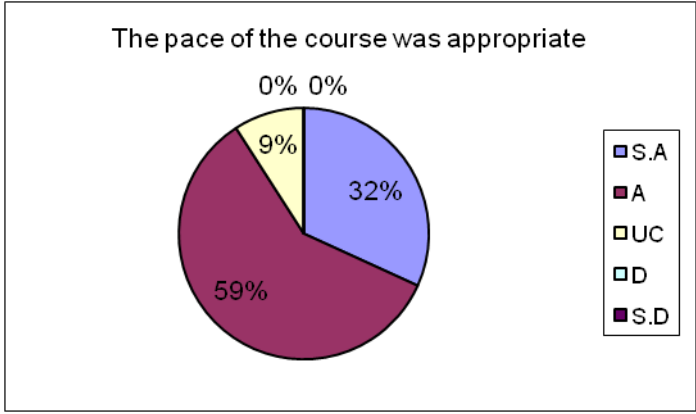
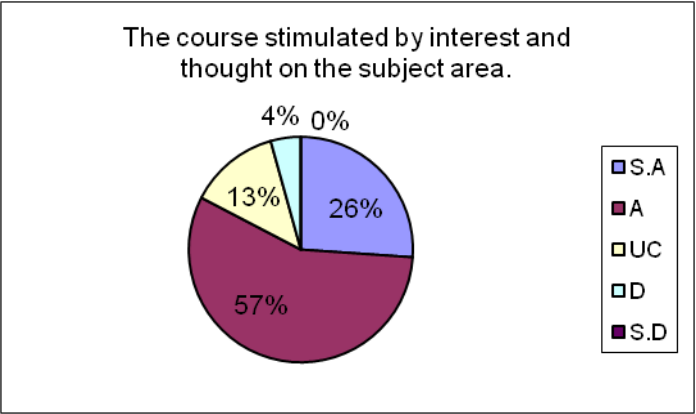
Results of Proforma No. 1 of BCH-710 (Teacher 3)

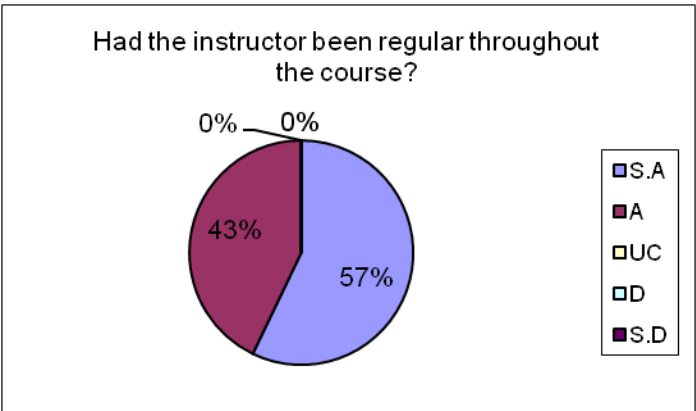
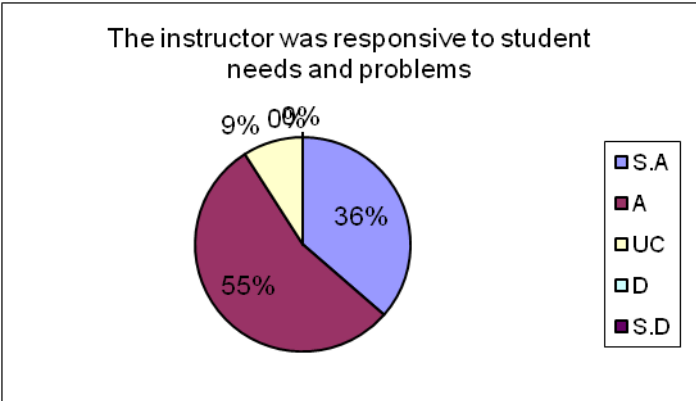
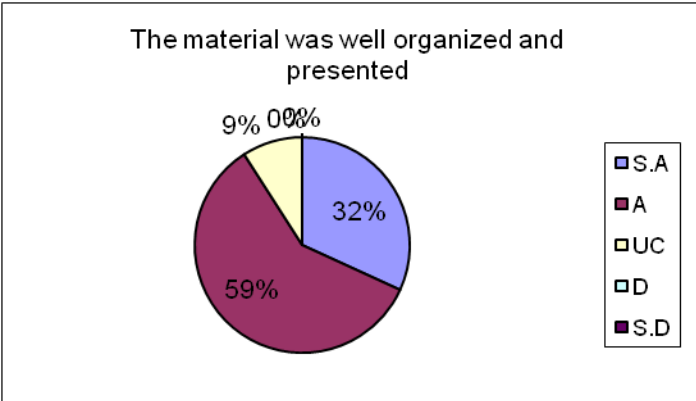
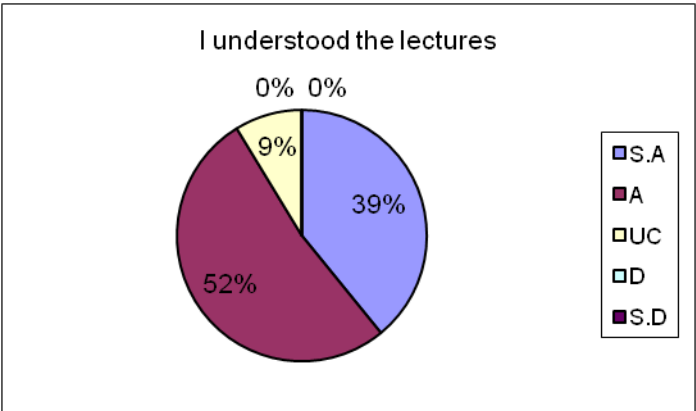
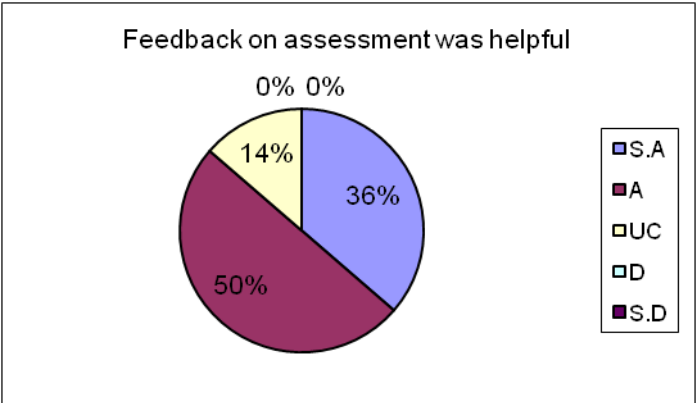
The course assessment taught by Teacher 3 shows 68% strong agreement/ on the provision of learning resources on the web was adqequate and appropriate (if relevant). However 59% students agreed with that material was well organized and presented. 56% students showed that demonstrators dealt effectively with my problem.

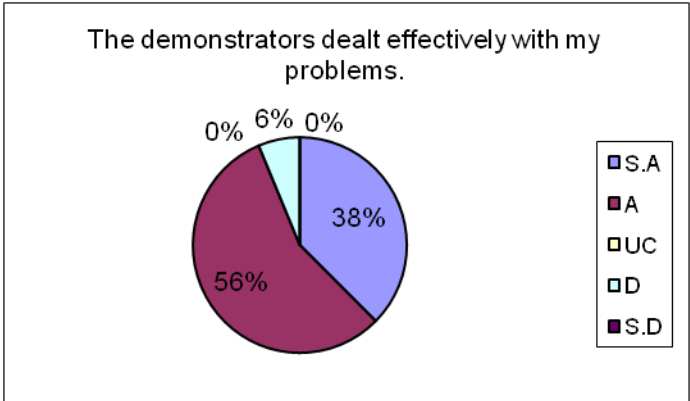
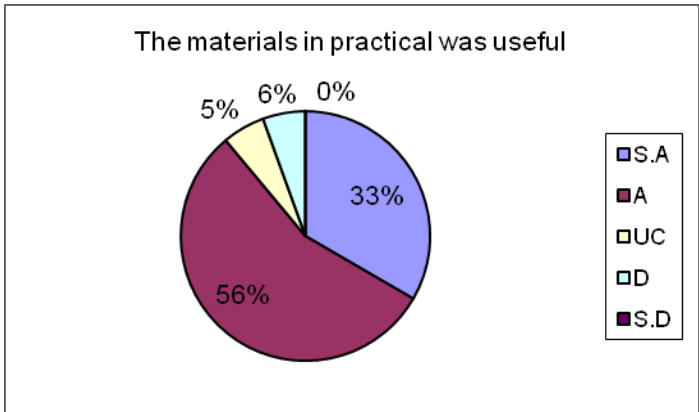
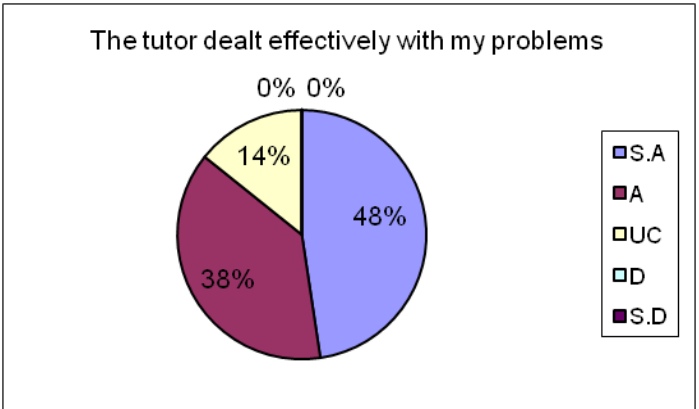
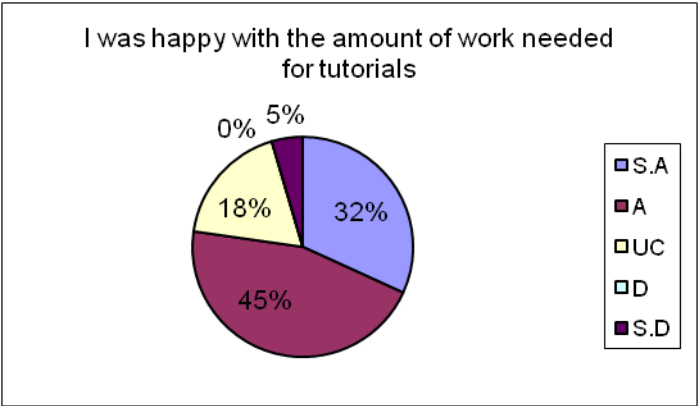
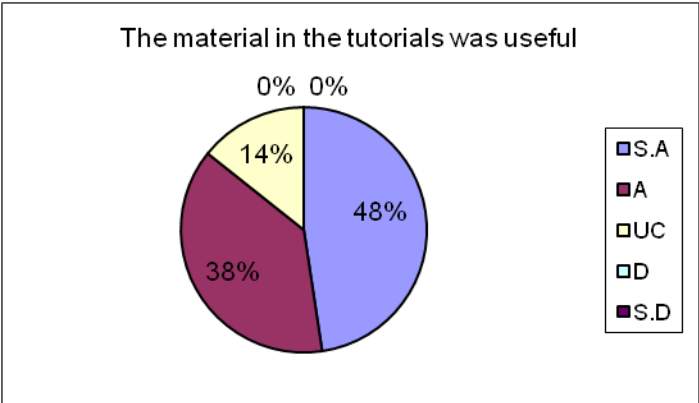






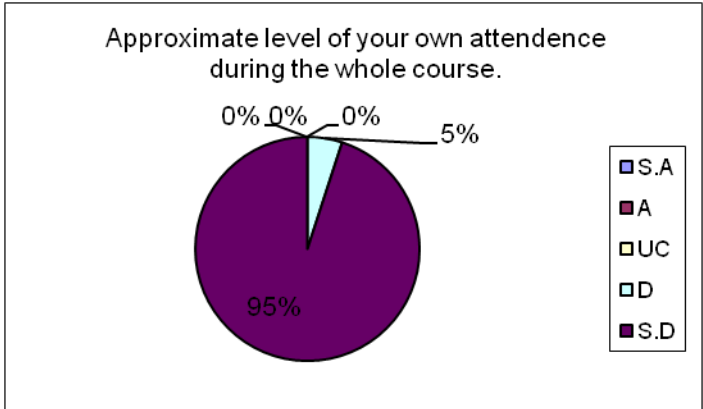
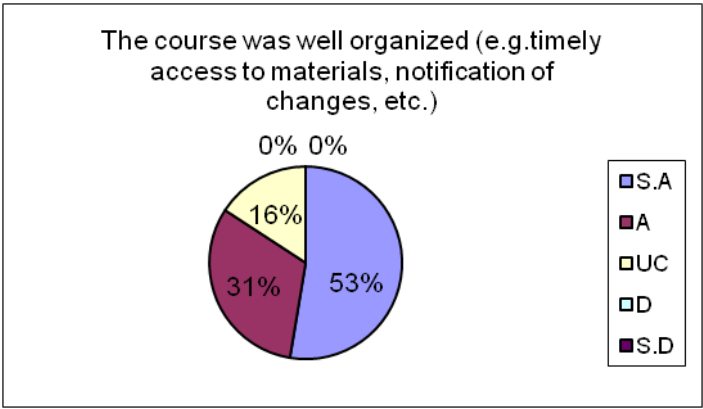
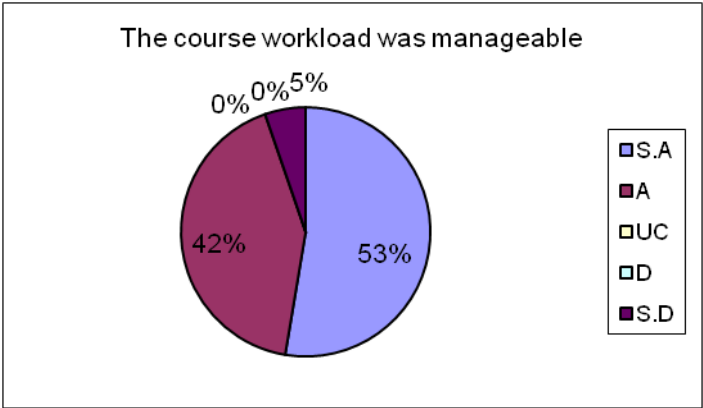
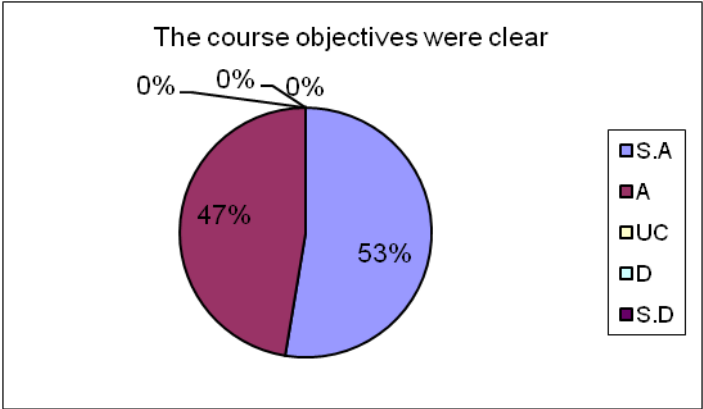


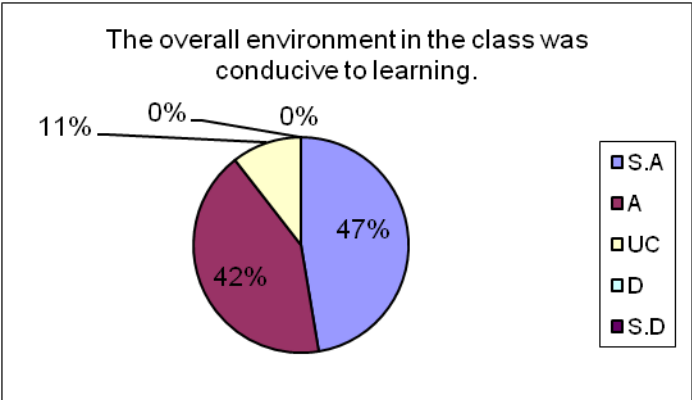
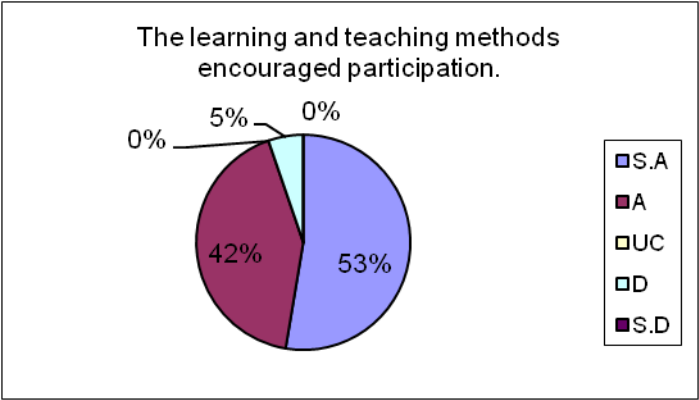
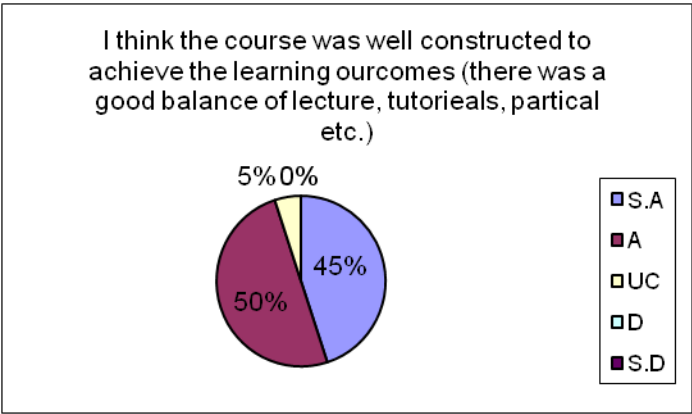
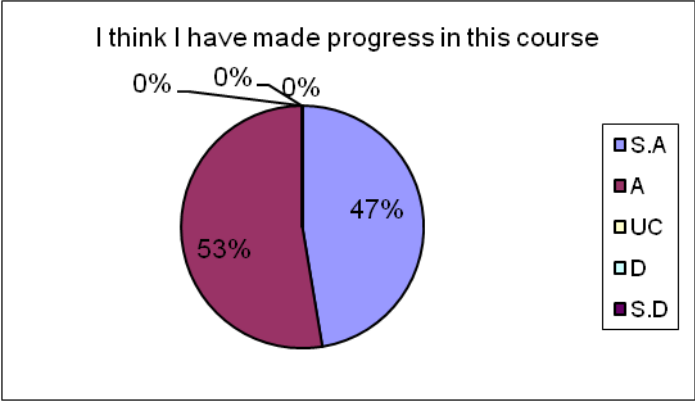
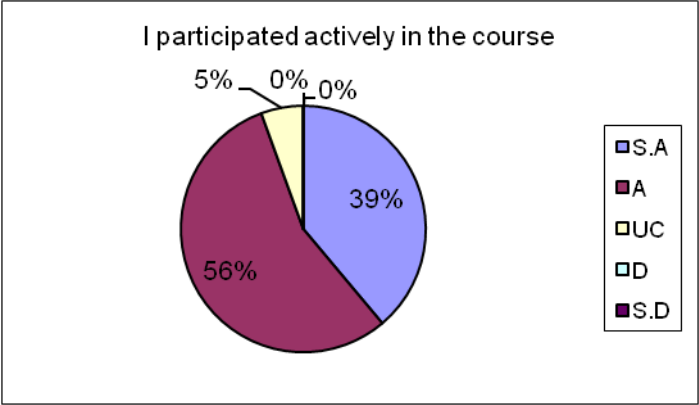


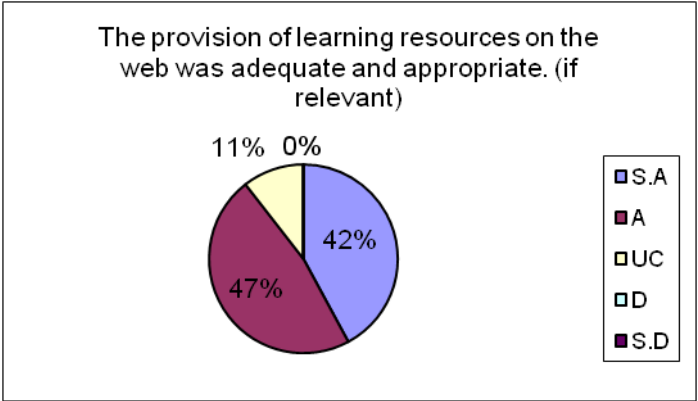
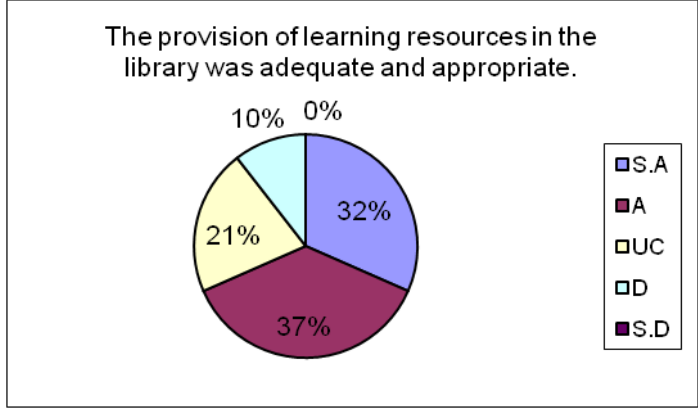
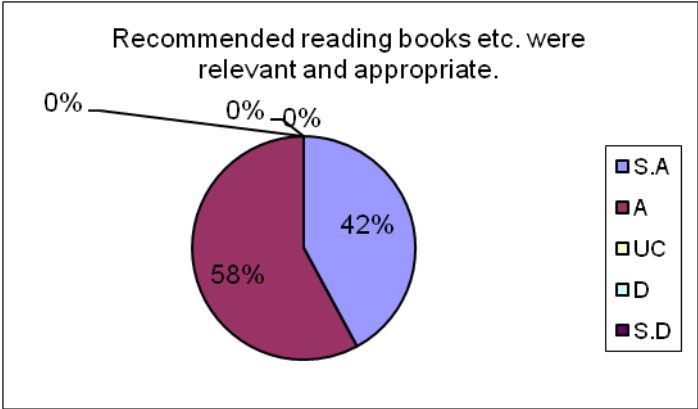
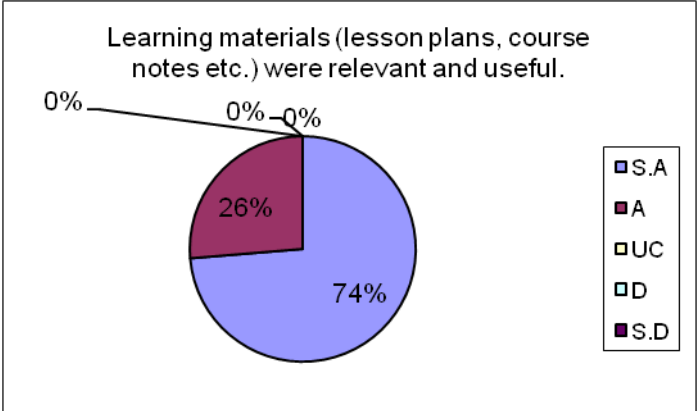
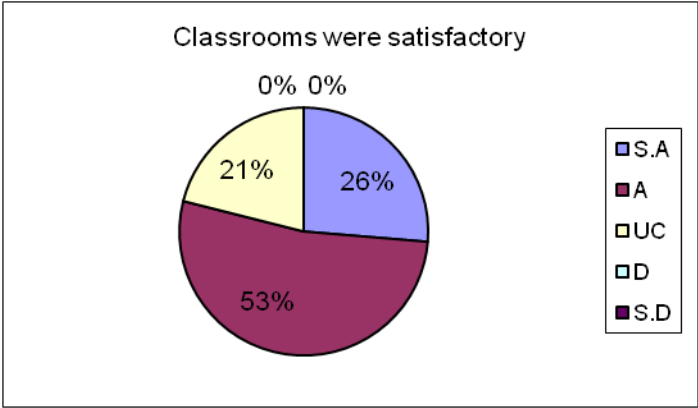


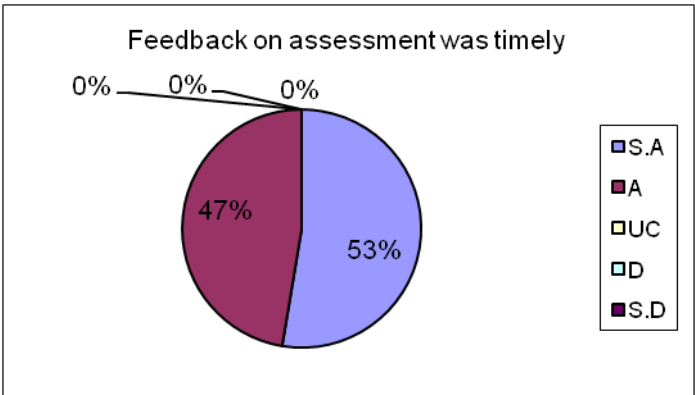
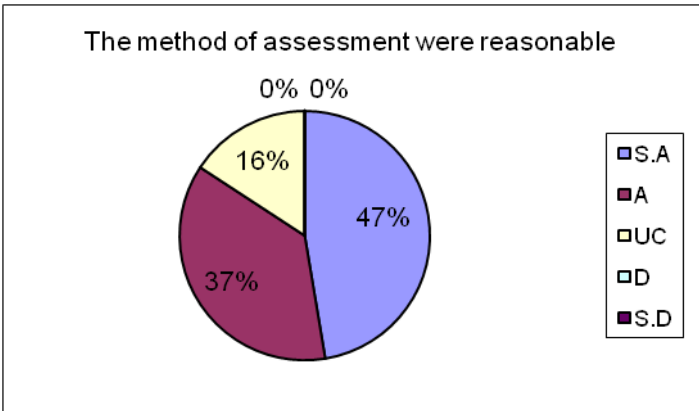
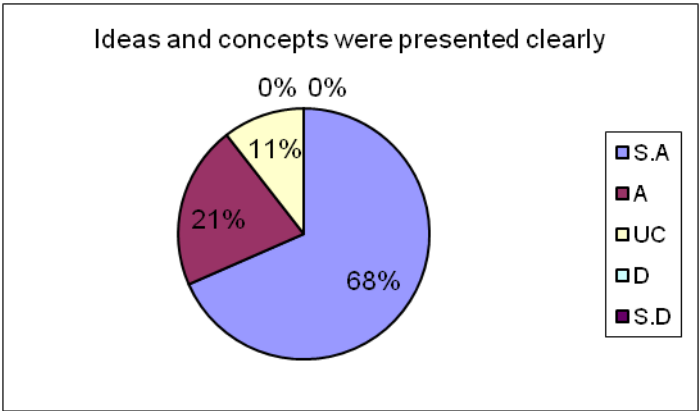
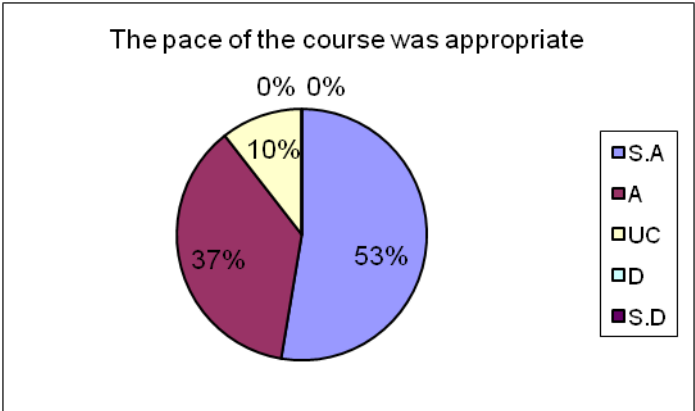
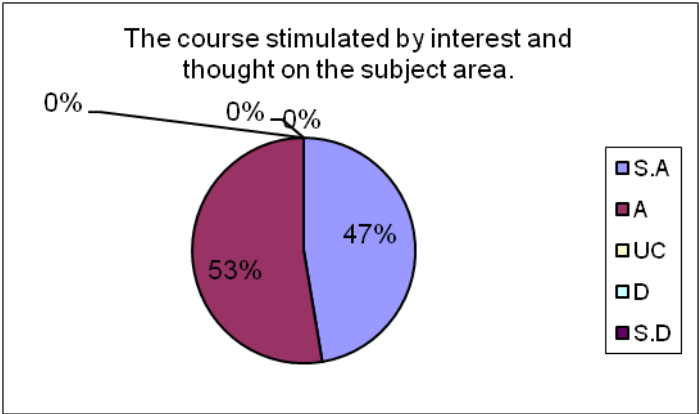
Results of Proforma No. 1 of BCH-732 (Teacher 4)

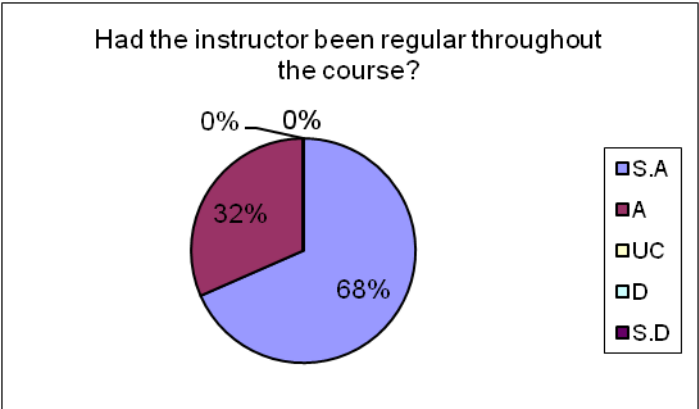
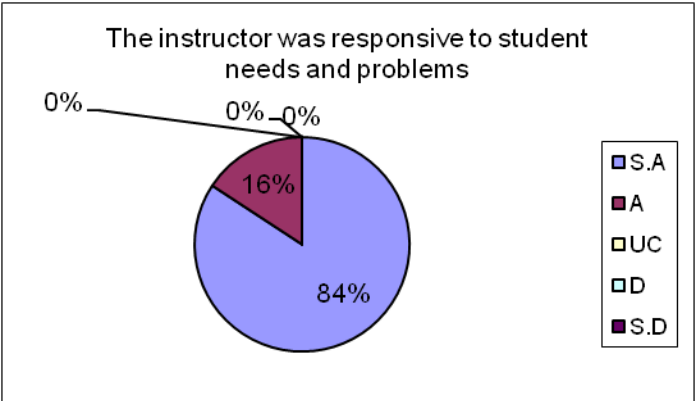
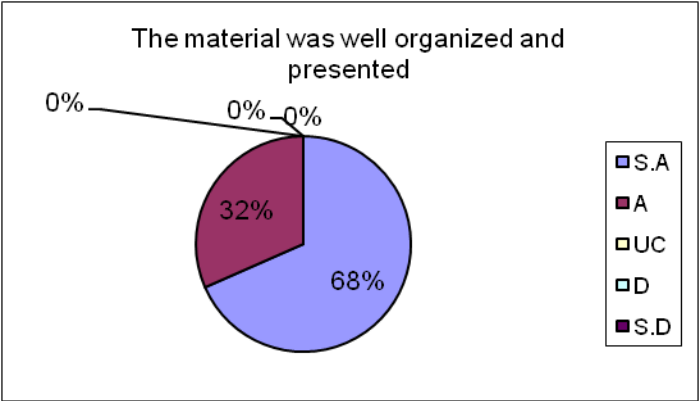
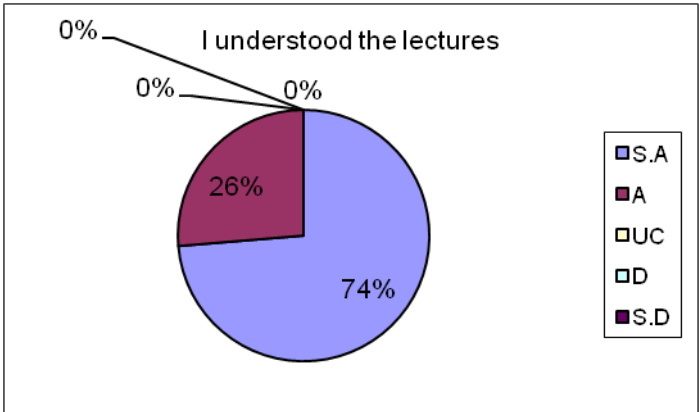
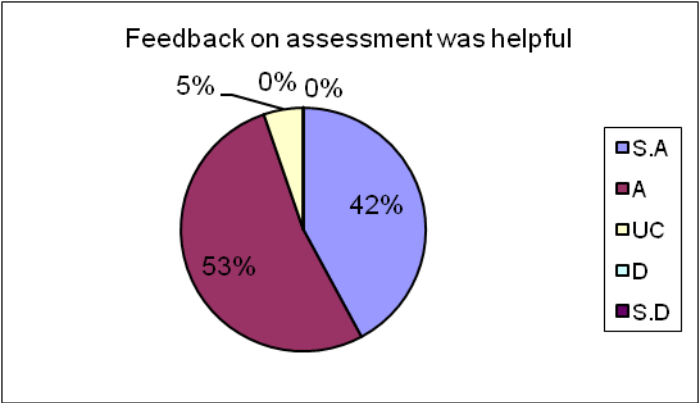
Performa I based course assessment taught by Teacher 4 produced following results; 80-84% students either strongly agreed or agreed regarding the Instructor was responsive to student needs and problems. Approximately 78% student stongly agreed that the tutor deal effectively with my problems. On the other hand, 22% students were agreed with same.

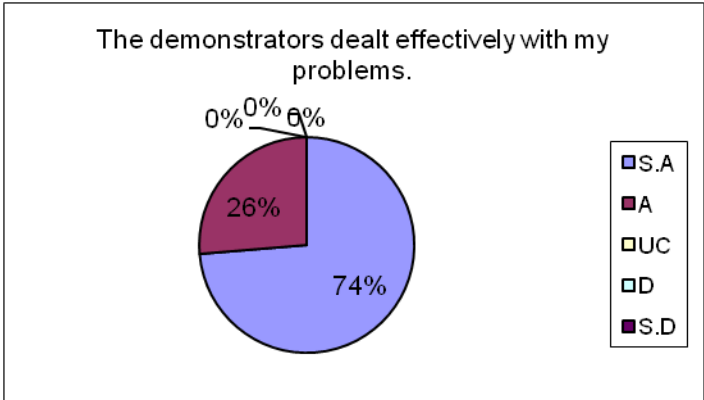
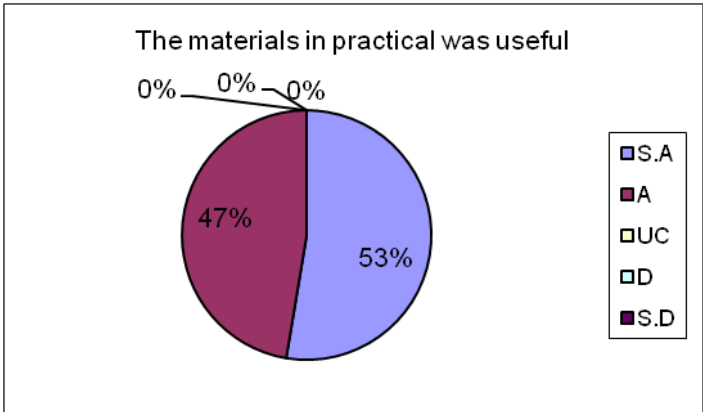
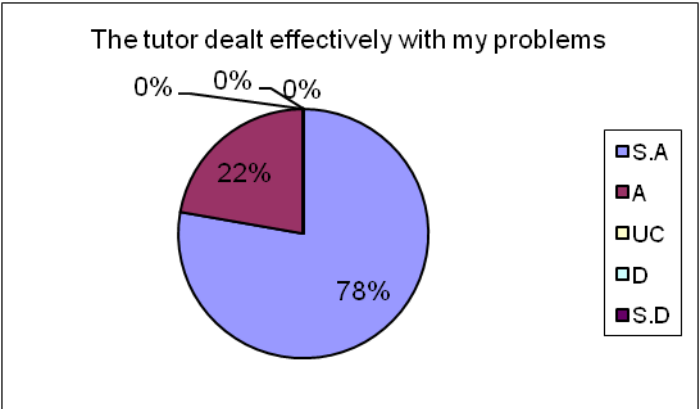
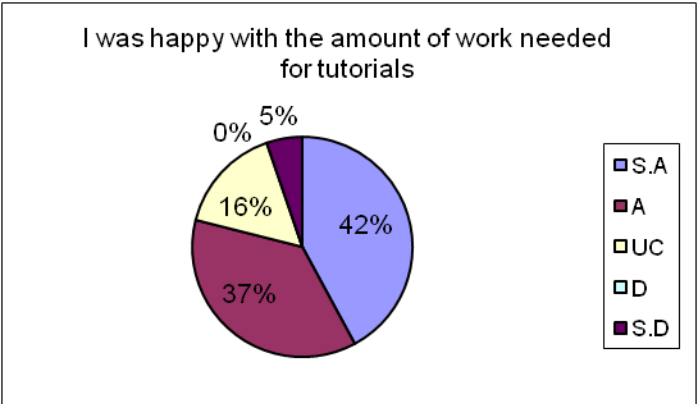
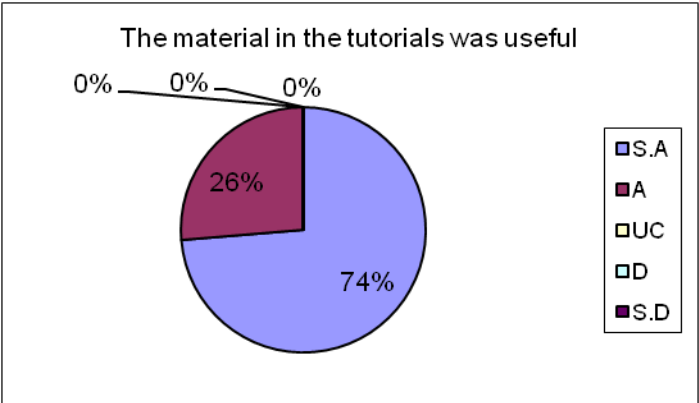






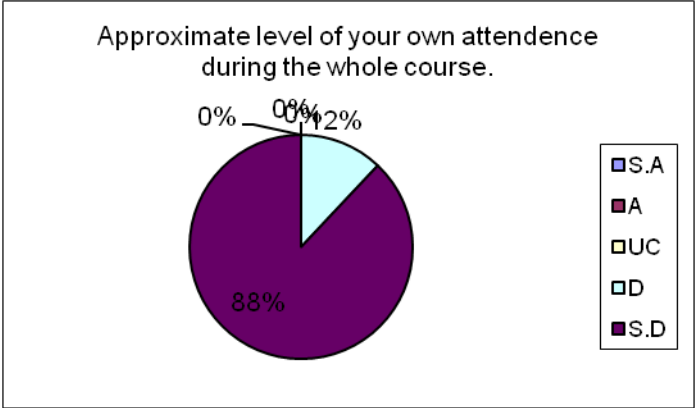
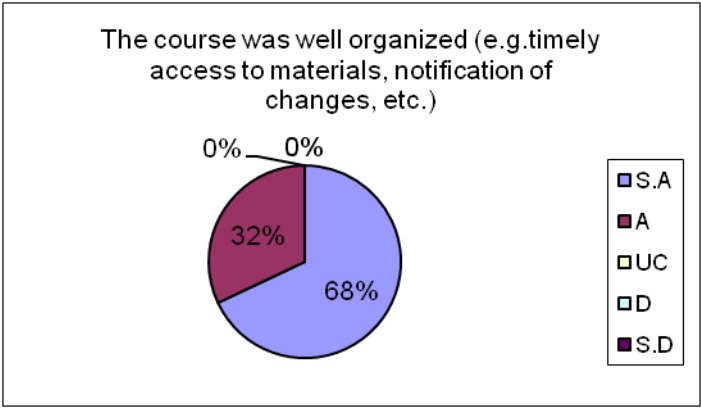
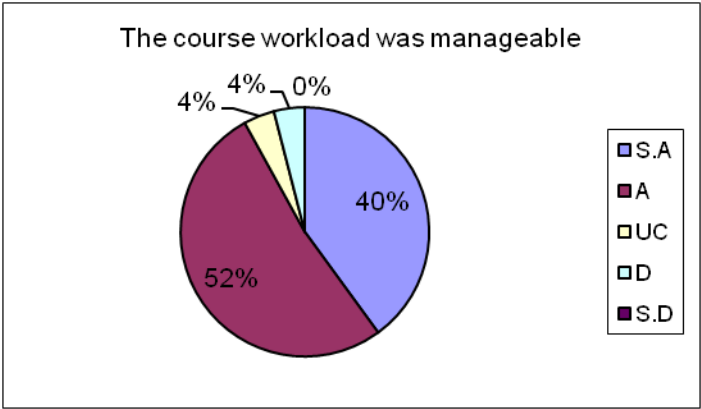
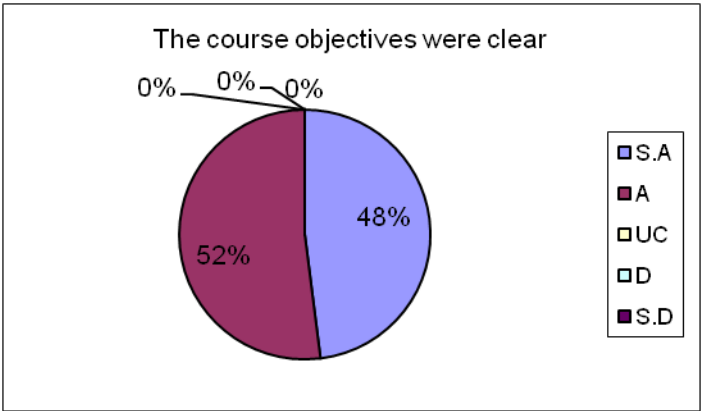


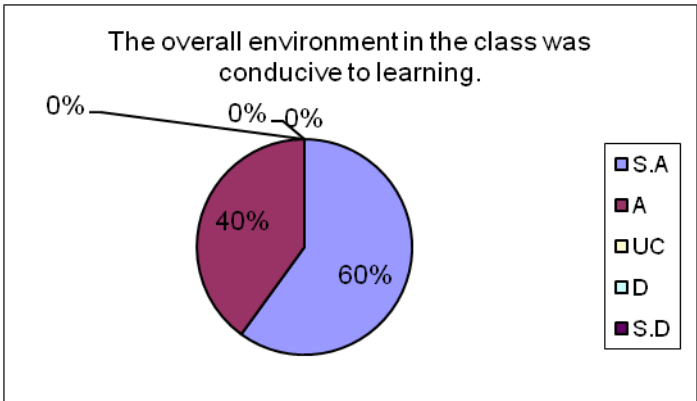
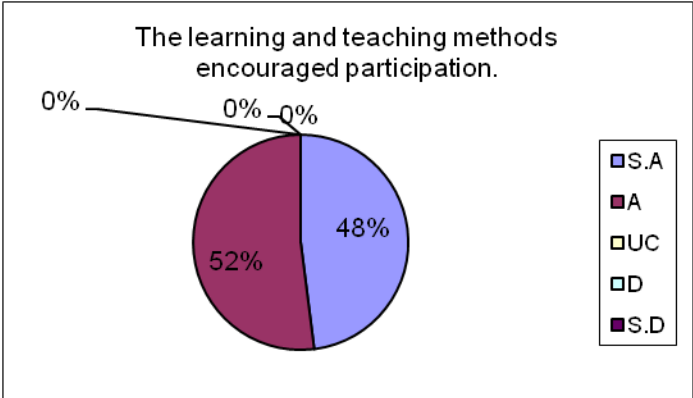
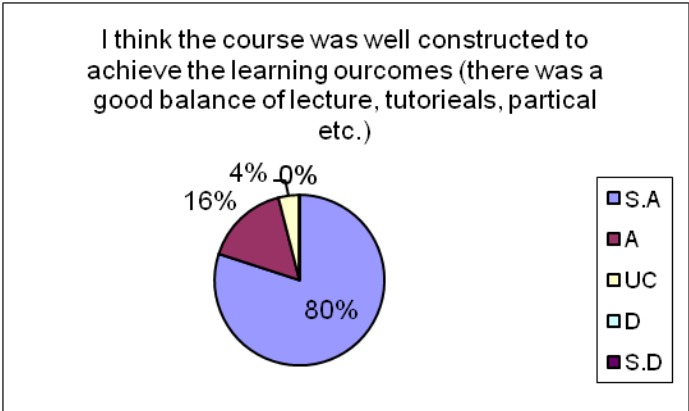
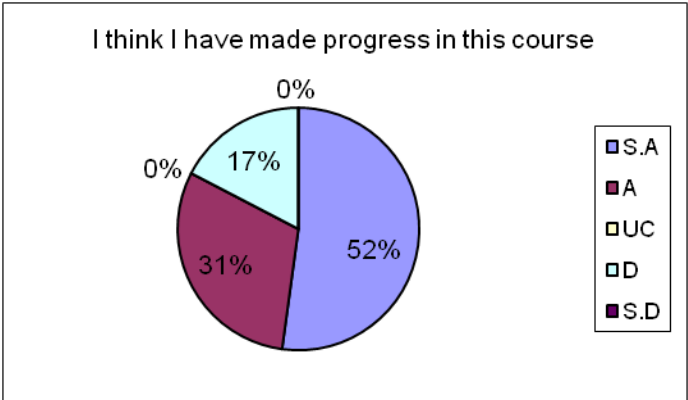
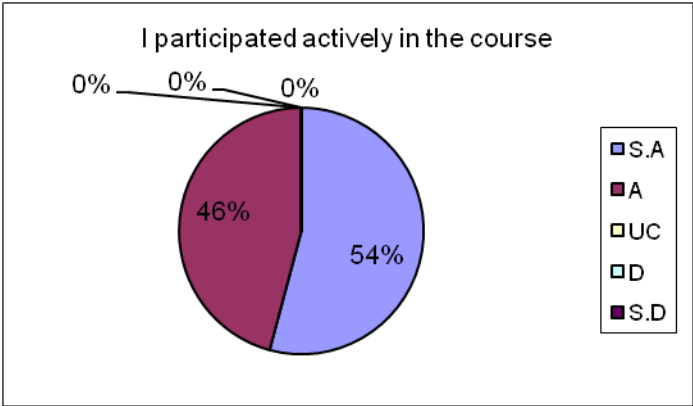


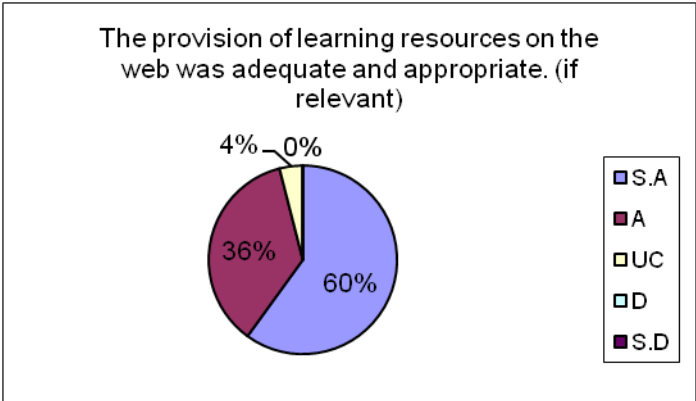
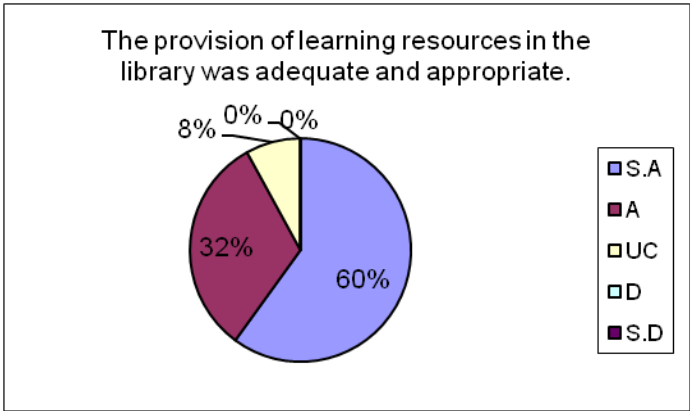
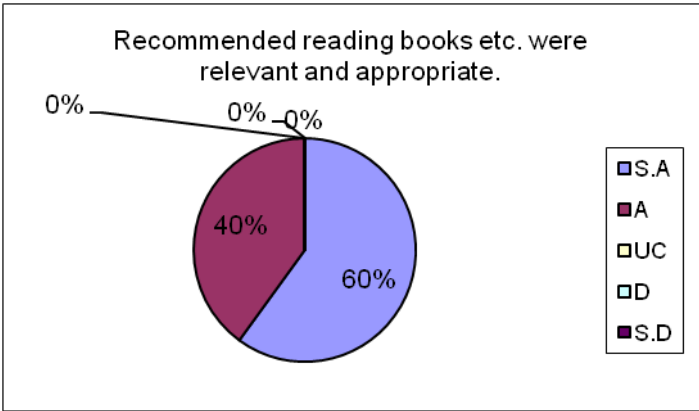
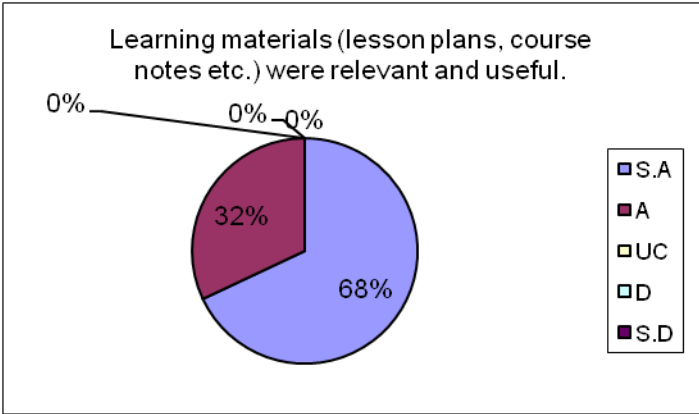
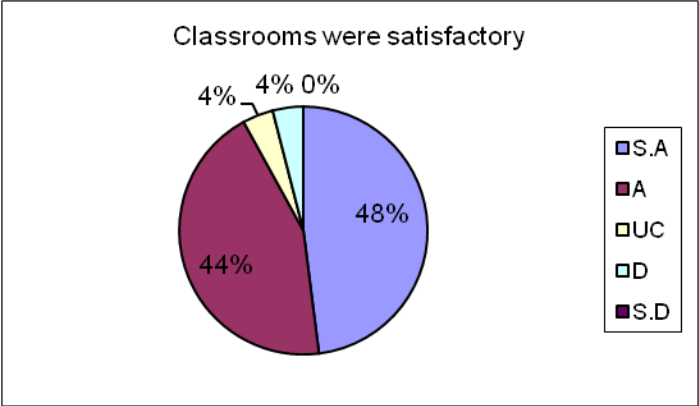


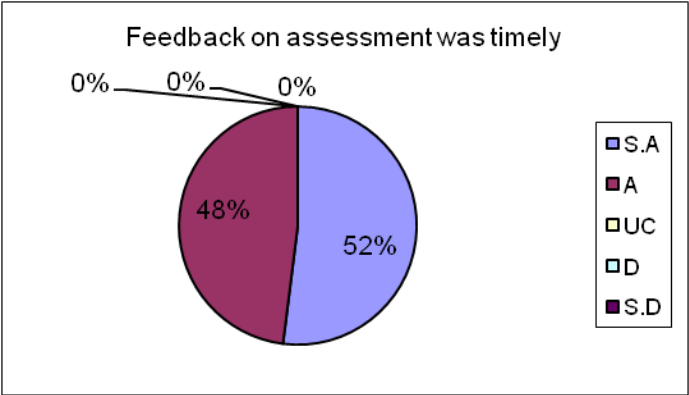
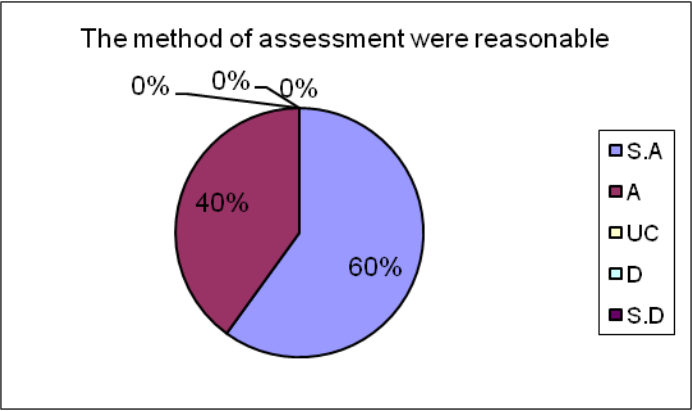
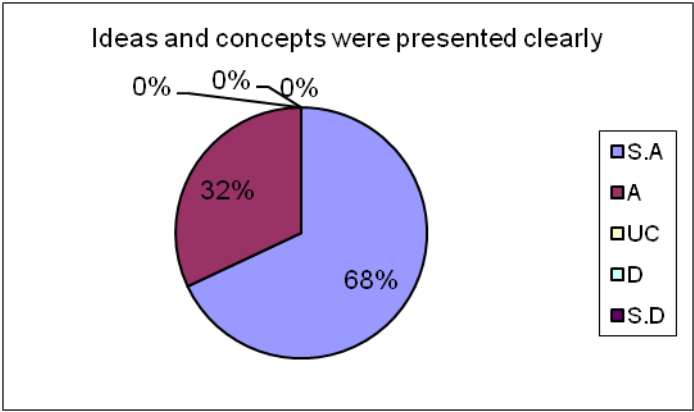
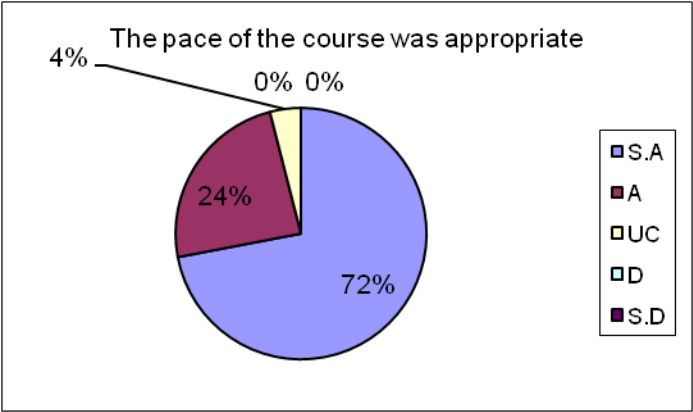
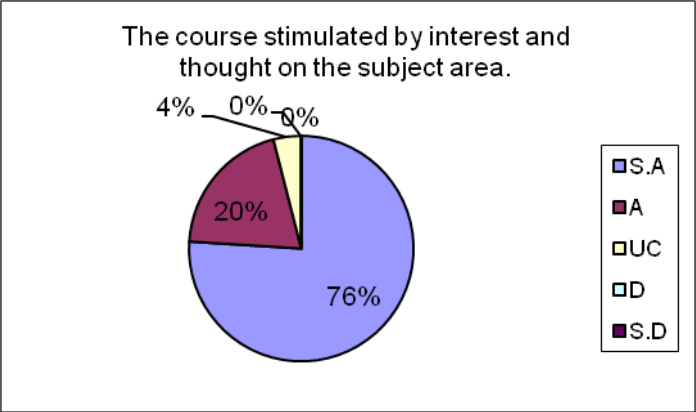
Results of Proforma No. 1 of BCH-712 (Teacher 5)

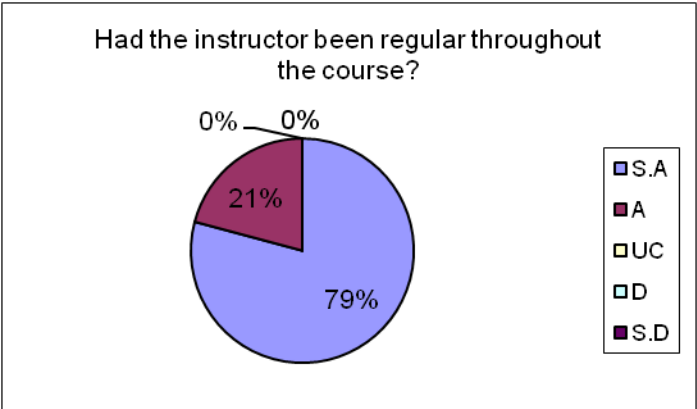
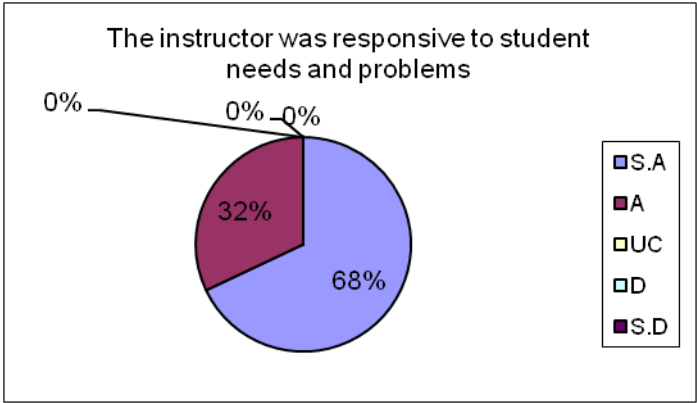
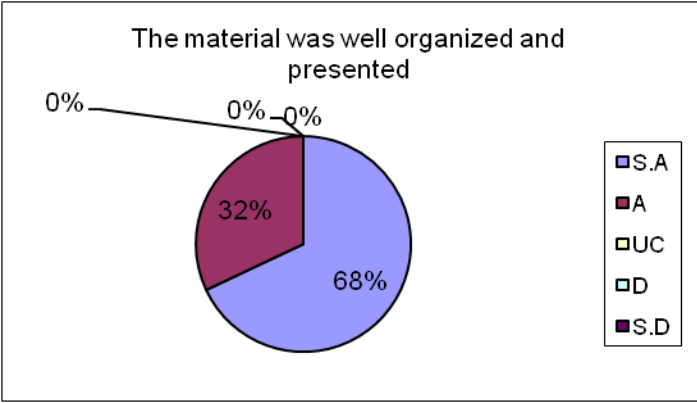
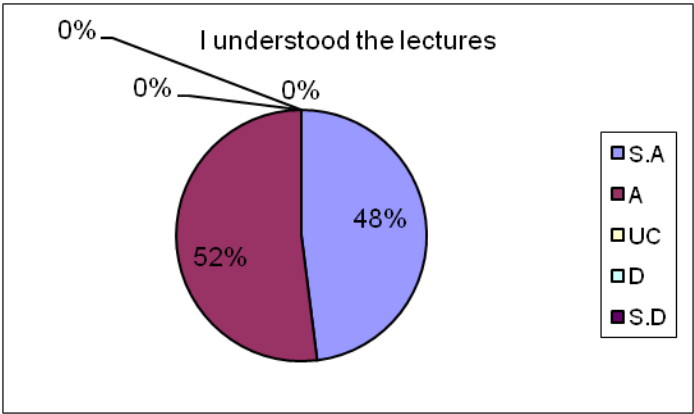
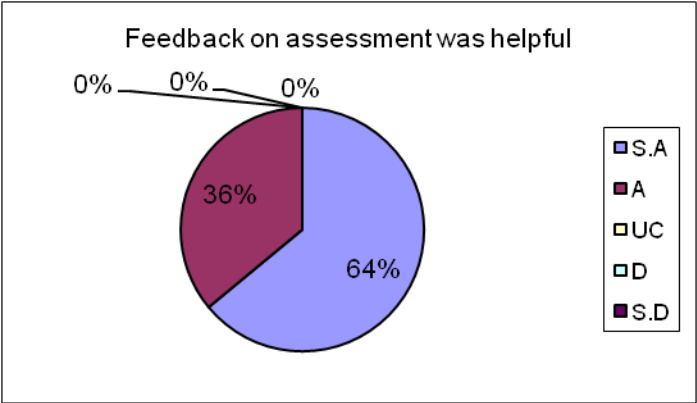
Taught course based assessment of Teacher 5 revealed that 80% of the students (strongly agreed or agreed) regarding that I link the course was well constructed to achieve the learning outcomes (there was a good balance to lecture, tutoriasl, practical where as 79% students were of view that the material in the tutorials was useful. On the other hand 0% students either strongly disagreed or disagreed with that above mentioned criteria assessed in Performa 1.

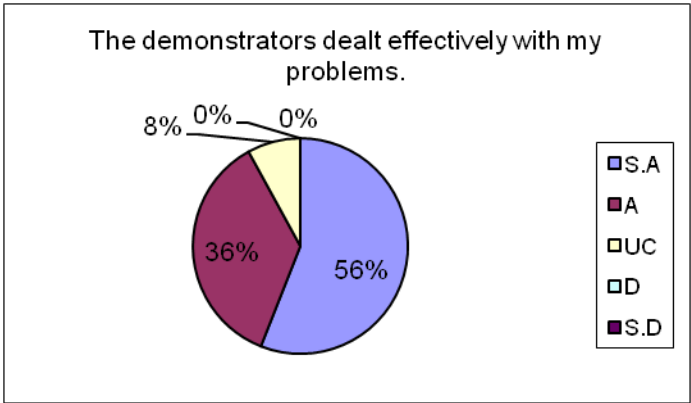
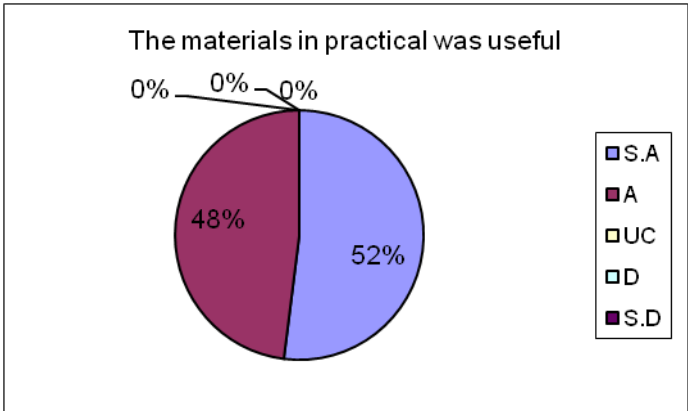
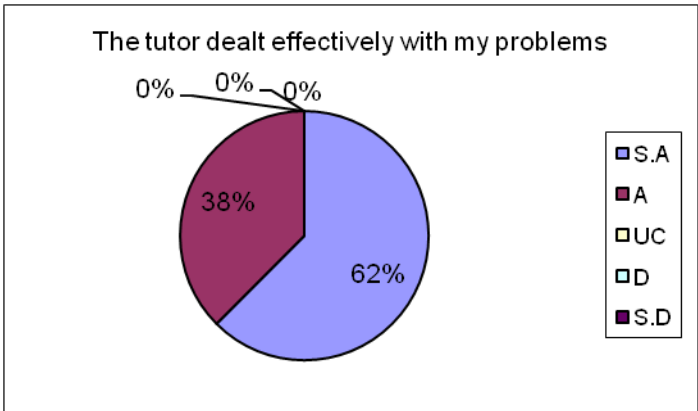
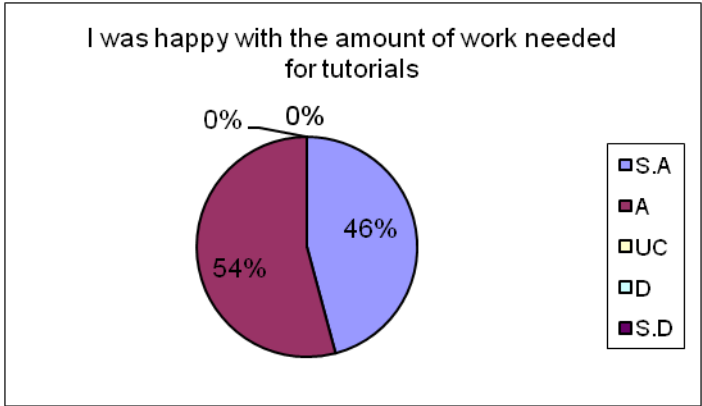
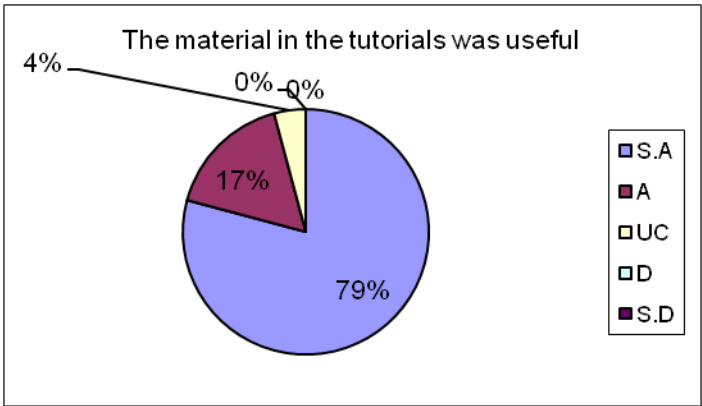










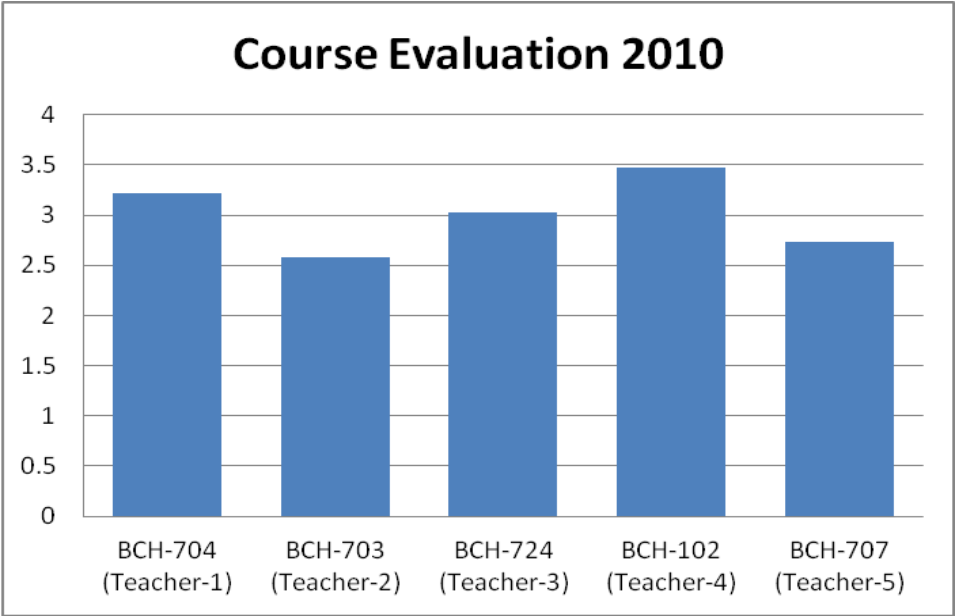


Student Course Evaluation:

Over all Results of Proforma No. 1 Teacher 1, 2, 3, 4 and 5

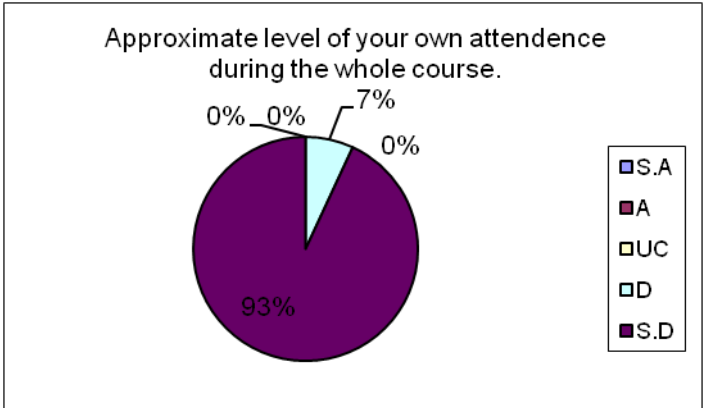
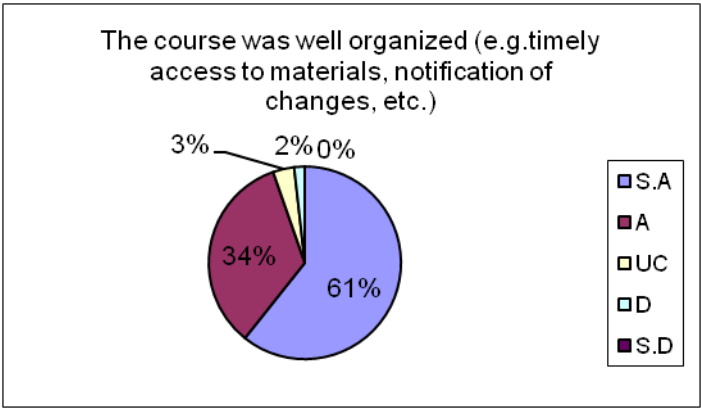
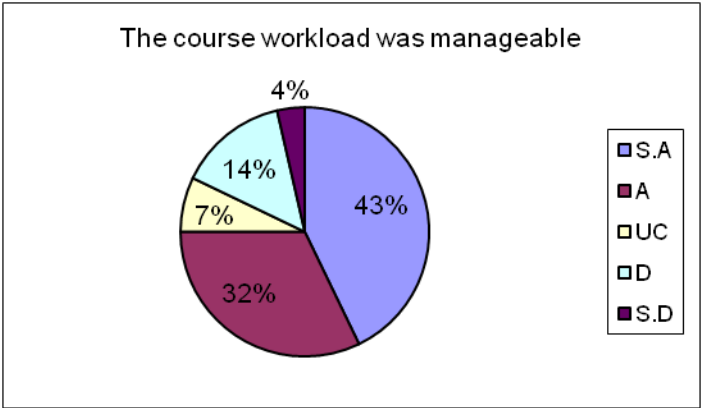
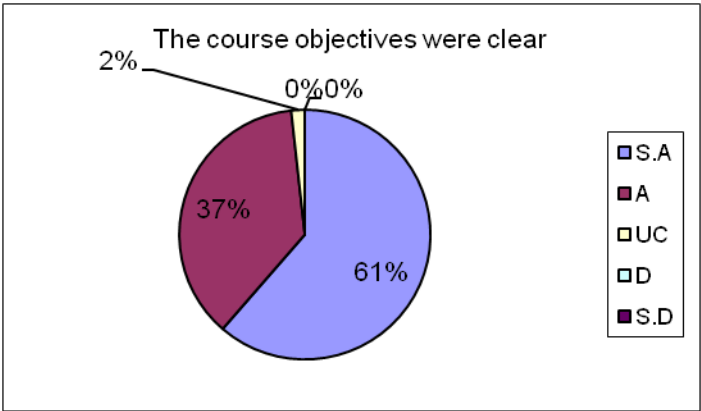
Performa No. 1, deals with study of course observation regarding design of course contents (both theoretical and practical), its relevance with subject and teaching material. It also emphasizes on instructor’s role in, not only completing course within given time frame, but how’ instructor developed student’s interest in this course, used updated literature and was fair in evaluation at the end of a study course.

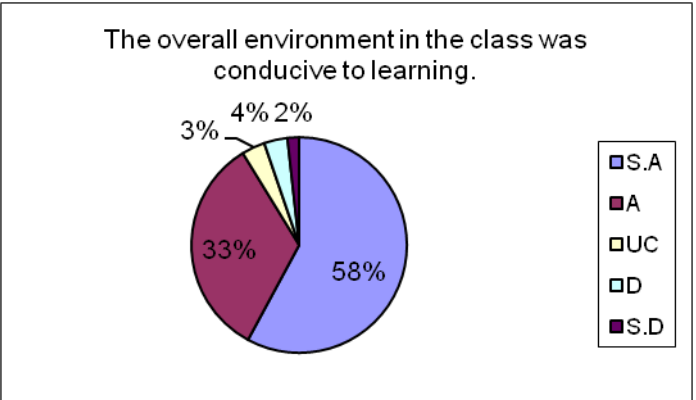
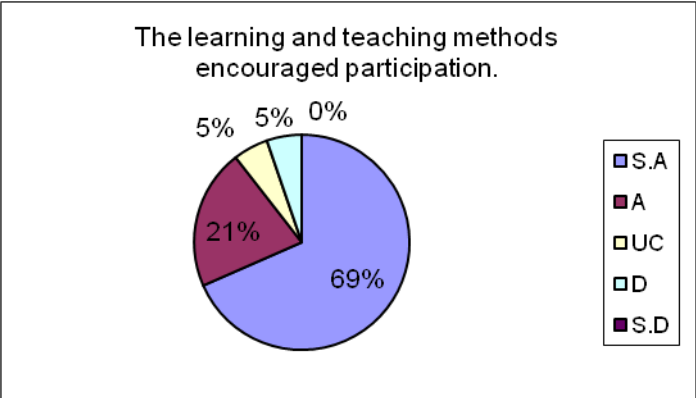
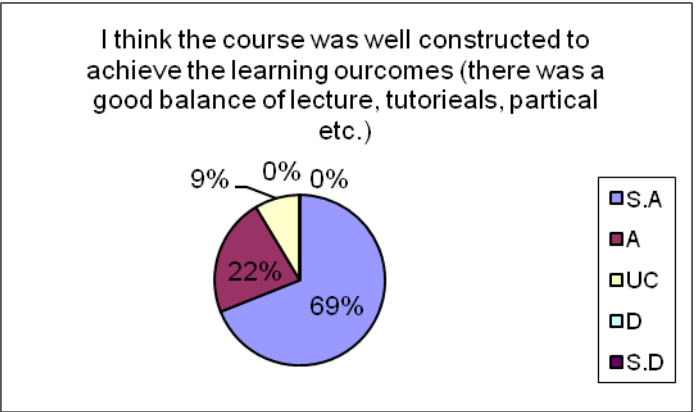
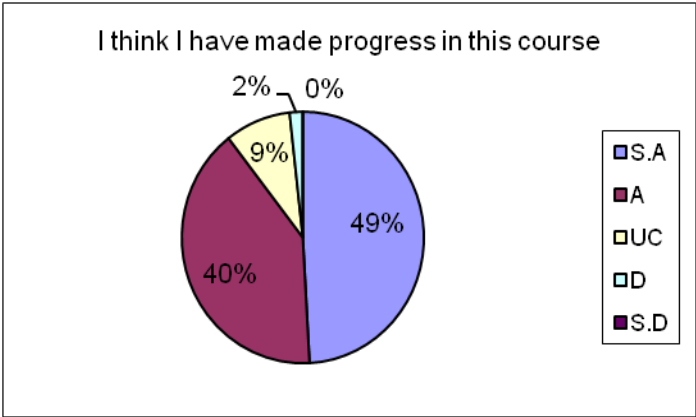
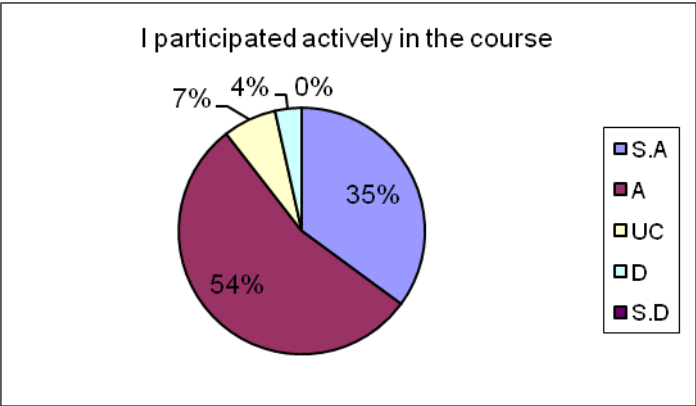
Overall results of Performa I evaluation performed for five teachers clearly show that on a scale of 4%, course evaluation ranged between 0-4.00. Teacher 4 averaged 3.25 as compared to Teacher 2 (2.50), Teacher 3 (3.00). Teacher 4 and 5 ranged between 3.5 and 2.70 respectively.

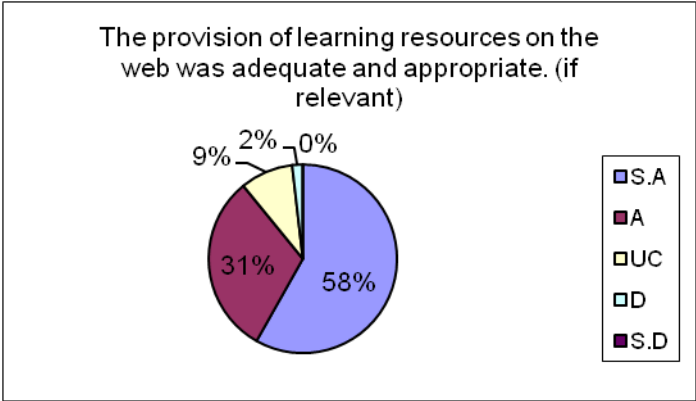
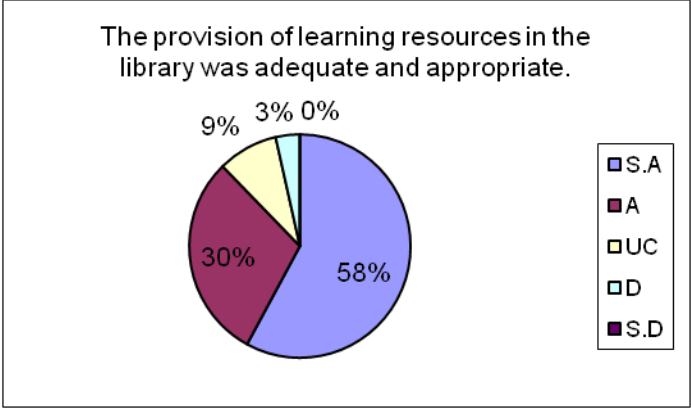
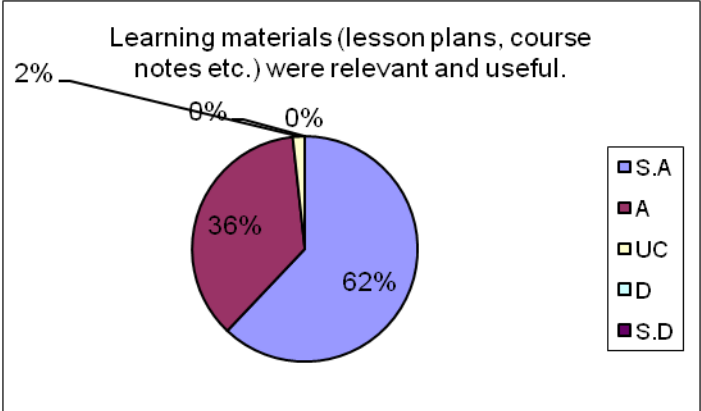
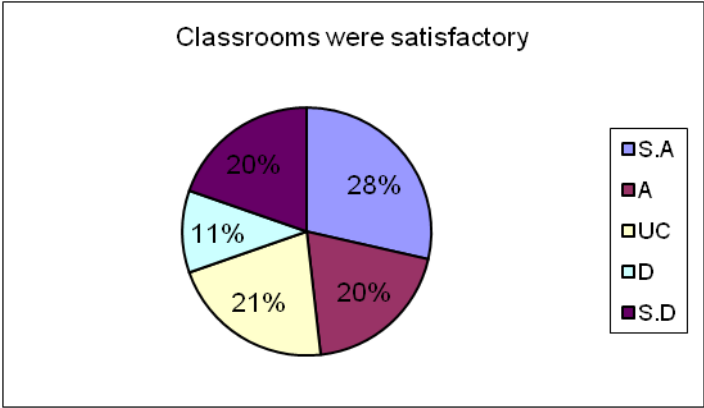


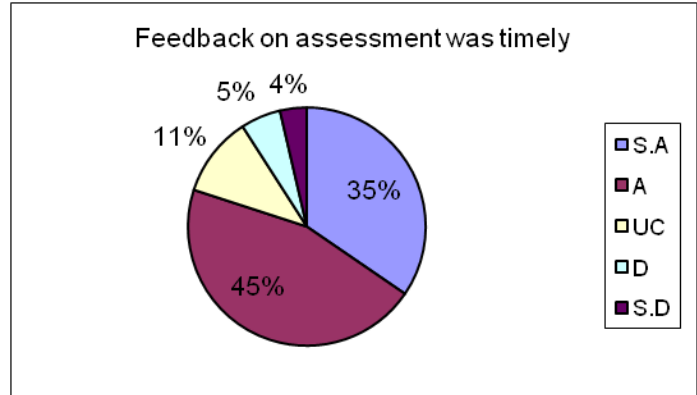
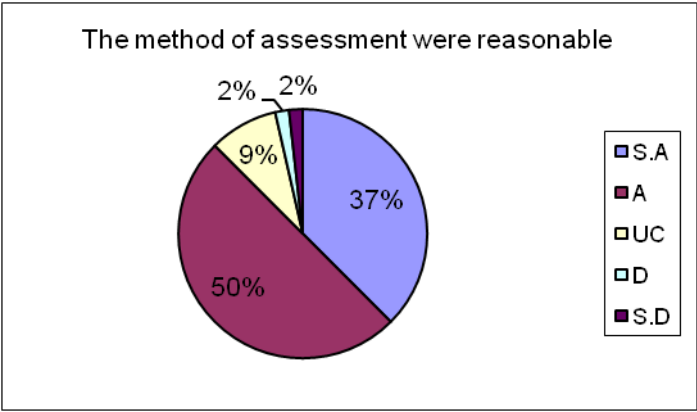
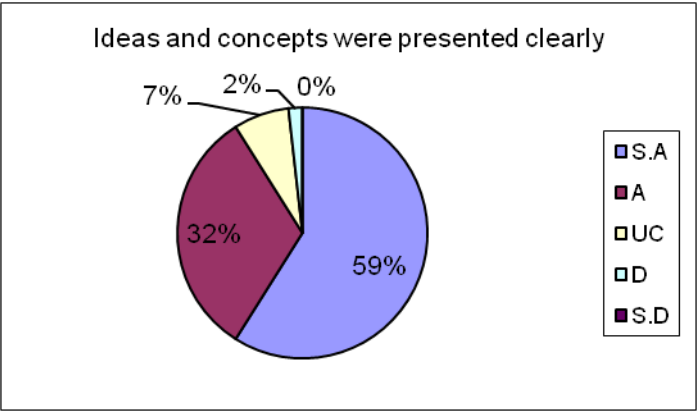
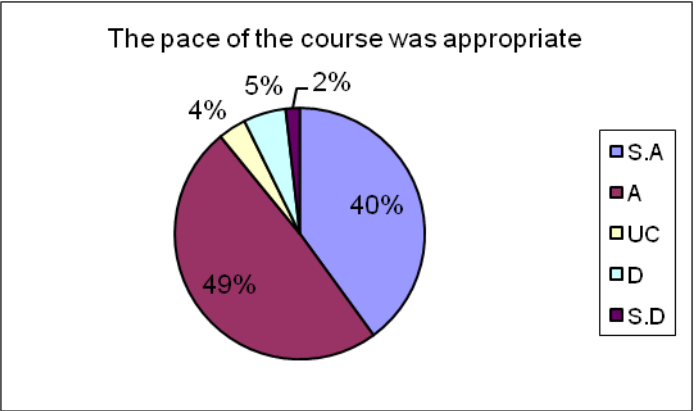
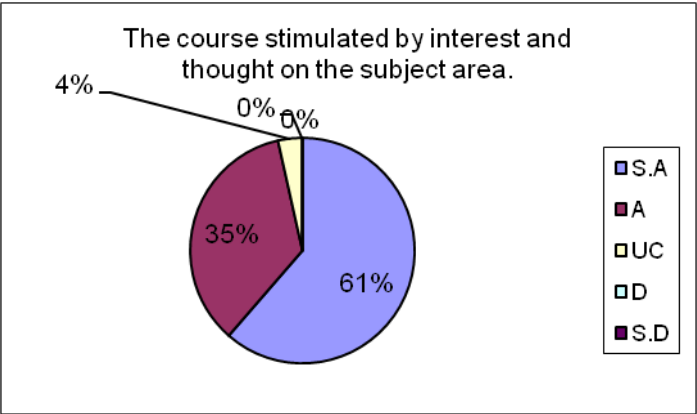
Results of Proforma No. 1 of BCH-704- (Teacher 1)

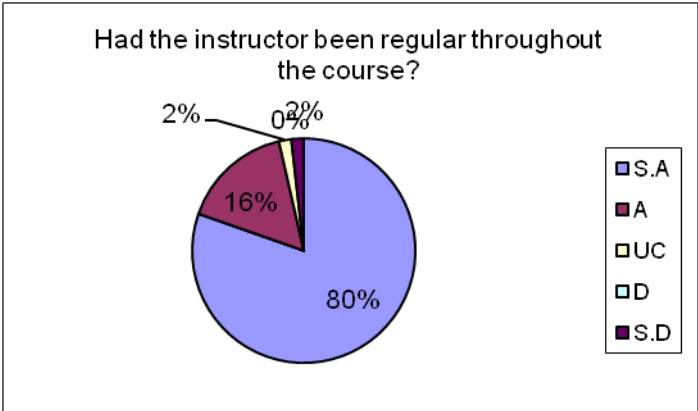
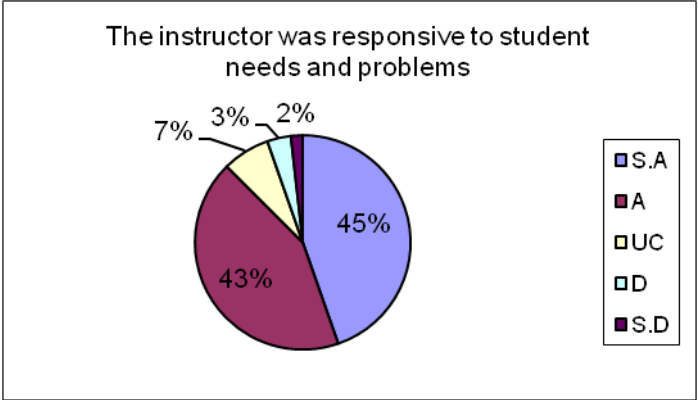
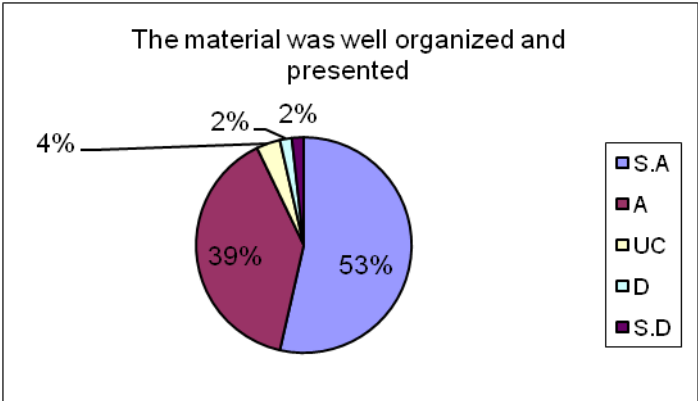
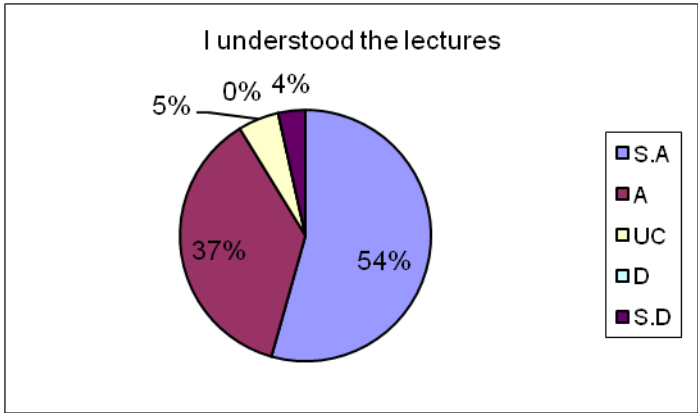
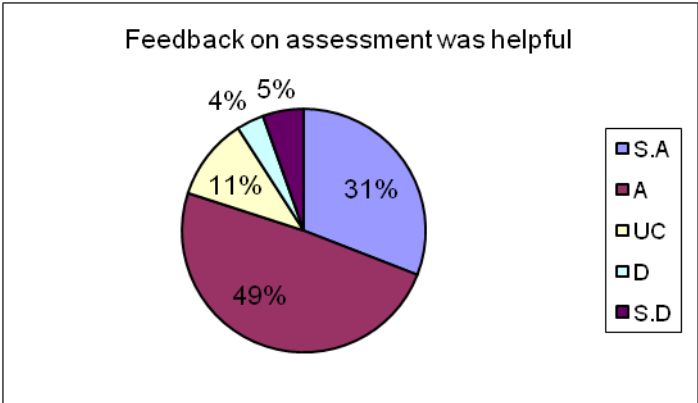
Depending upon the results of Performa.1, approximately 80% students strongly agreed that Teacher 1 had been regular throughout the course. 691% were of view that learning and teaching methods encouraged participation. On the other hand 2% students either strongly disagreed/disagreed regarding above mentioned criteria in Performa I evaluated for Teacher 1.

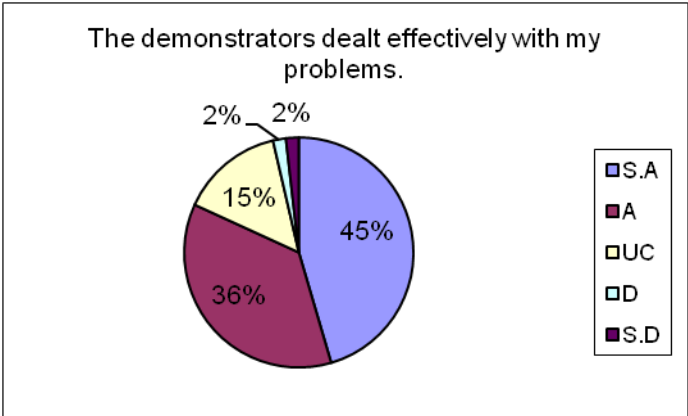
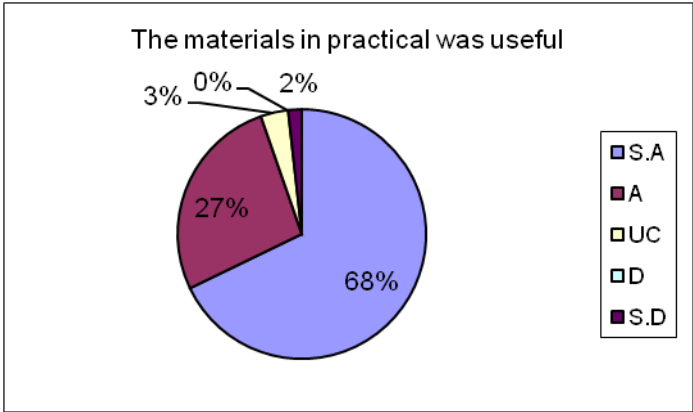
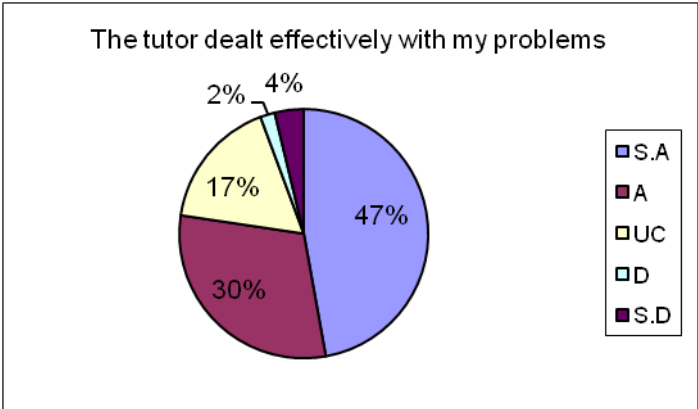
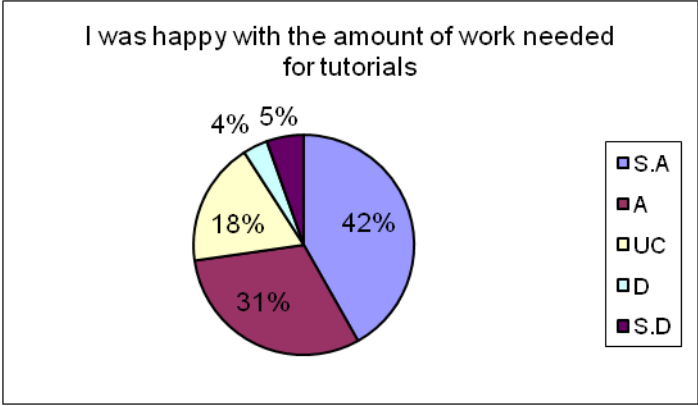
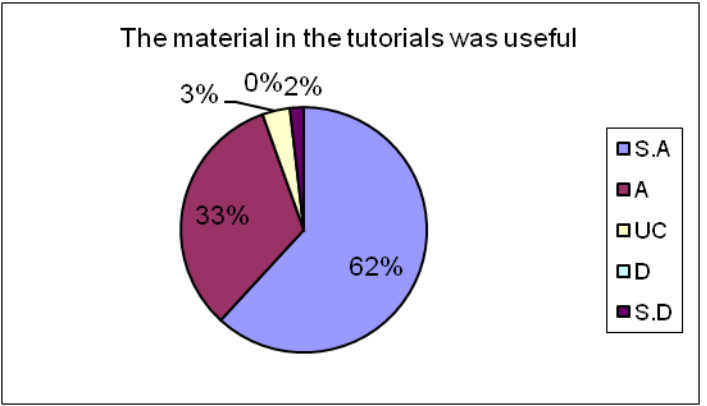






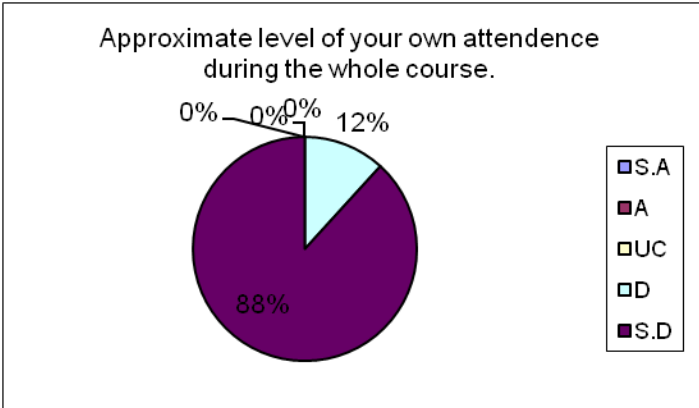
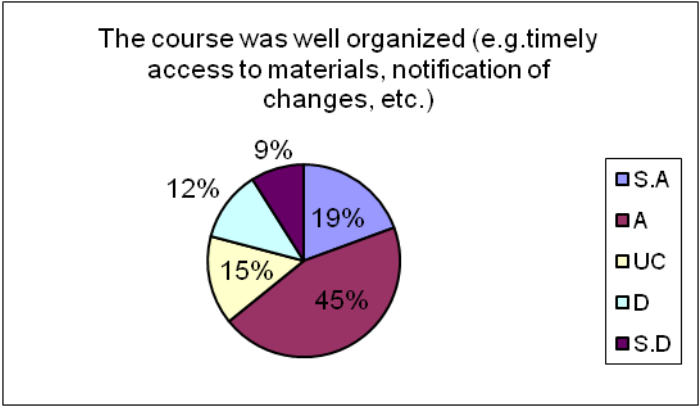
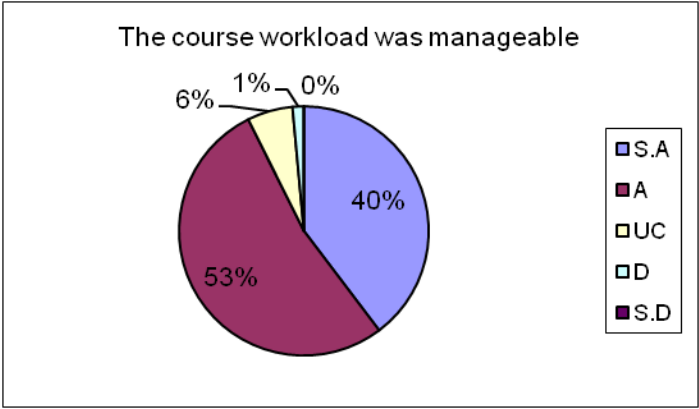
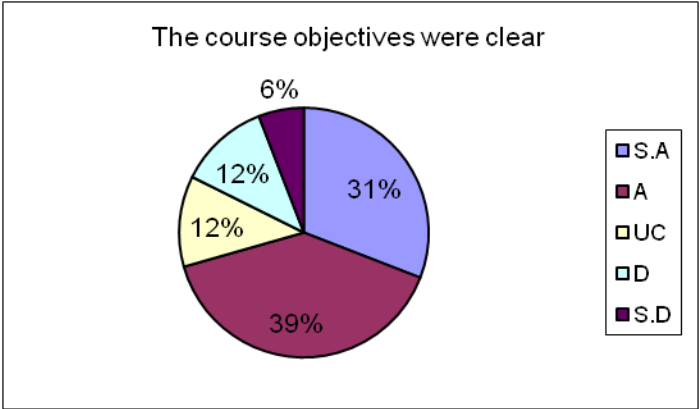


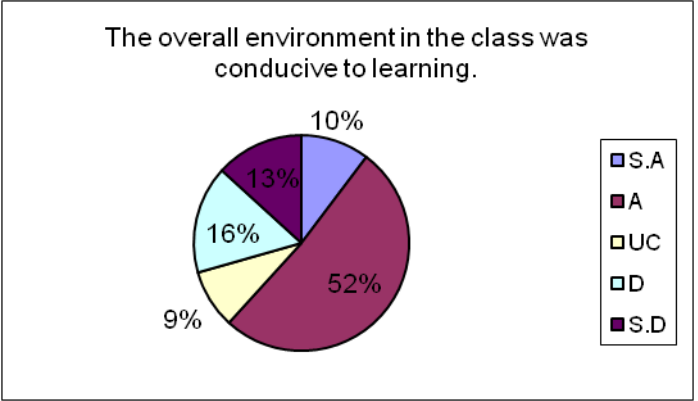
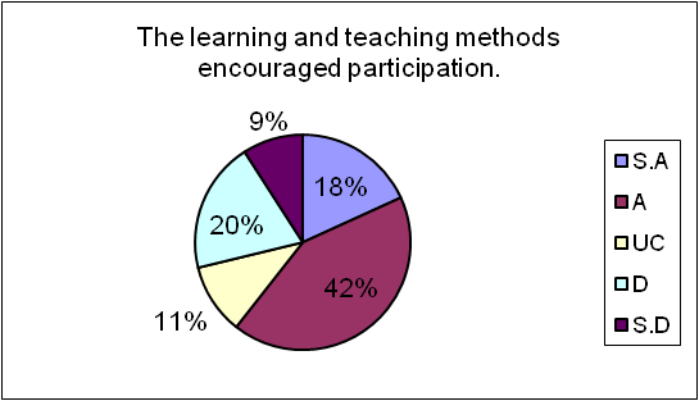
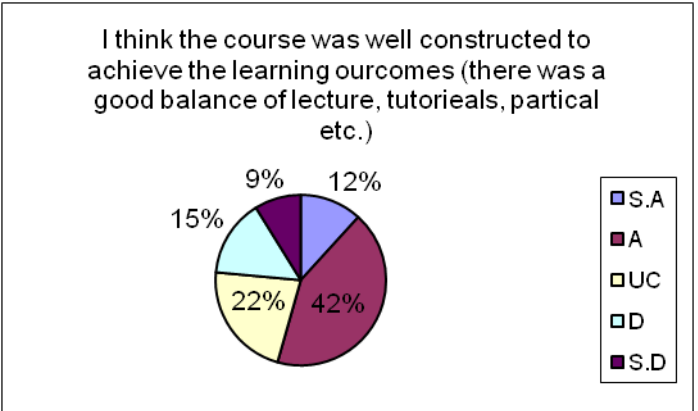
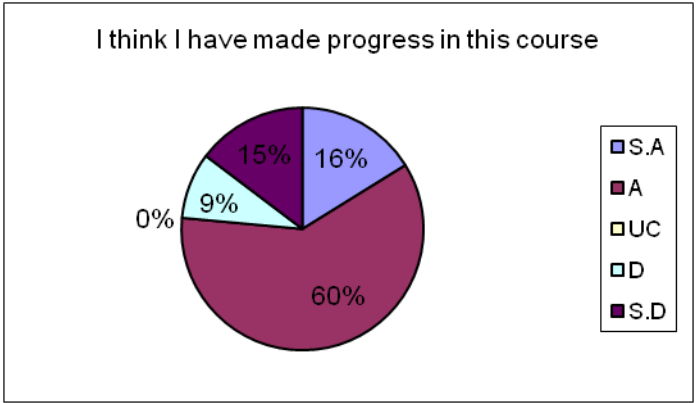
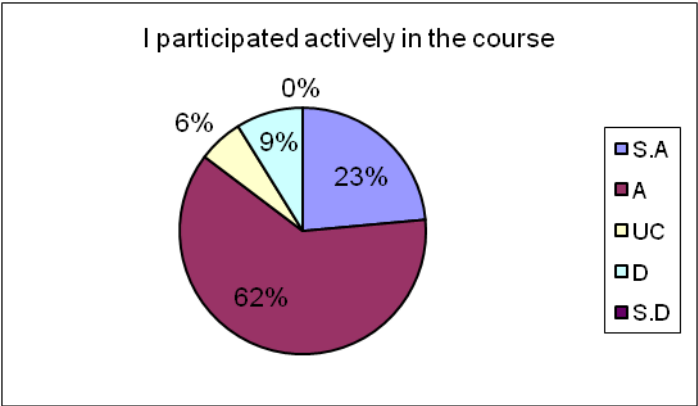


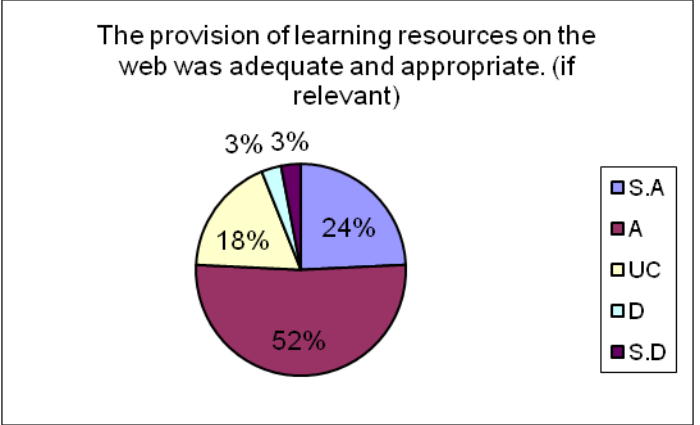
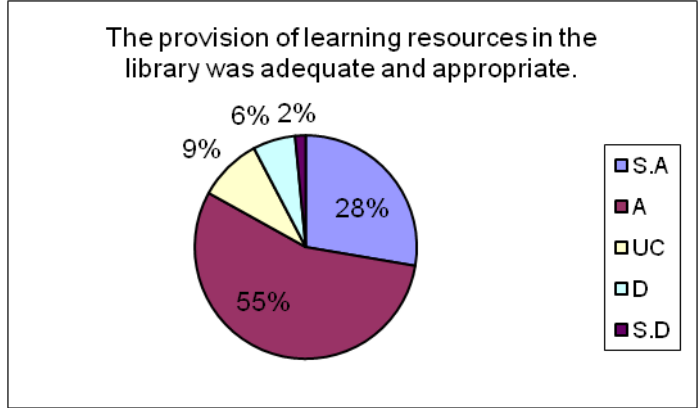
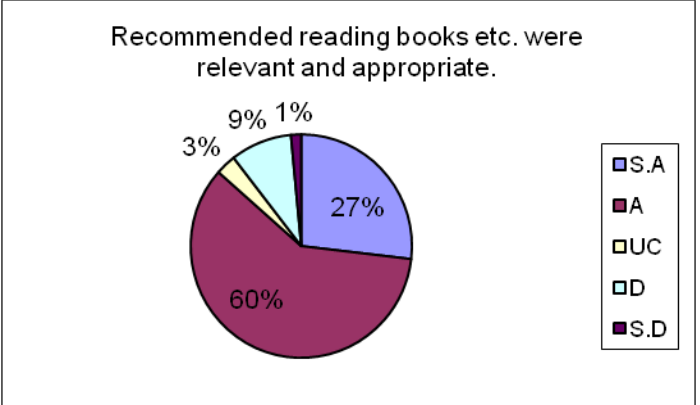
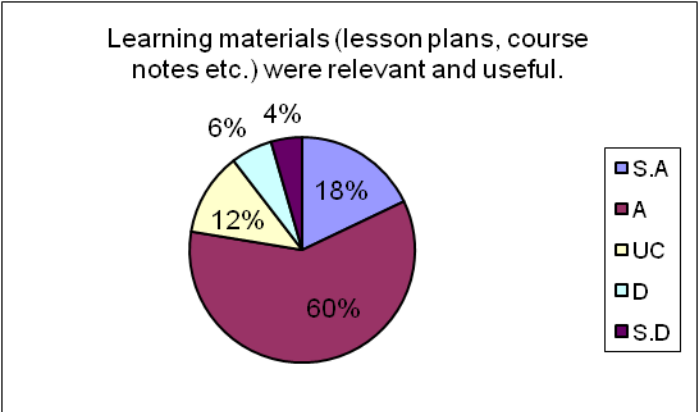
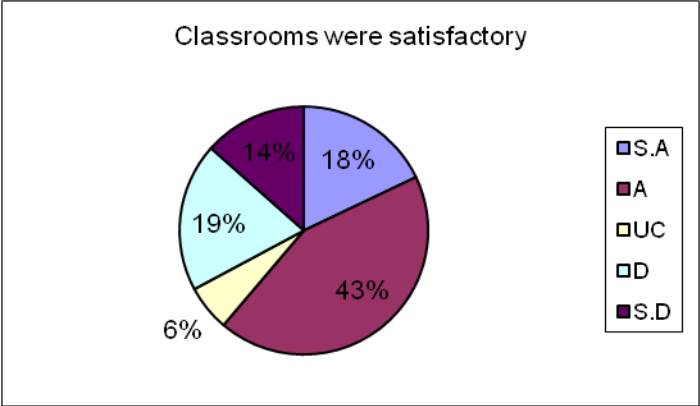


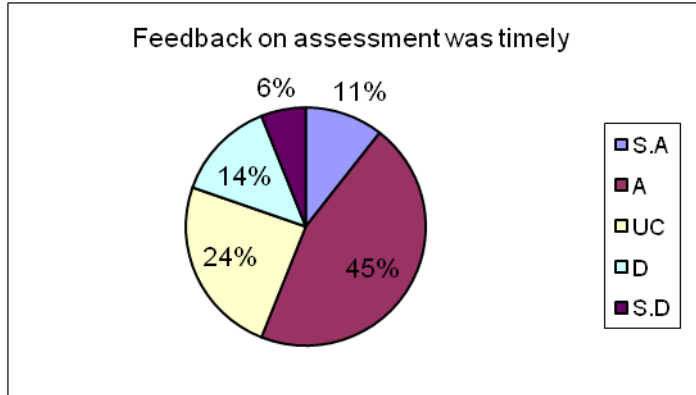
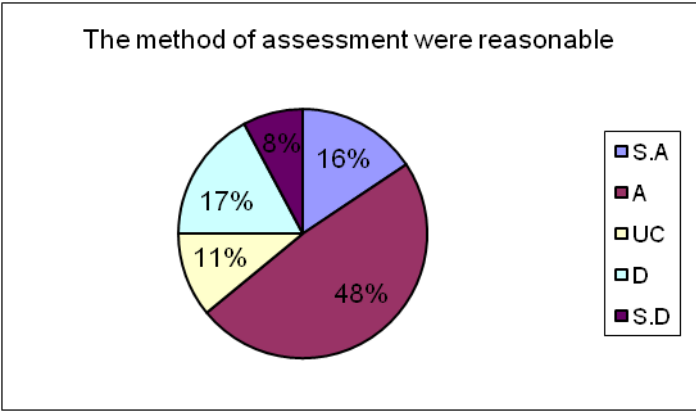
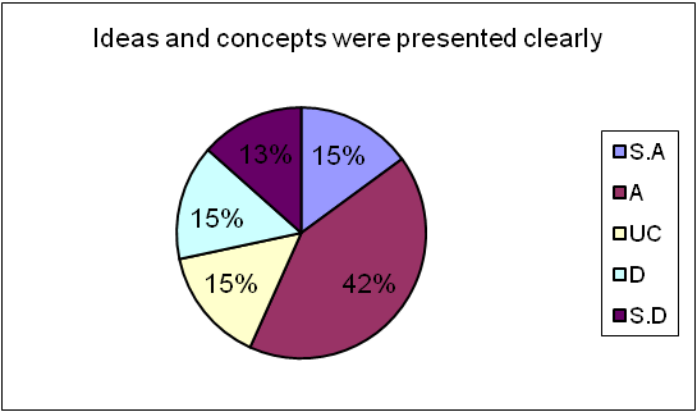
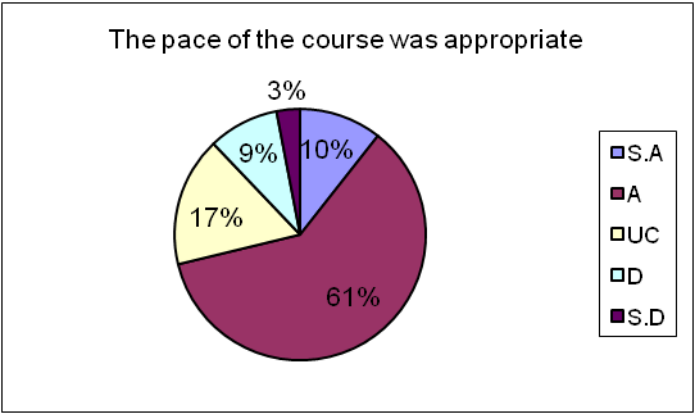
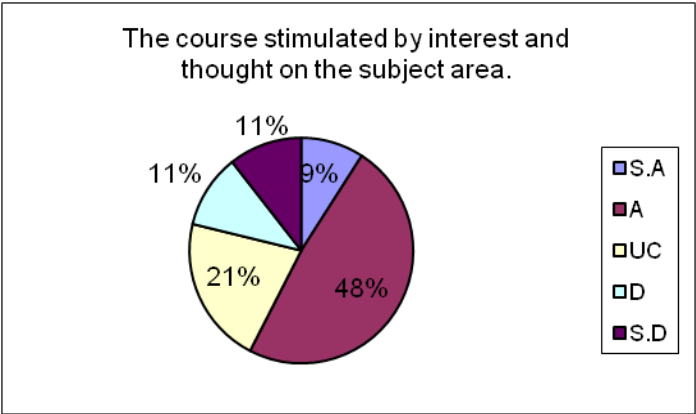
Results of Proforma No. 1 of BCH-703- (Teacher 2)

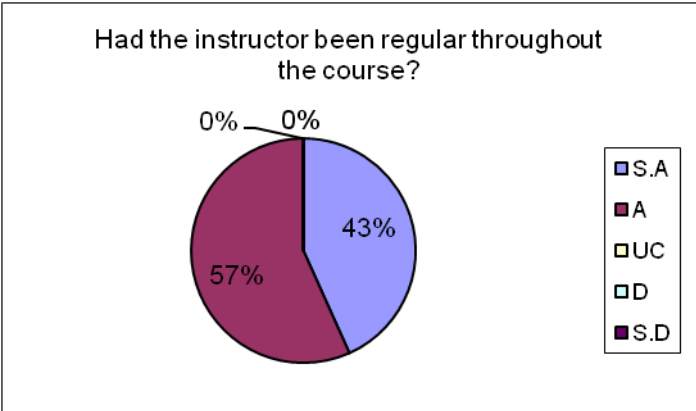
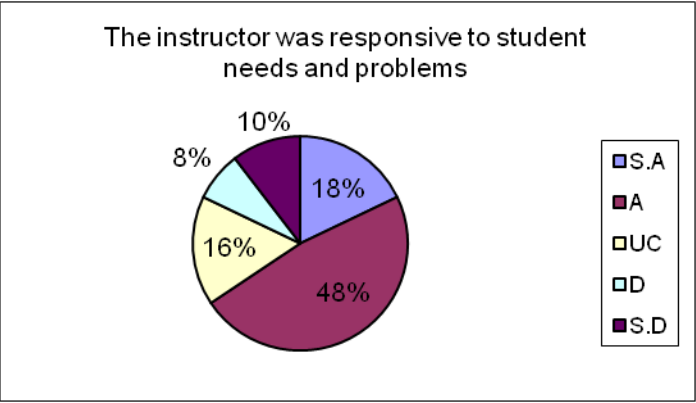
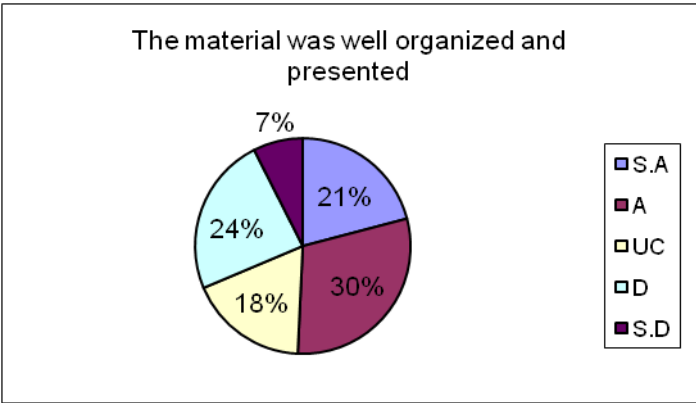
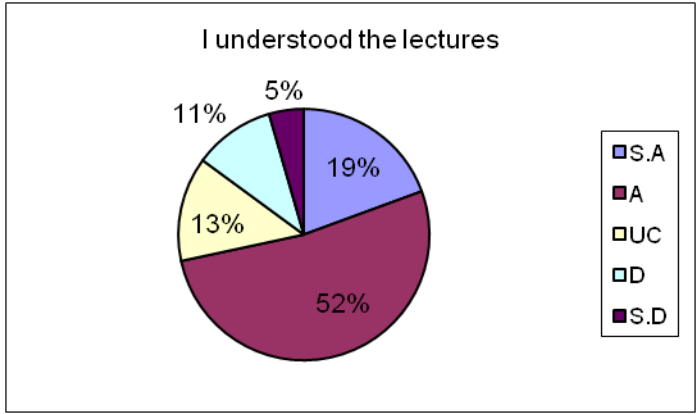
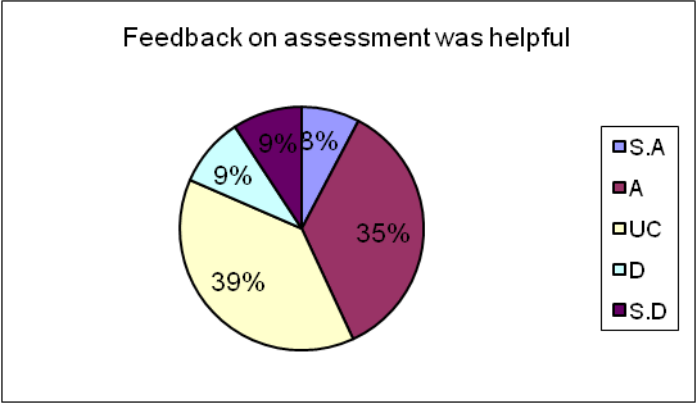
Course assessment based on Performa 1 thought by Teacher 2 yields that 62% students strongly agreed/agreed regarding that Instructor participated actively in the course whereas, 0% either strongly disagreed or disagreed with the above mentioned. Approximately 60% students were of the view that learning materials (lessons plans, course notes etc) were relevant and use ful.

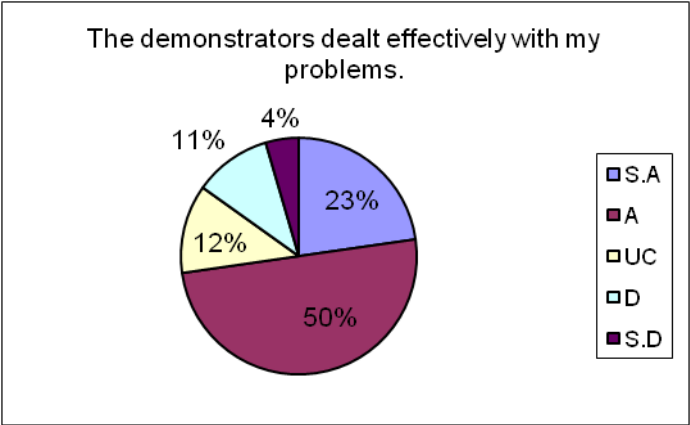
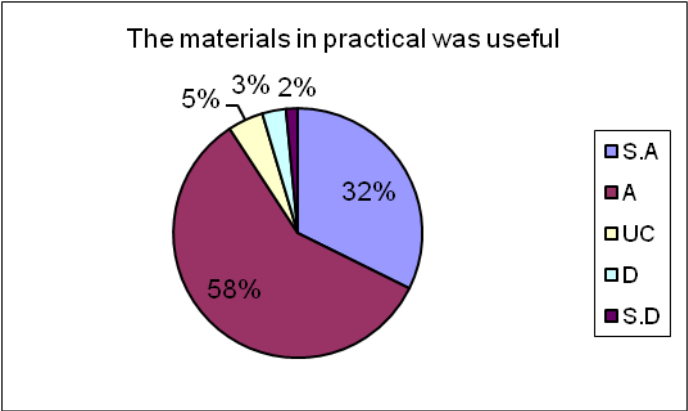
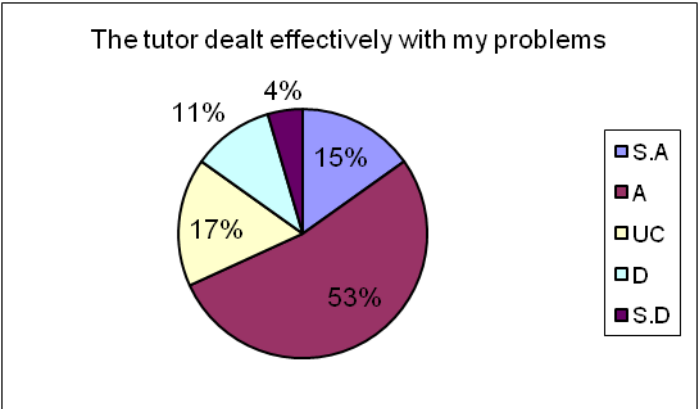
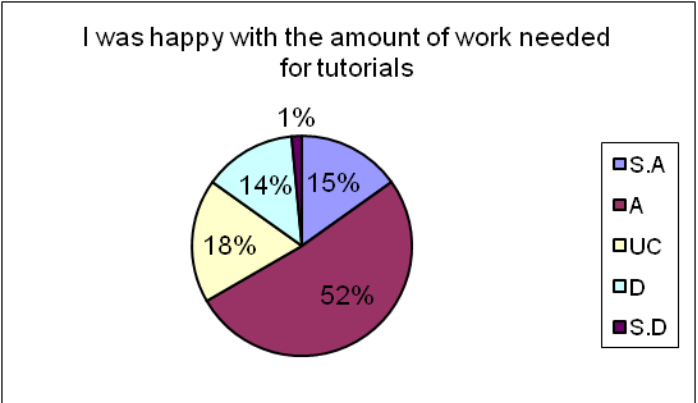
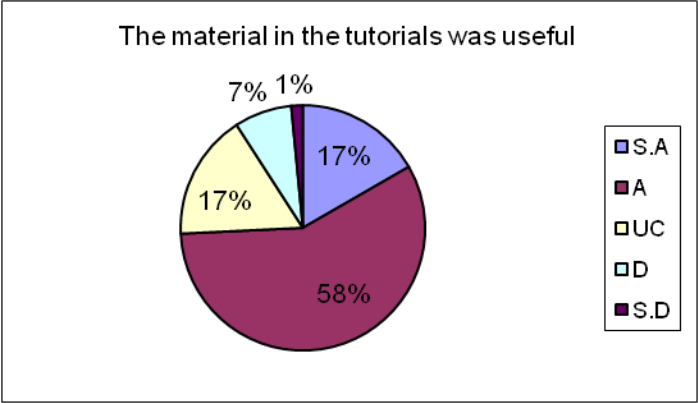






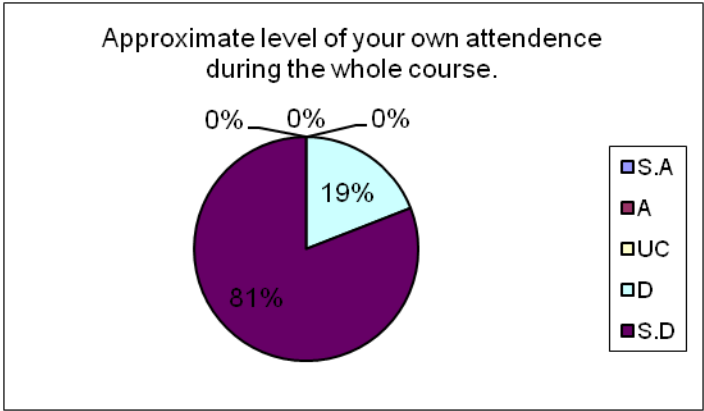
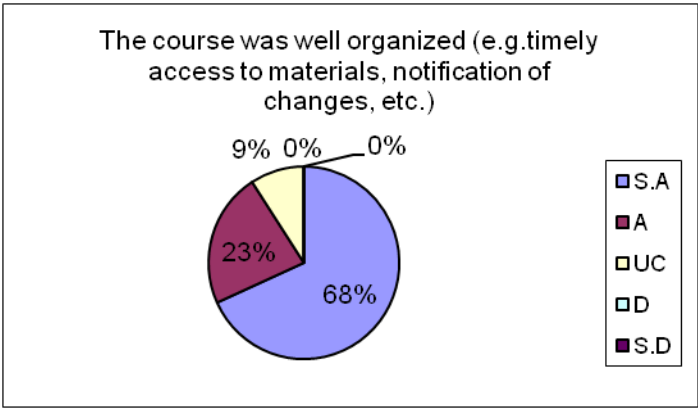
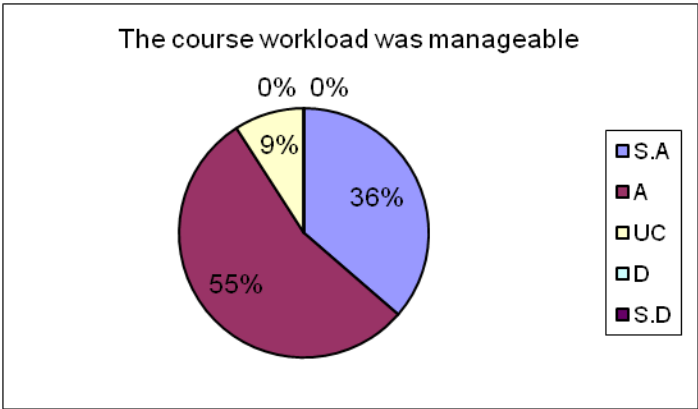
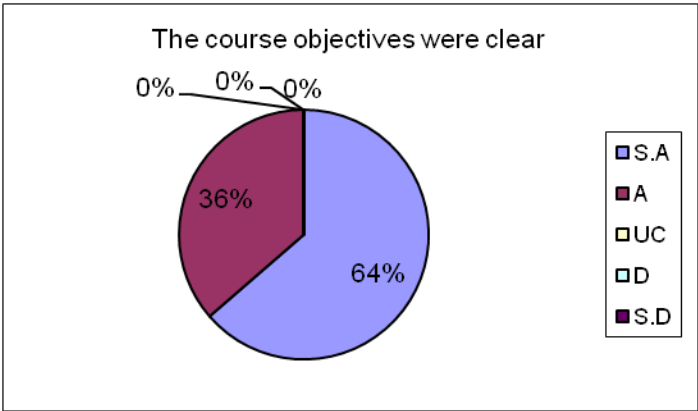


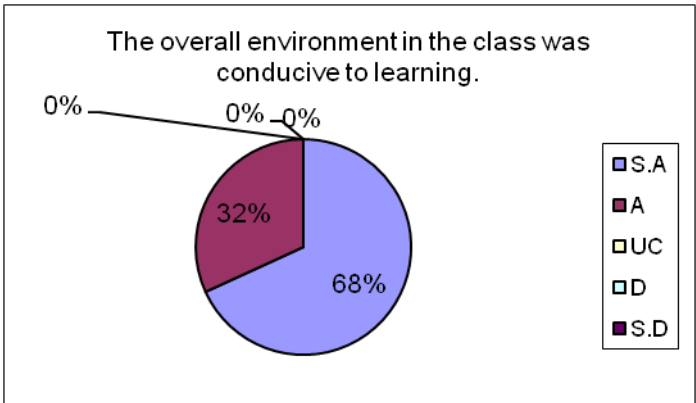
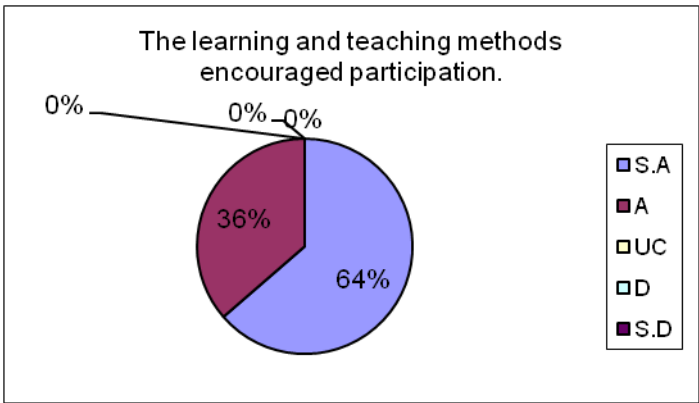
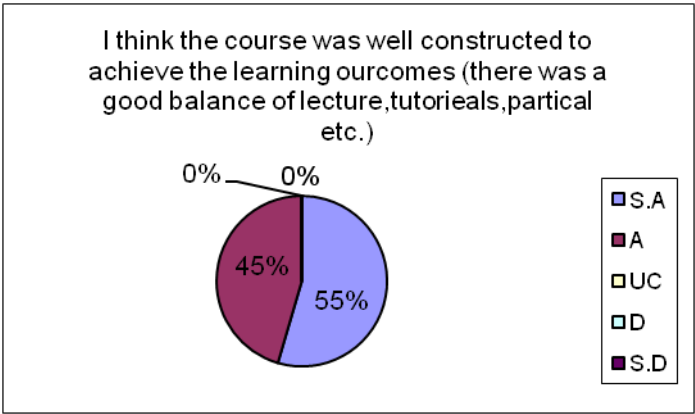
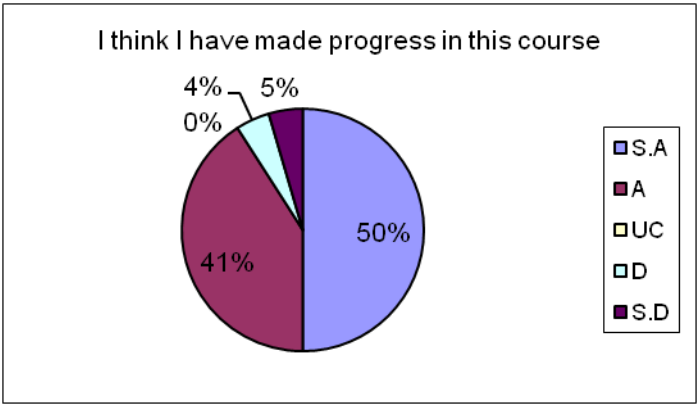
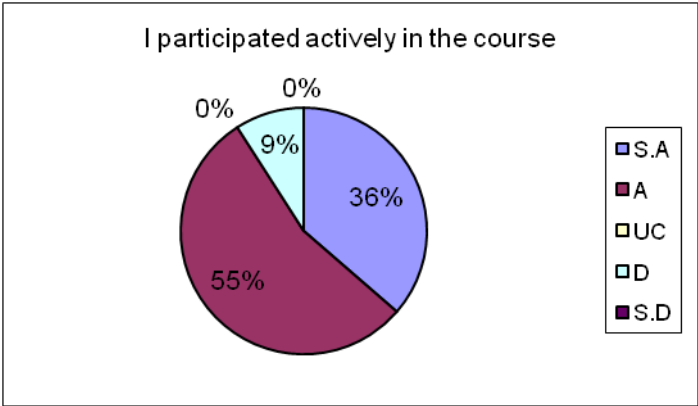


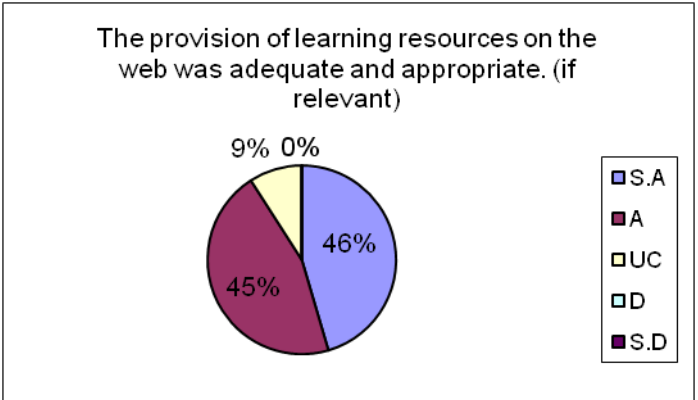
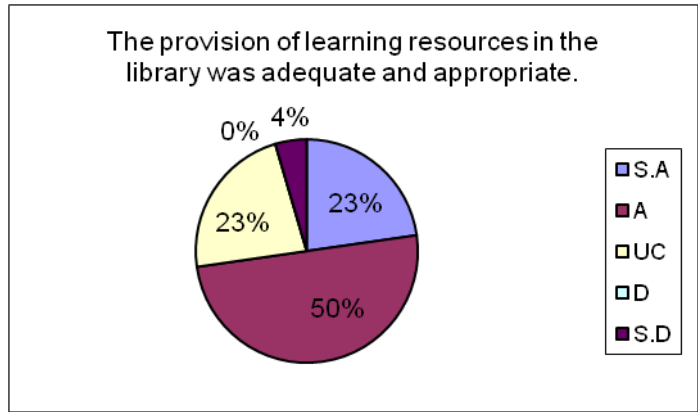
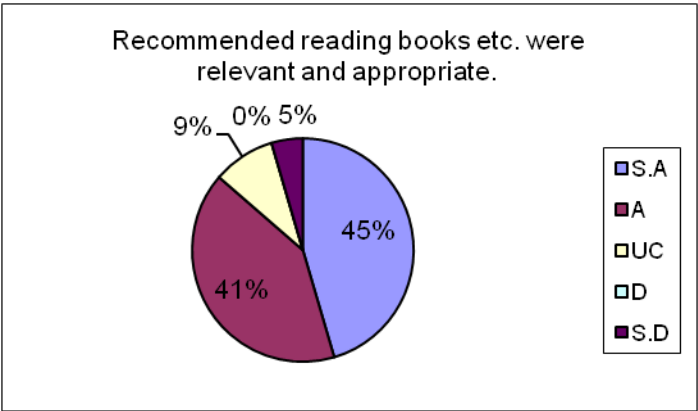
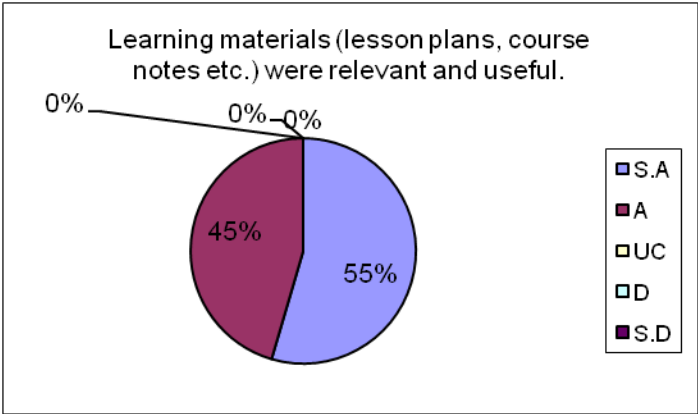
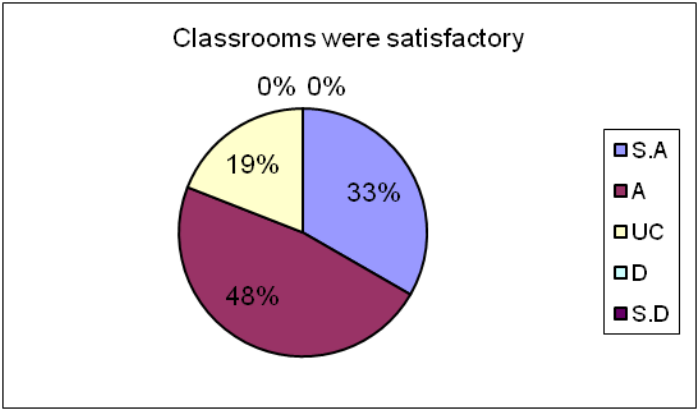


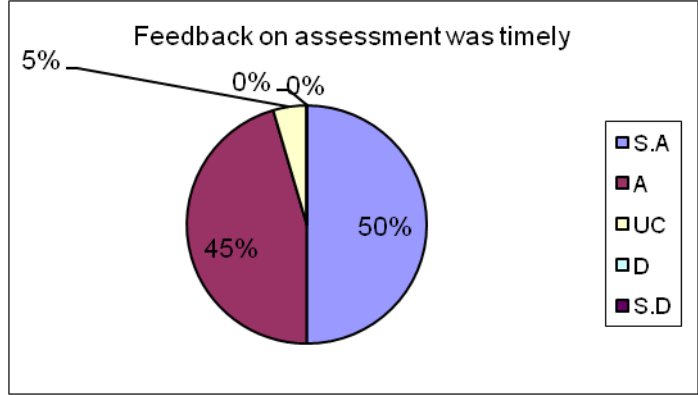
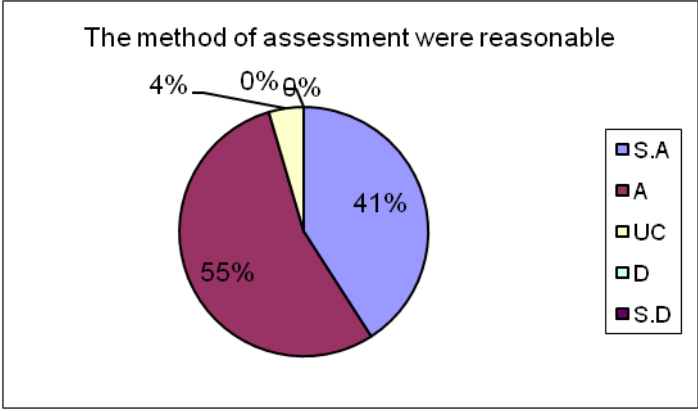
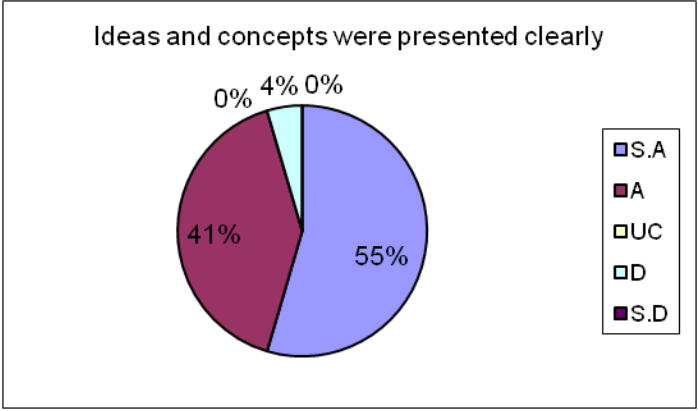
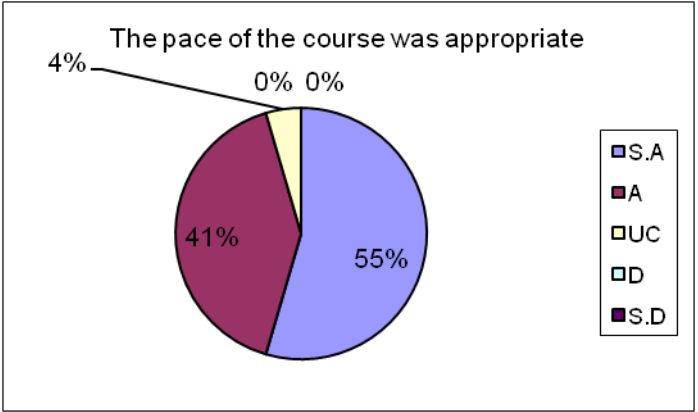
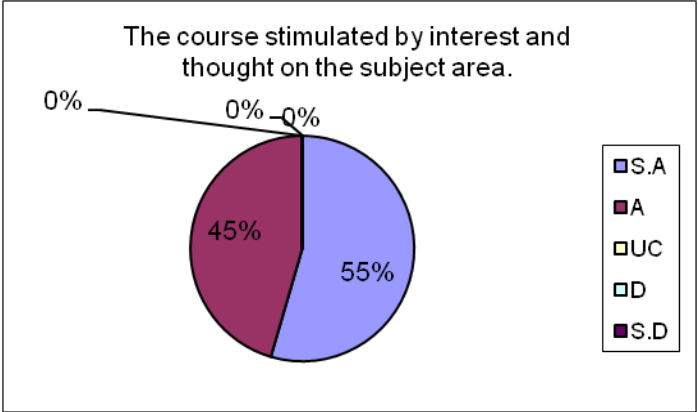
Results of Proforma No. 1 of BCH-724 (Teacher 3)

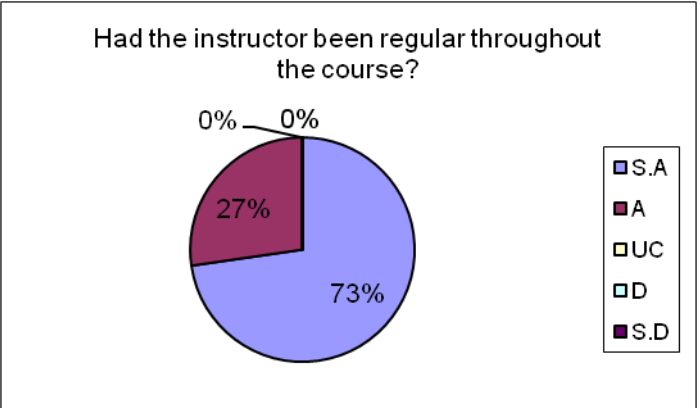
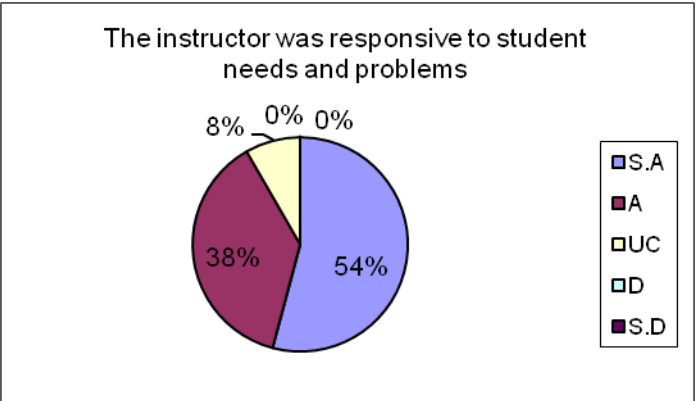
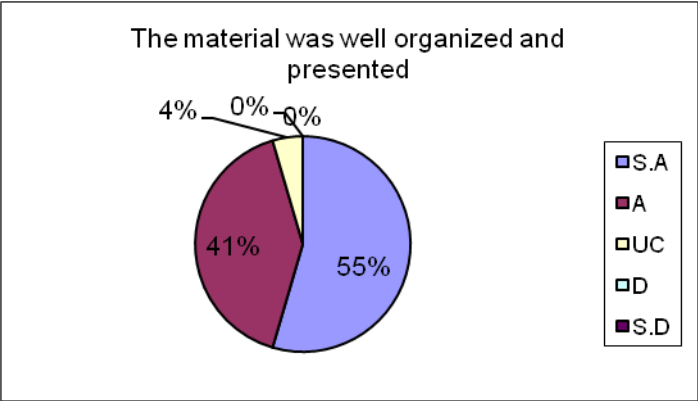
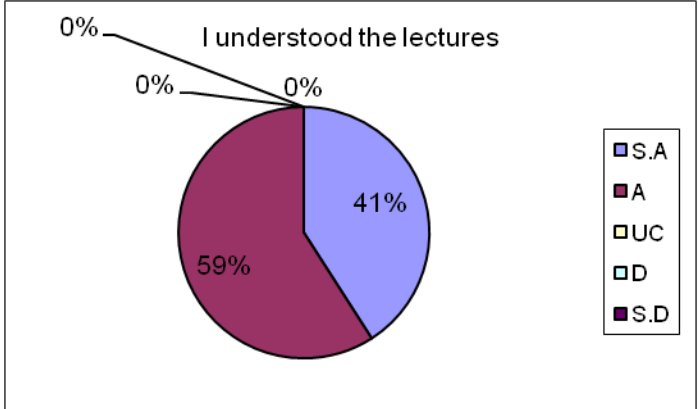
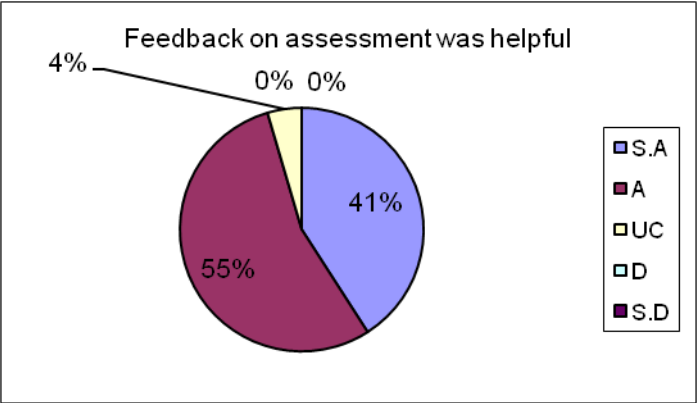
The course assessment taught by Teacher 3 shows 73% strong agreed/ agreed regarding the instructor has been regular through out the course. However 68% students strognly agreed with that the course was well organized (eg. Timely access to materials notification of changes). As far as student learning, teaching methods and students assessment during examination goes 64% either strongly agreed or agreed

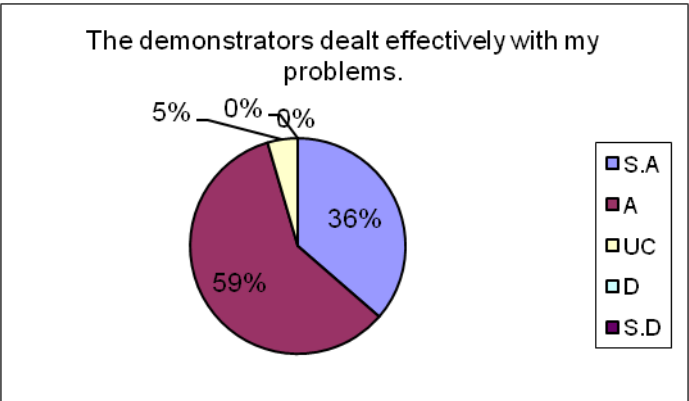
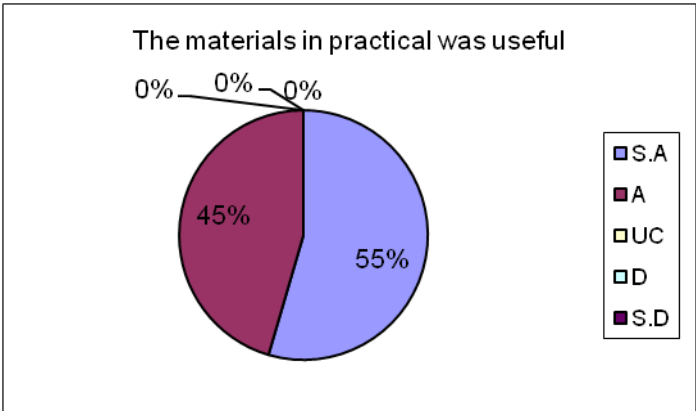
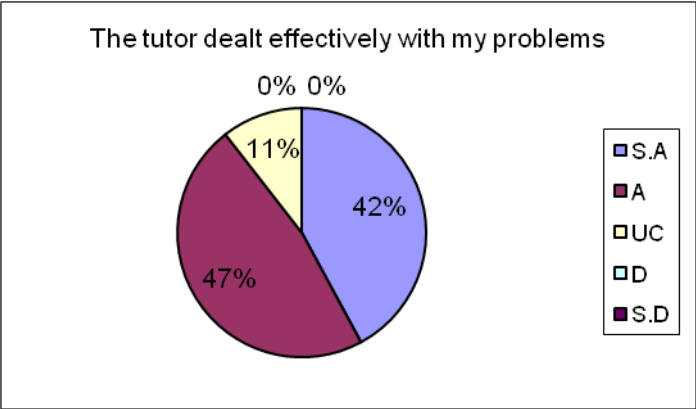
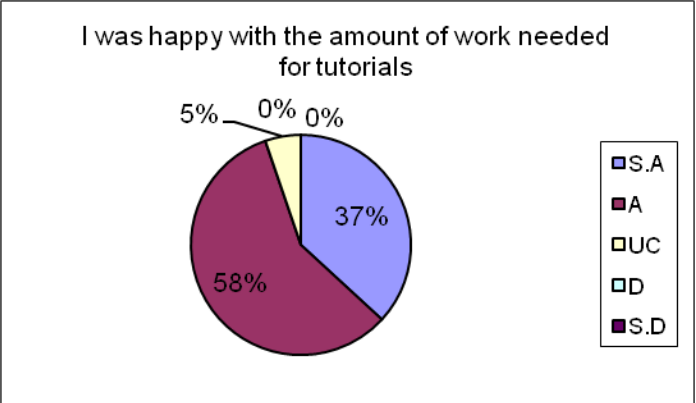
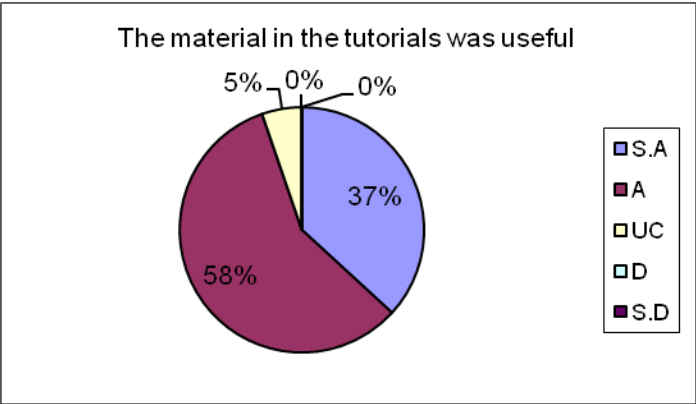






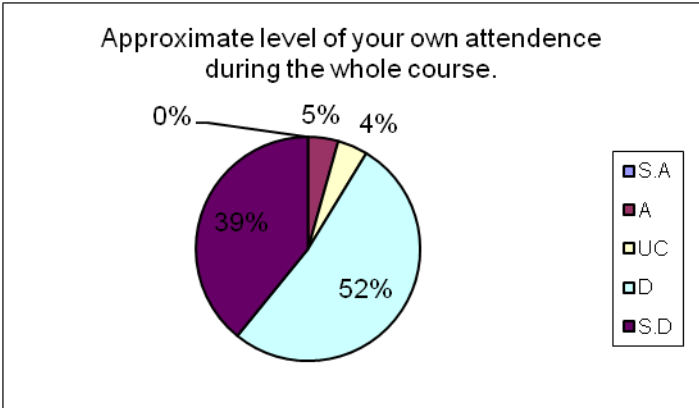
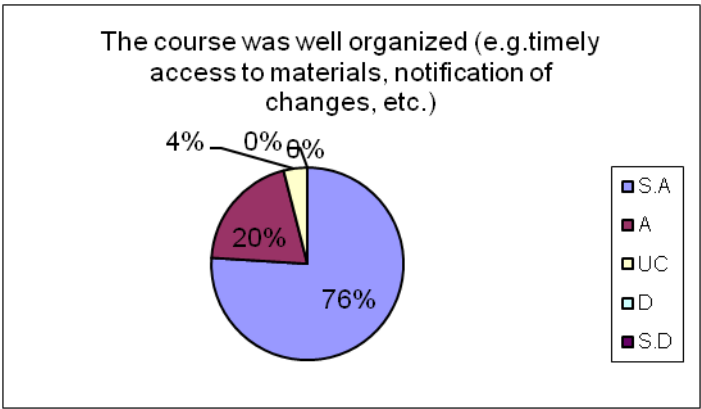
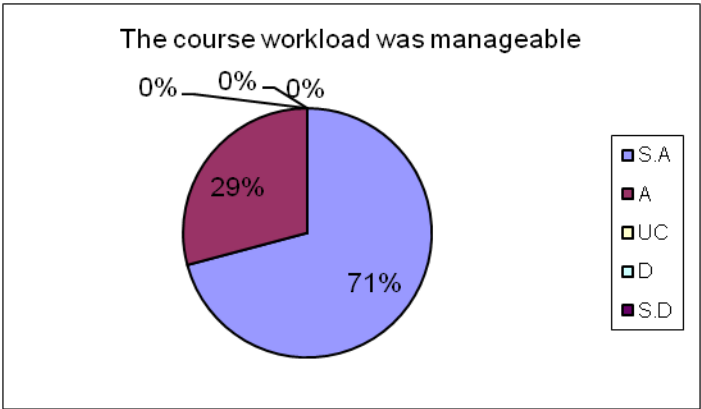
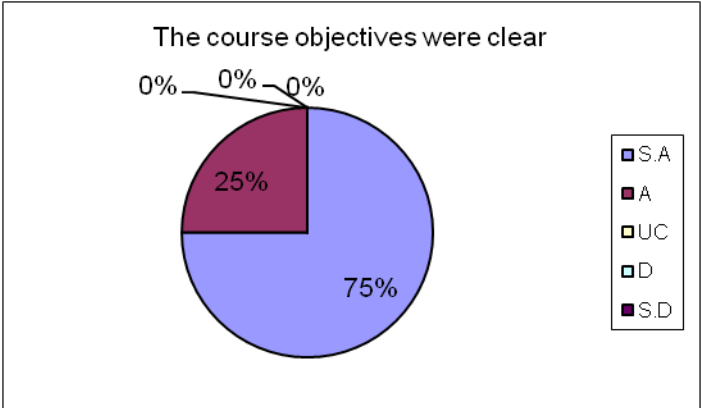


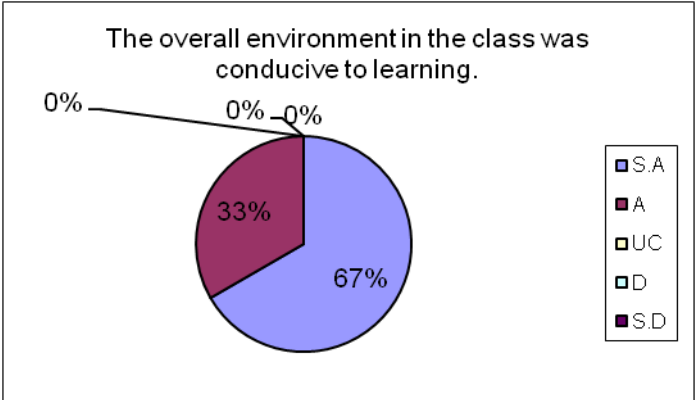
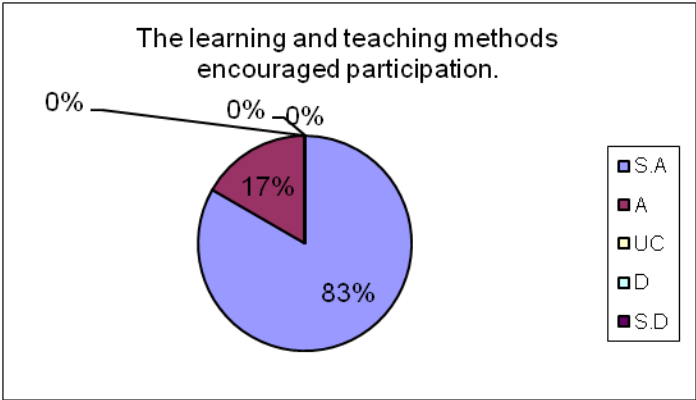
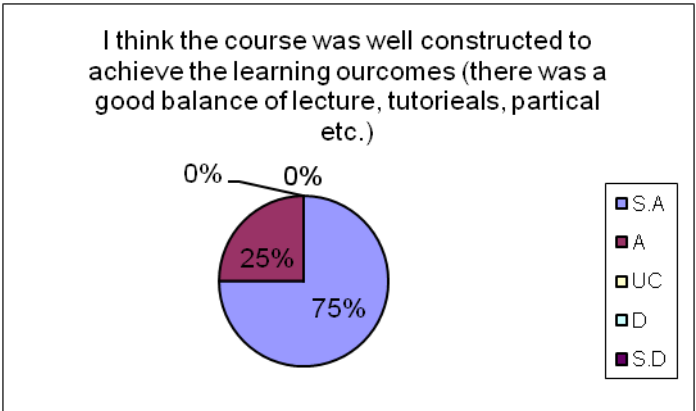
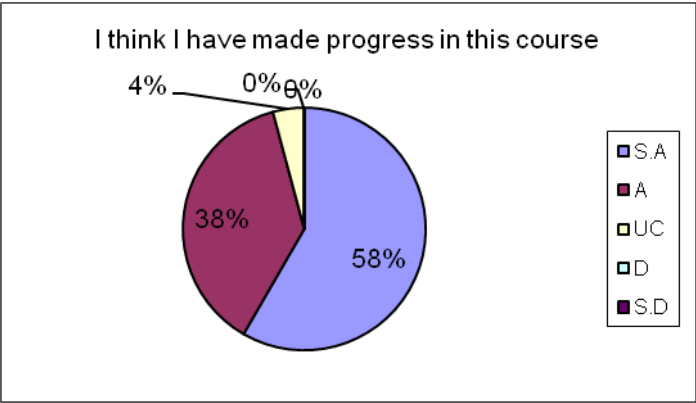
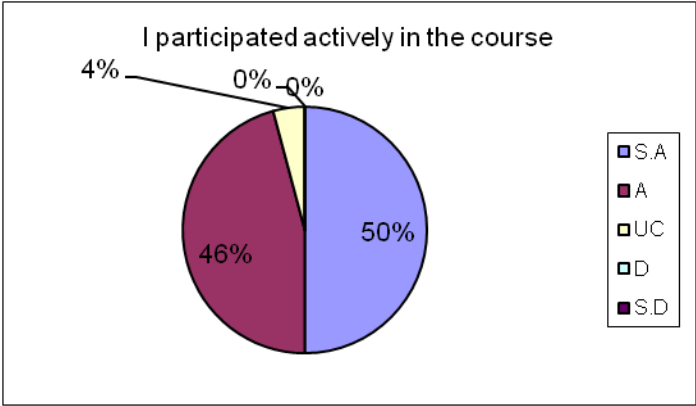


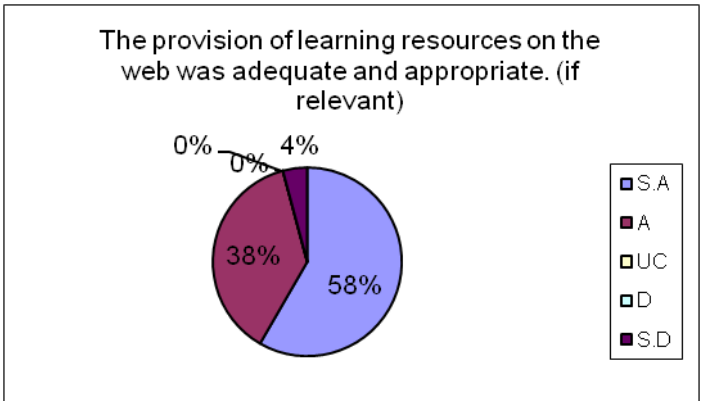
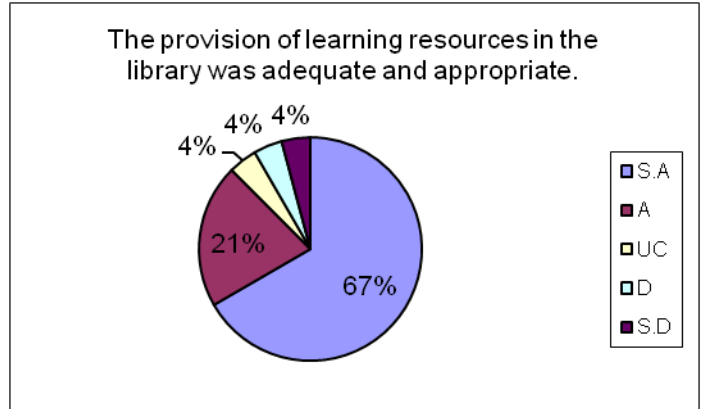
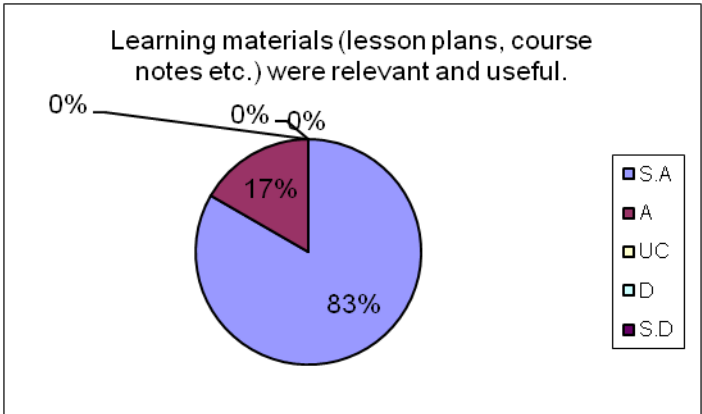
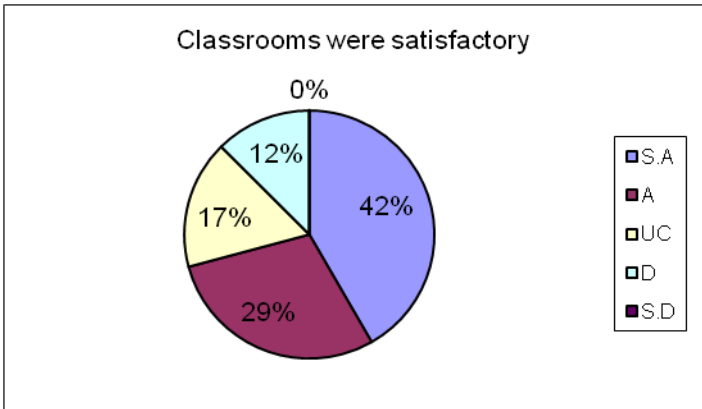


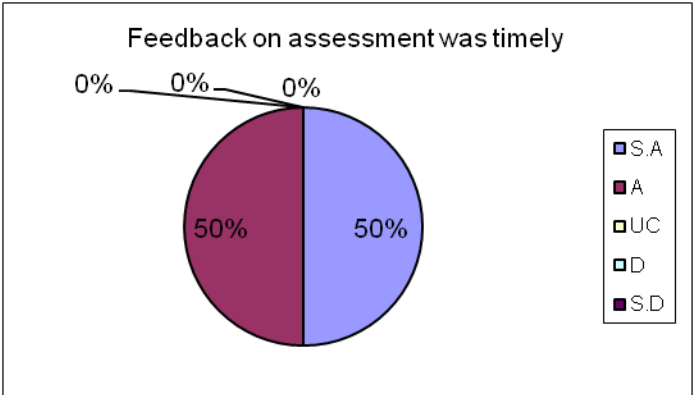
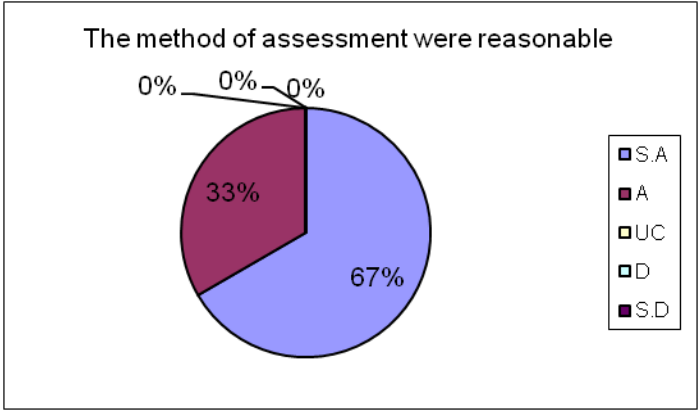
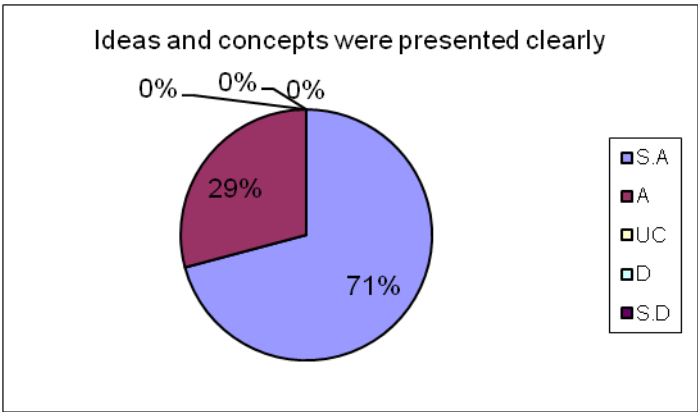
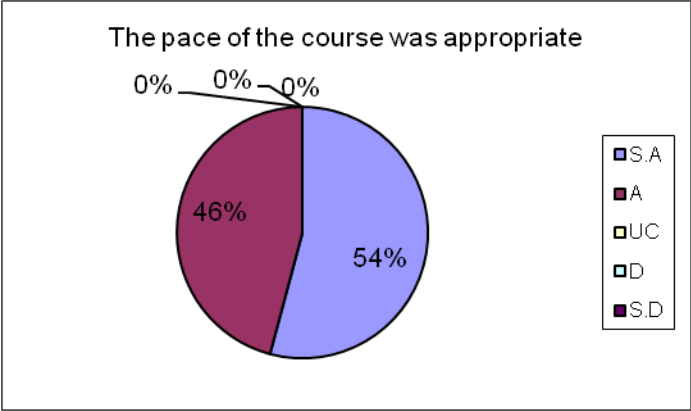
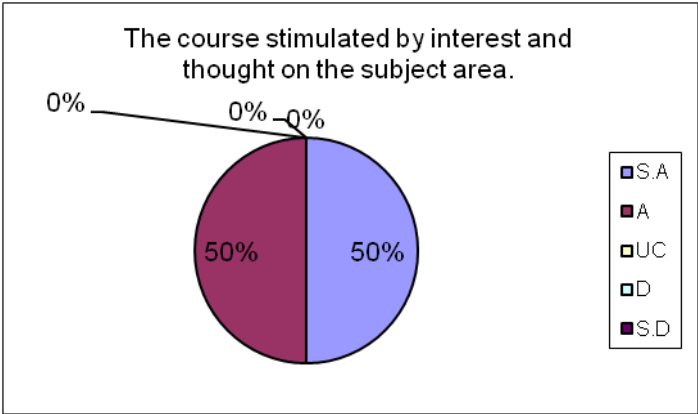
Results of Proforma No. 1 of BCH-102 (Teacher 4)

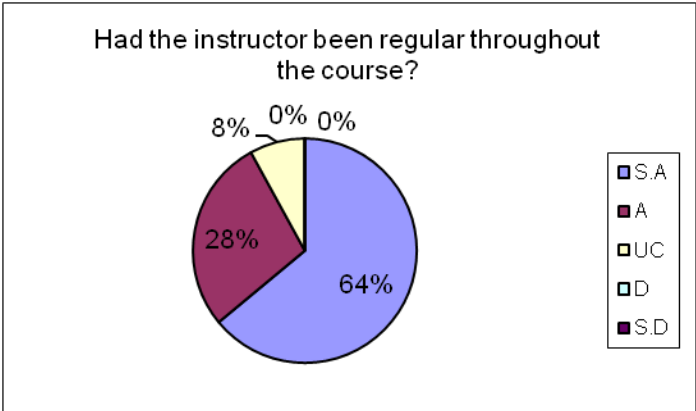
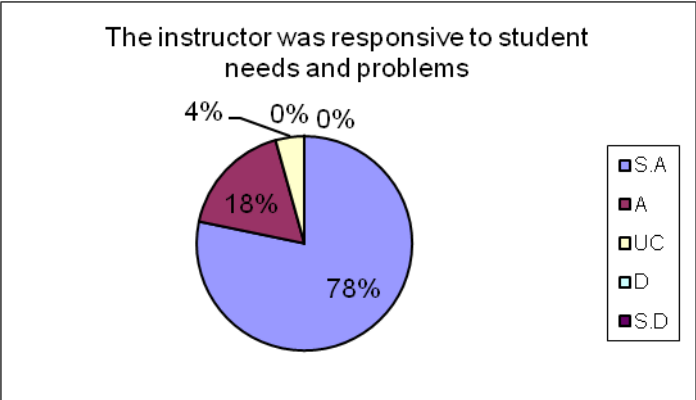
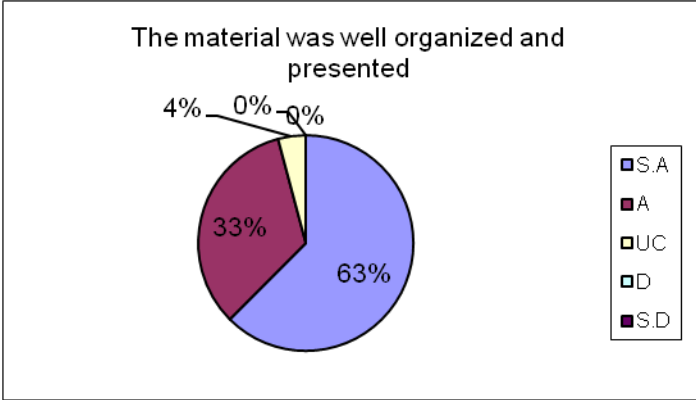
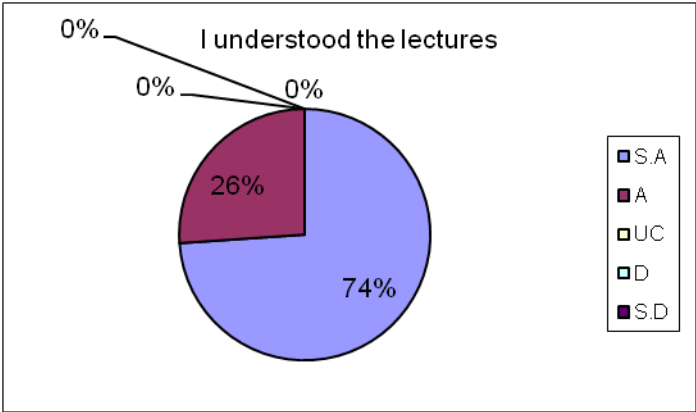
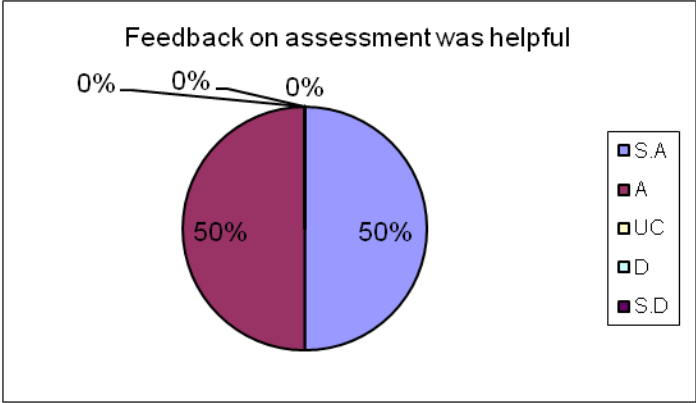
Performa I based course assessment taught by Teacher 4 produced following results; 83% students either strongly agreed or agreed regarding learning material were relevant and useful. Approximately 76% students agreed that the course was well organized access to materials, notification of charges etc. On the other hand, 67% students were of view that overall environment in the class was conducive to learning. Overall 33% students agreed with the above mentioned criteria in Performa 1.

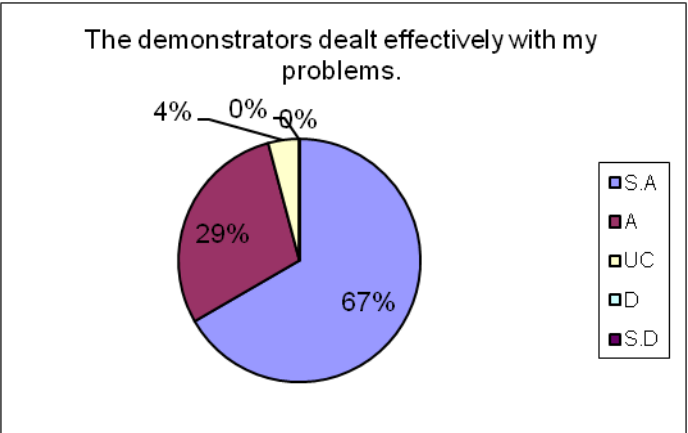
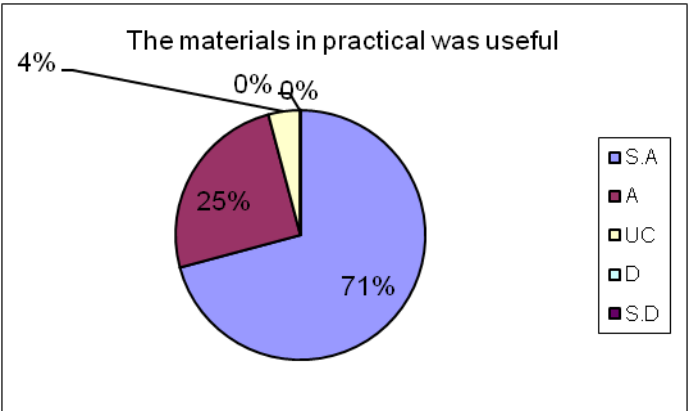
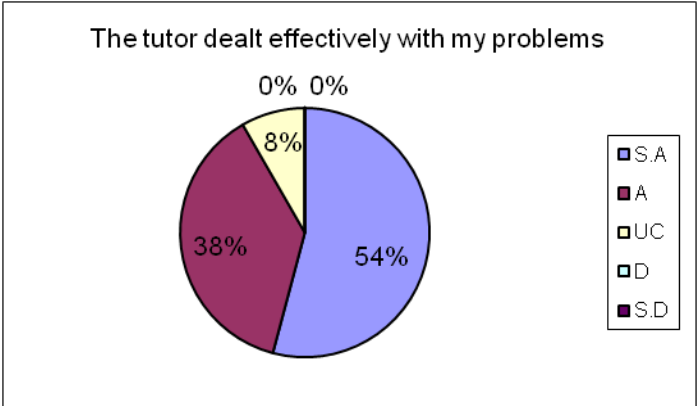
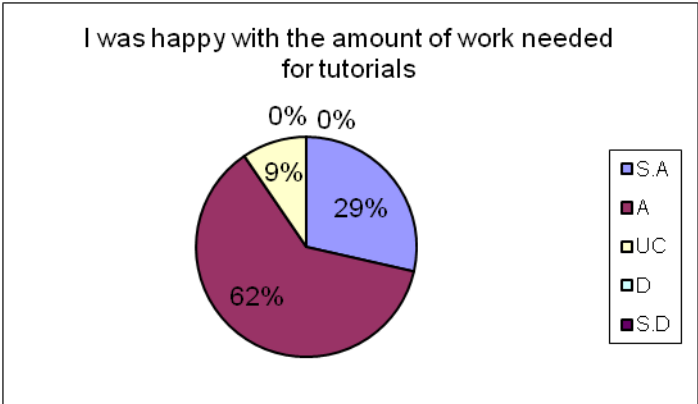
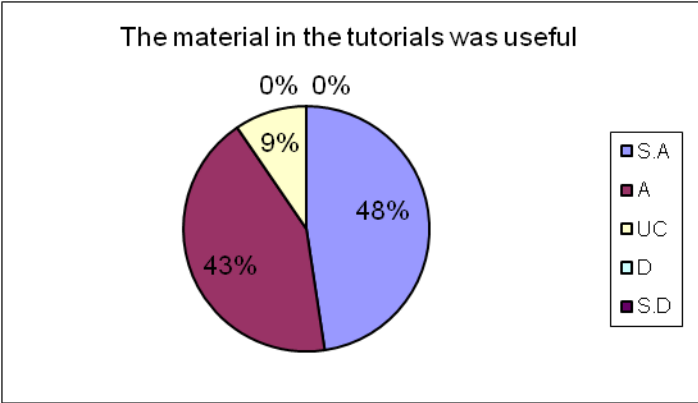






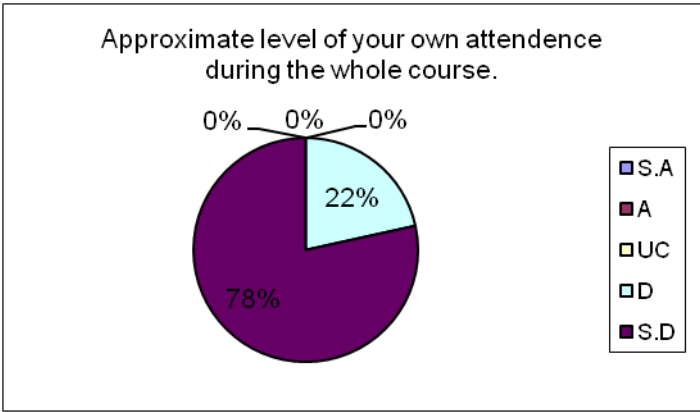
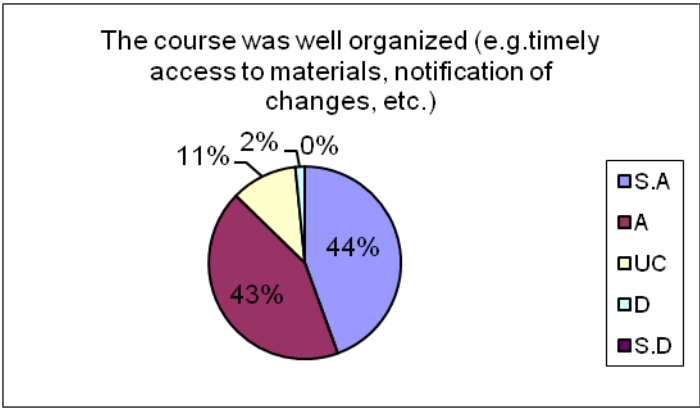
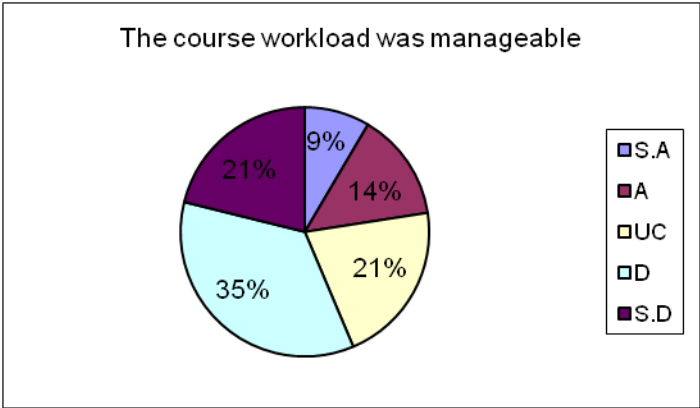
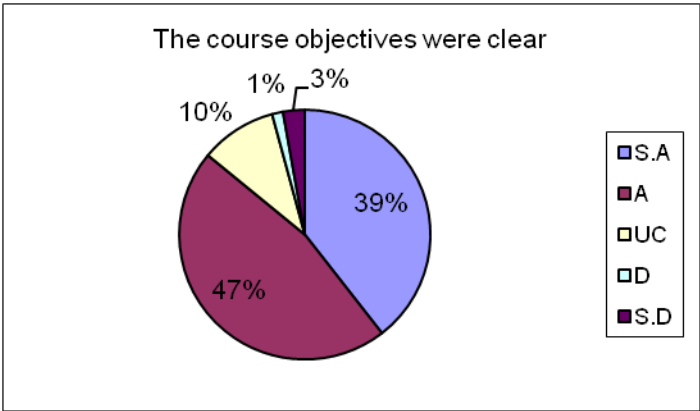


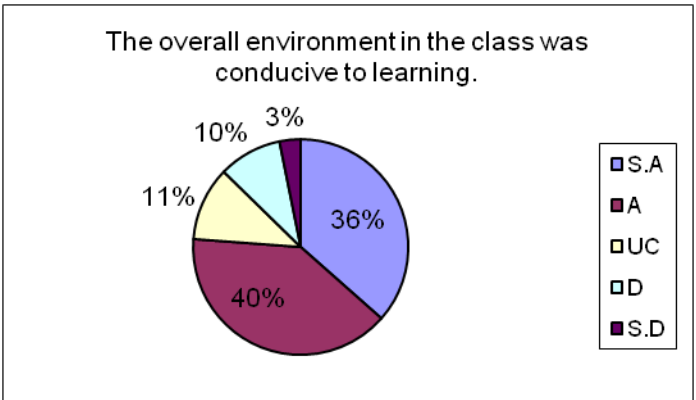
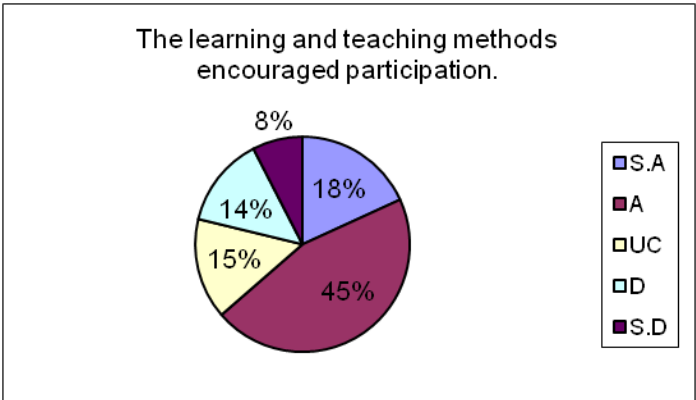
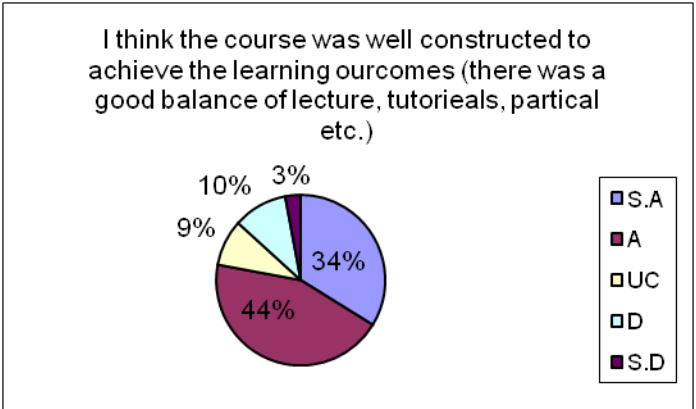
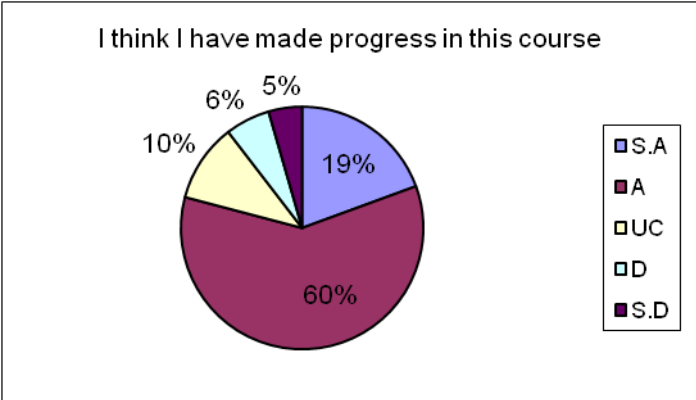
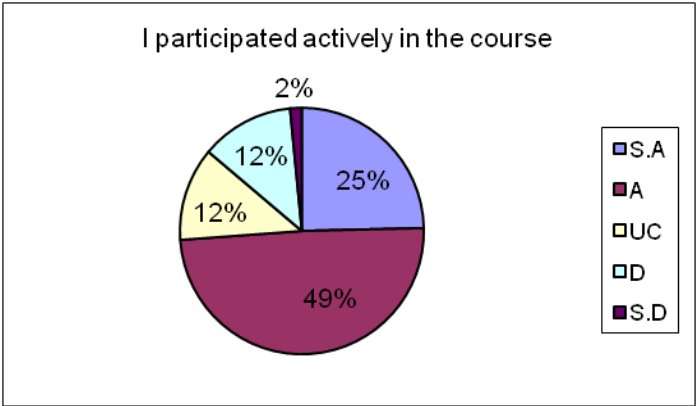


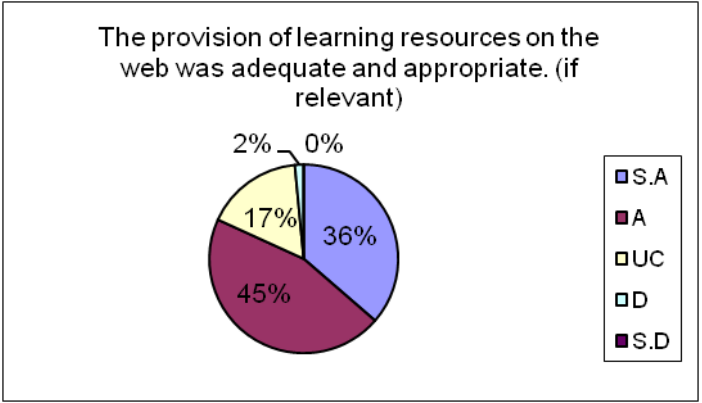
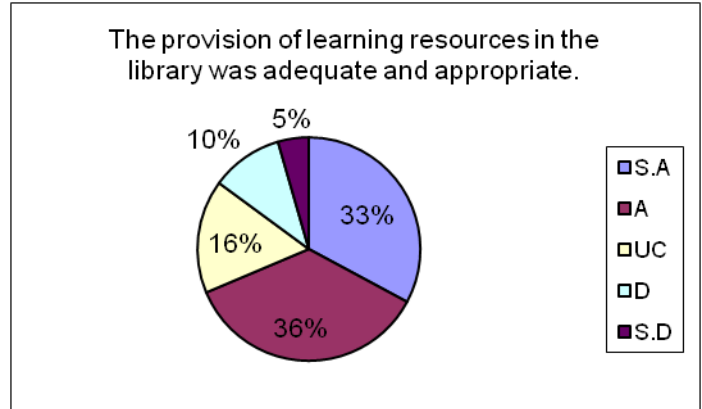
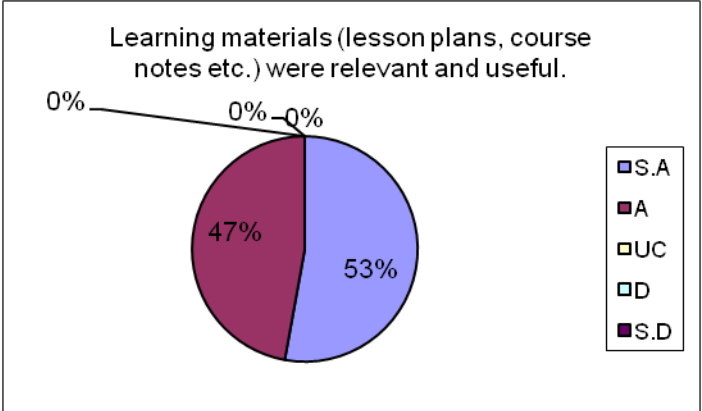
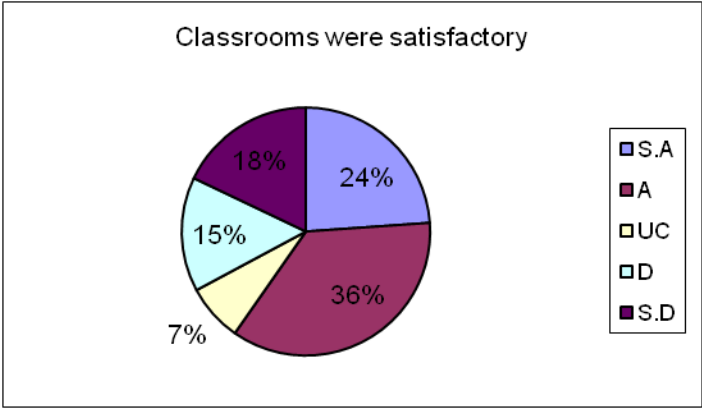


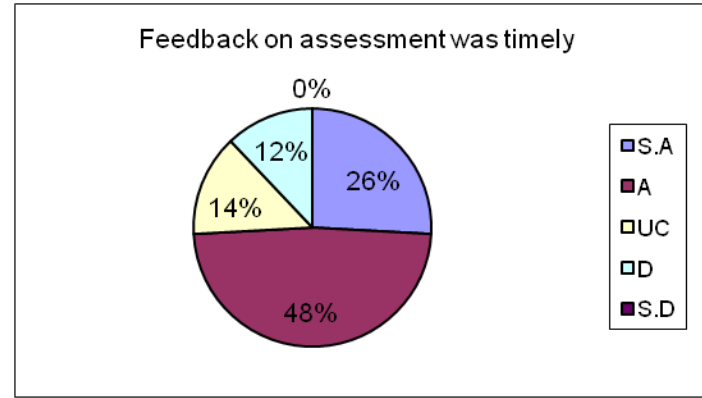
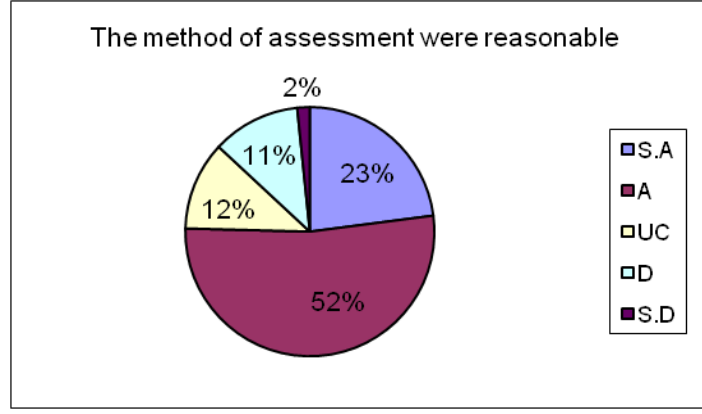
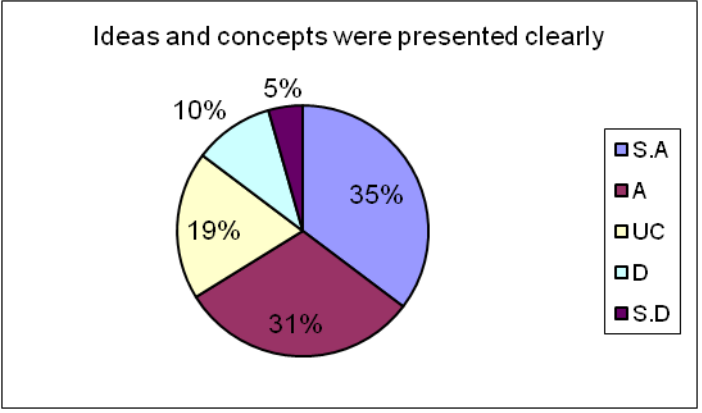
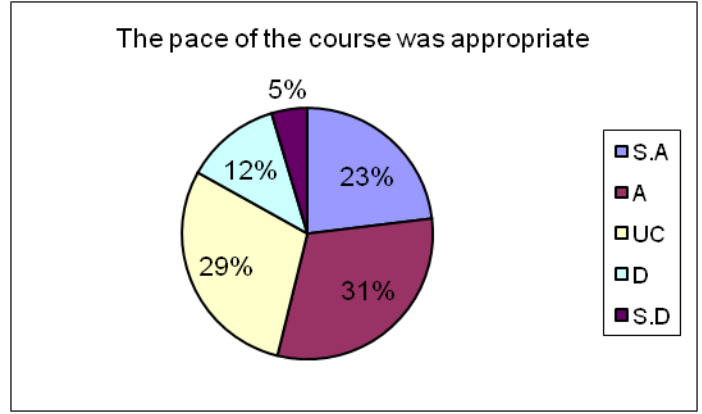
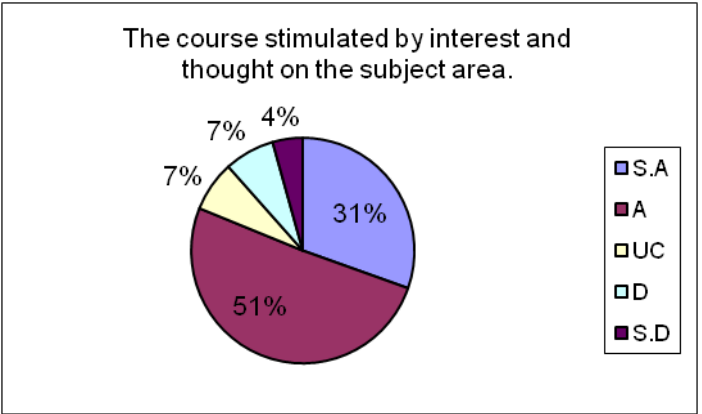
Results of Proforma No. 1 of BCH-707 (Teacher 5)

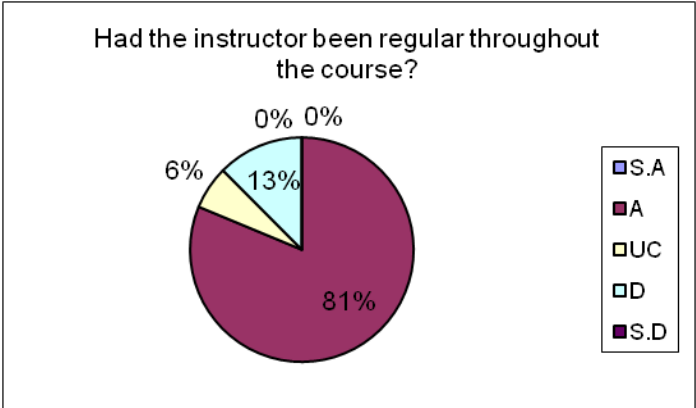
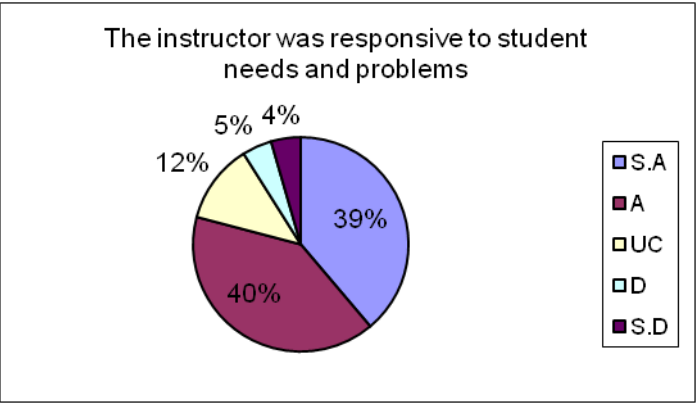
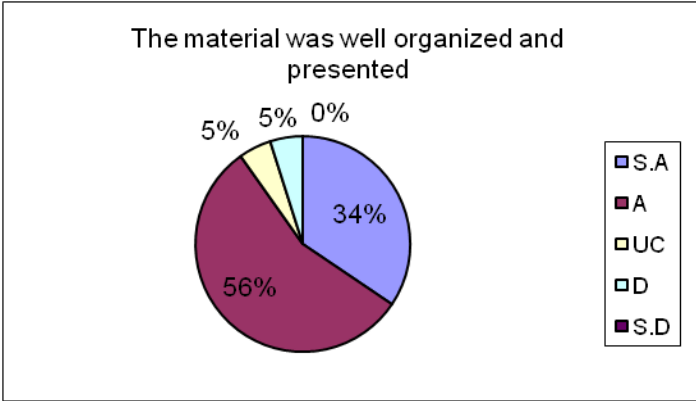
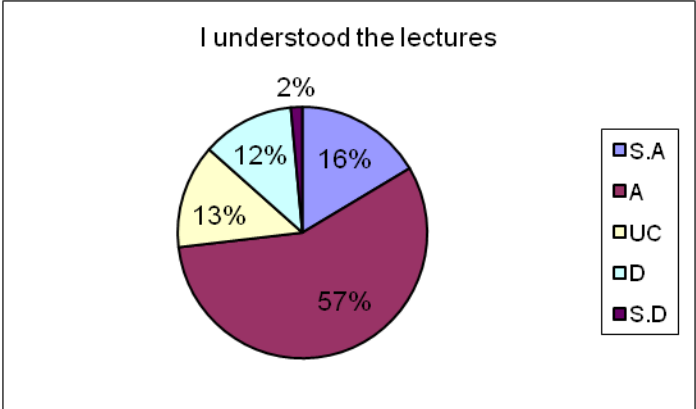
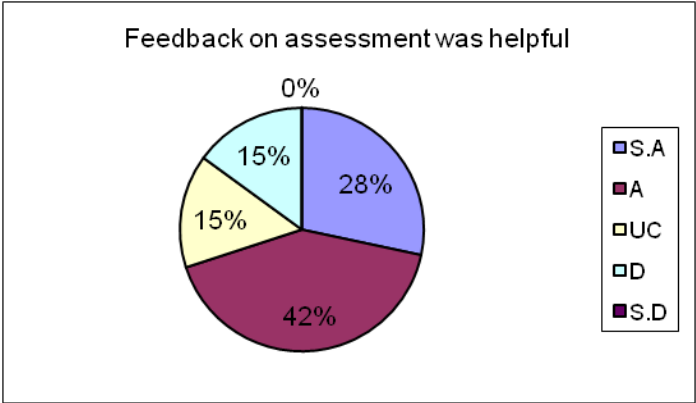
Taught course based assessment of Teacher 5 revealed that 60% of the students (strongly agreed or agreed) regarding they have made progress in this course. Where 53% students were of view that learning materials were relevant and useful. On the other hand 0% students either strongly disagreed or disagreed with the above mentioned criteria assessed in Performa 1.

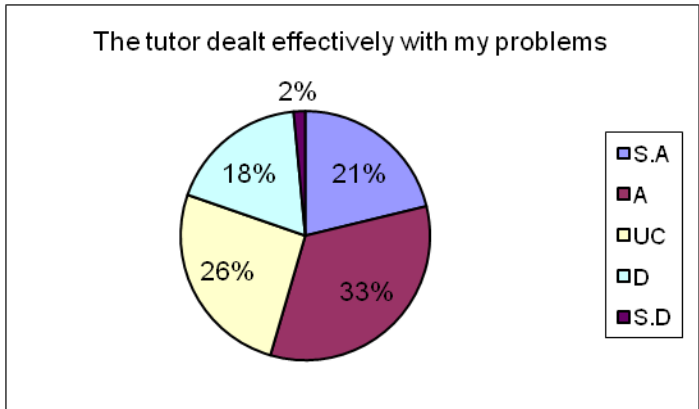
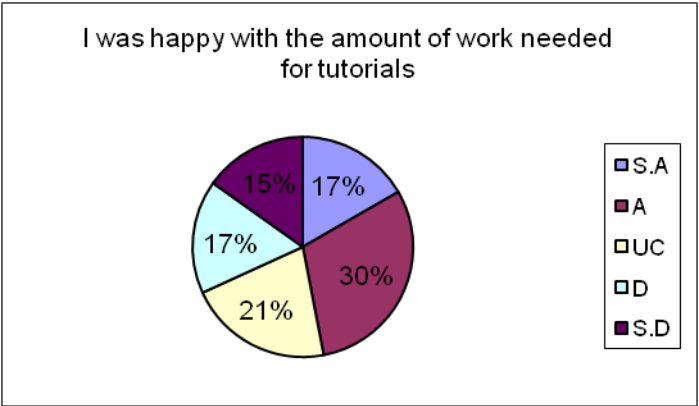
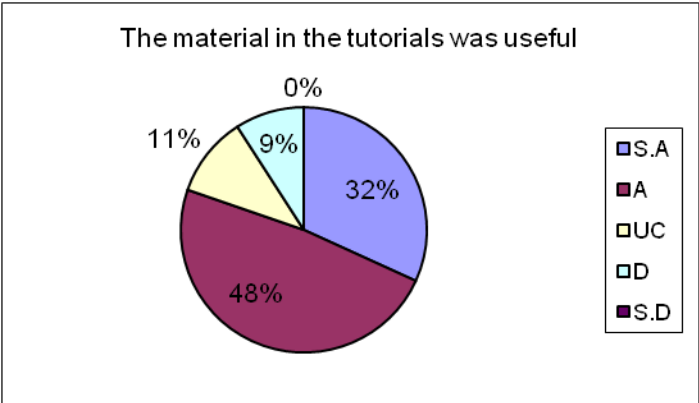












Results of Proforma No. 2: Results of Faculty Course Review Report

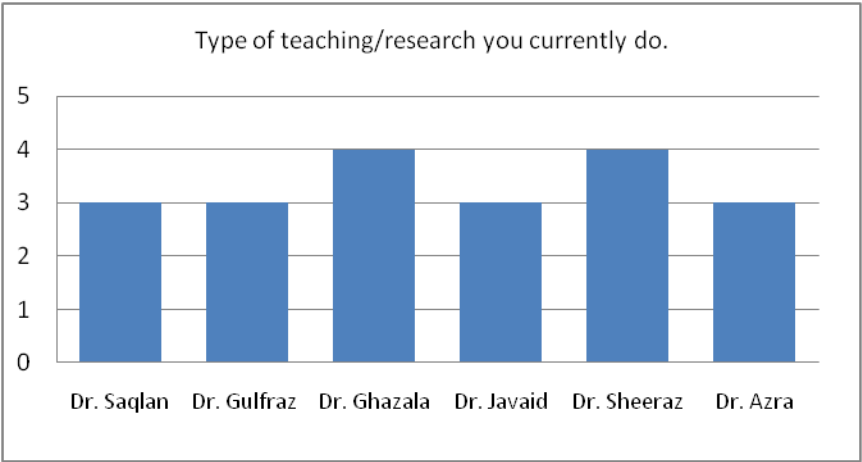
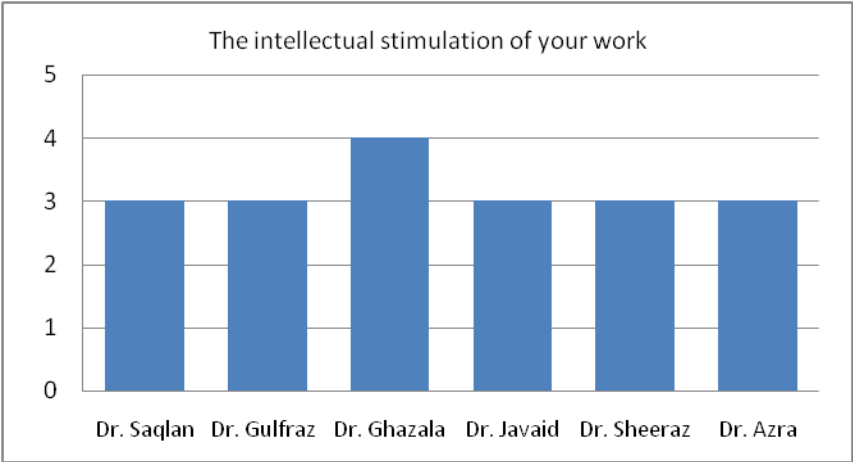
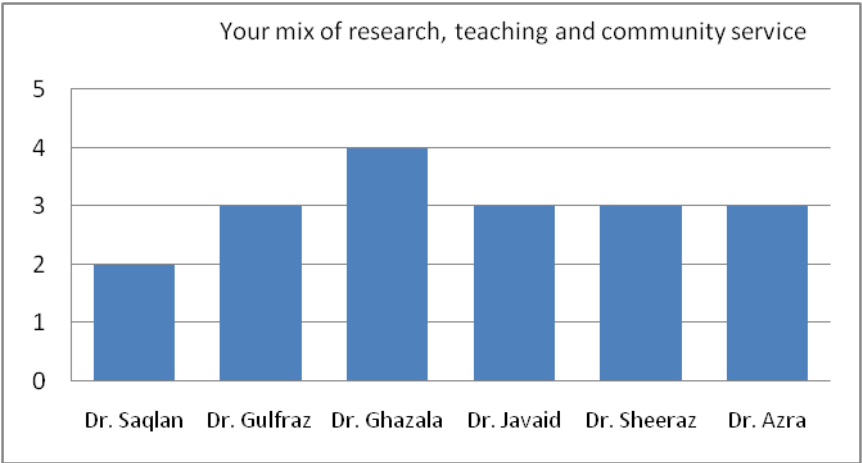
According to the result of the proforma No. 2, most of the teachers pointed out that it will be an ideal to have modern lecture theaters equipped with internet and multimedia facility.

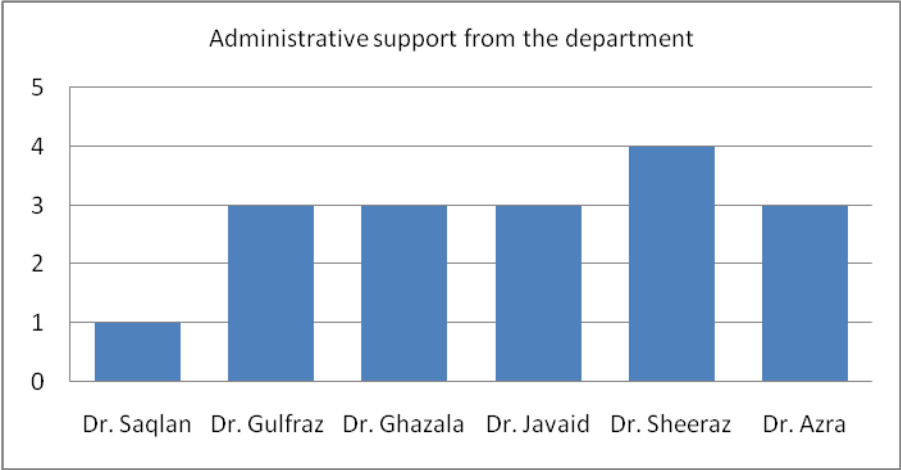
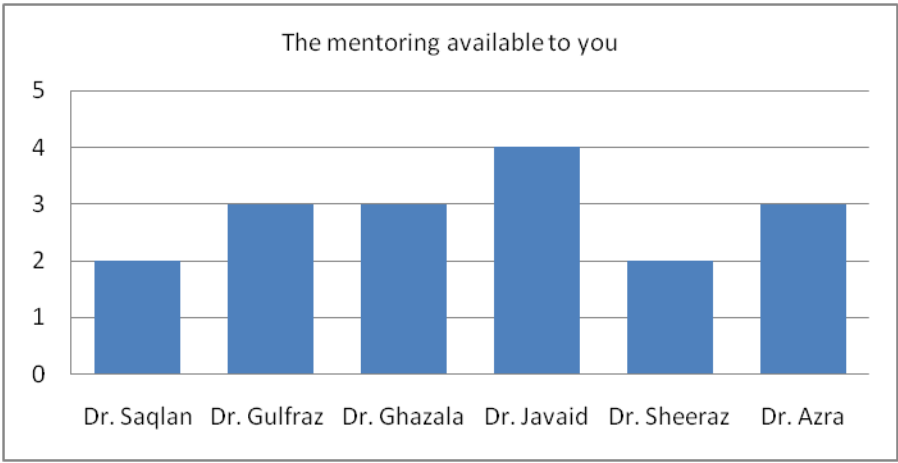
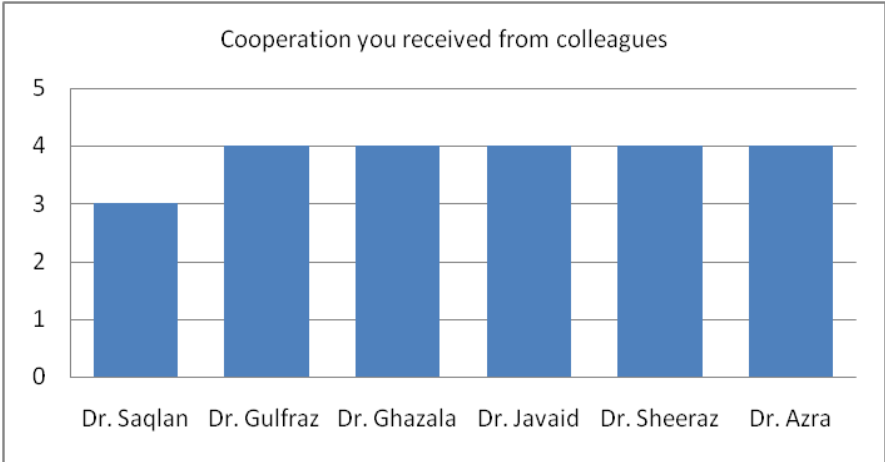
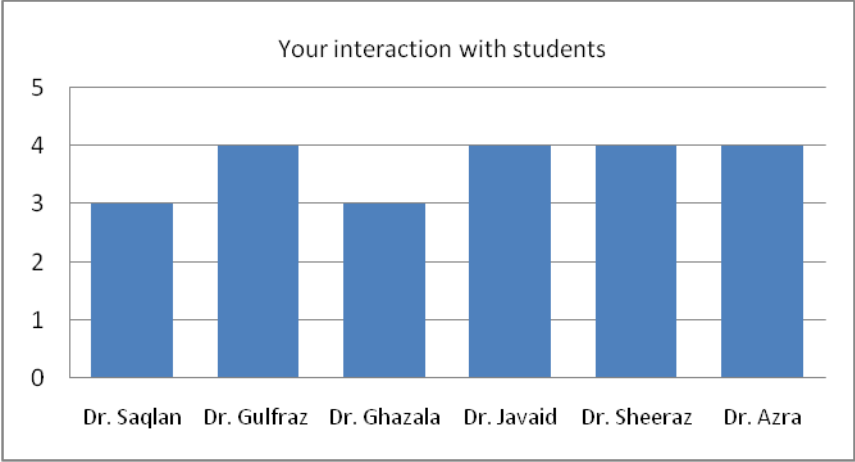
Results of Proforma No. 4: Research Student Progress Form/Result of Faculty Survey

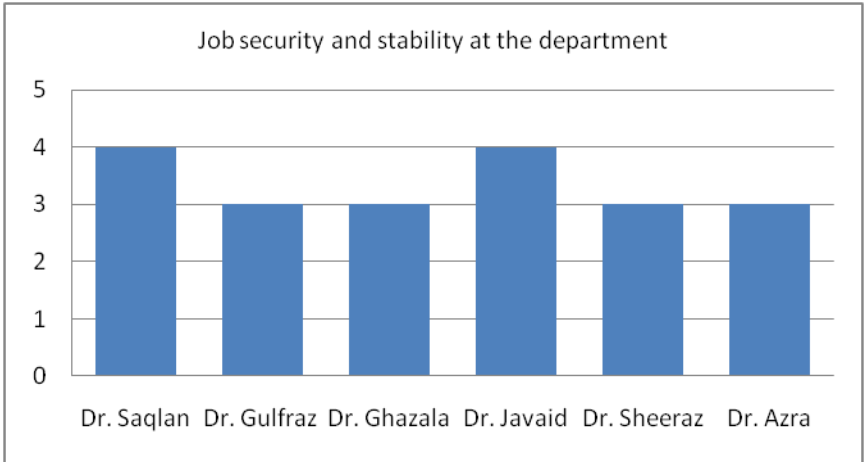
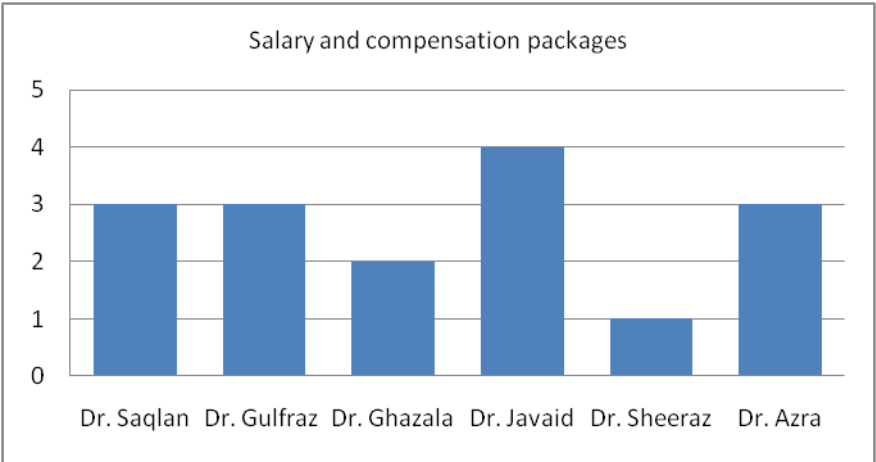
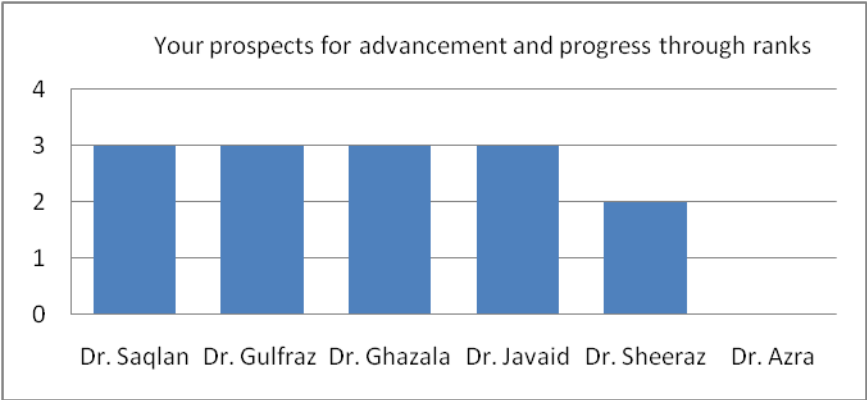
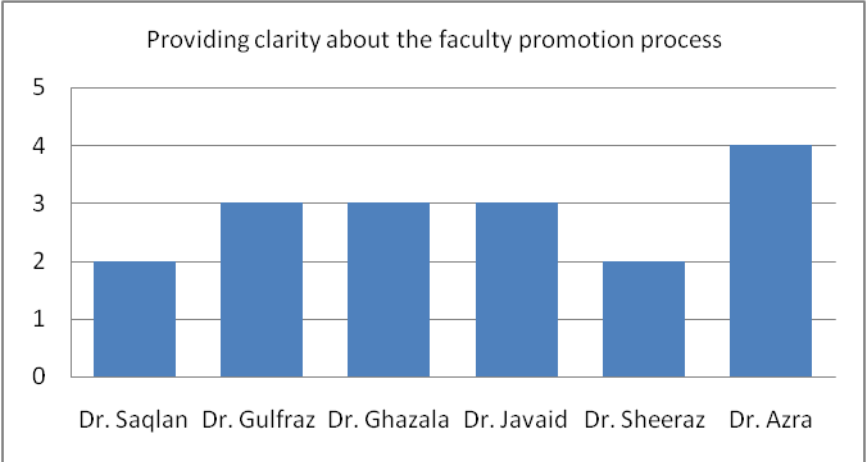
According to the result of the proforma No. 4. The students of M.Phil. and Ph.D. pointed out the problems regarding to the administrative and financial approval of the budget/ and as well as maintenance. Most of the students of M.Phil. and Ph.D. are interested to take training from abroad and they also have keen interest to operate sophisticated equipments. They also pointed out the problems regarding to the availability of computers and they don't have too much computer to download literature related to their research work.

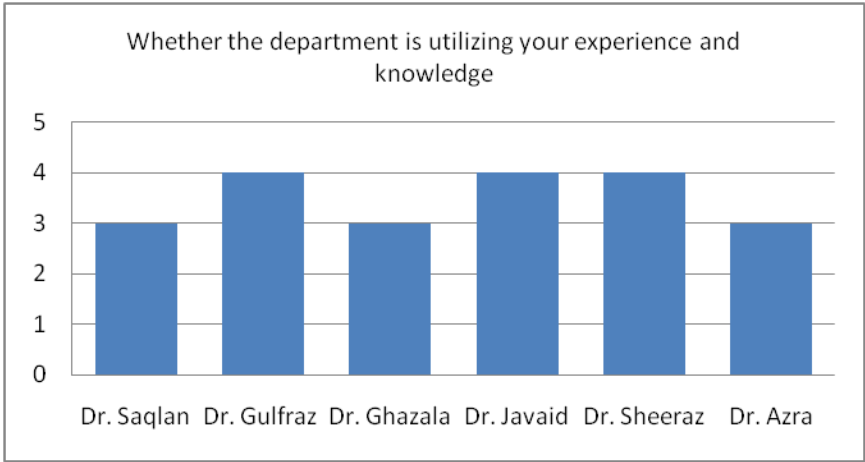
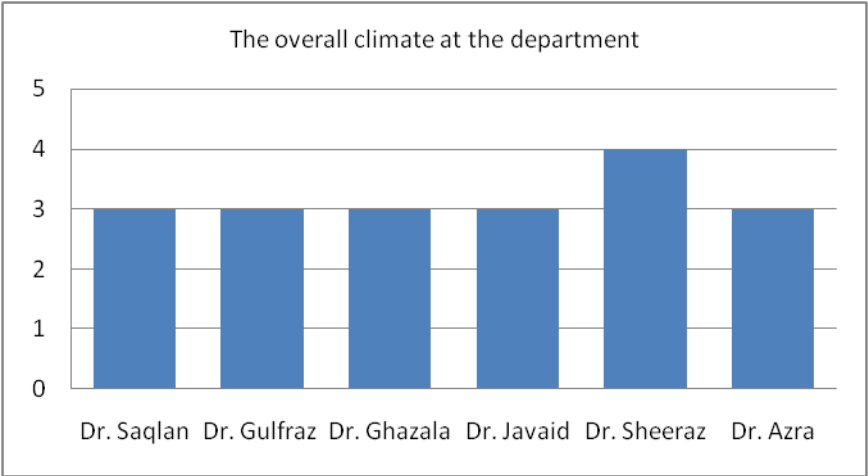
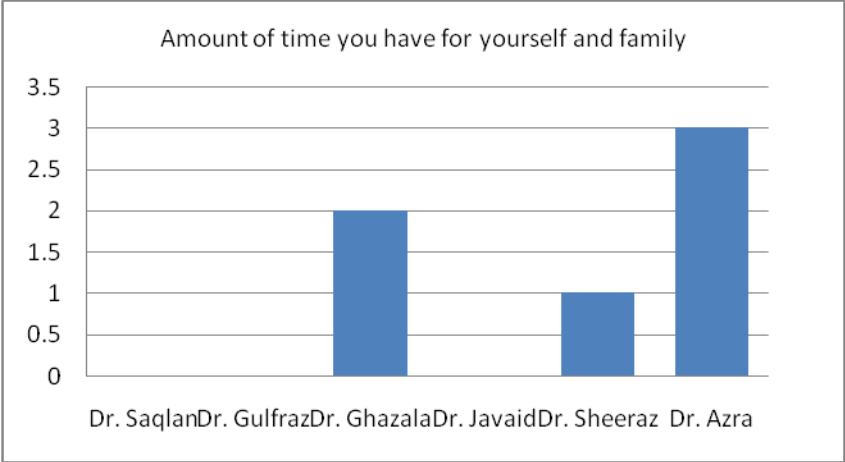
Proforma No. 5: Results of Faculty Survey

Accordingt to Annexure II regarding the satisfaction of the Faculty, the weakest aspect is the amount of time teachers find to interact with their families. This is basically due to the shortage of teachers.





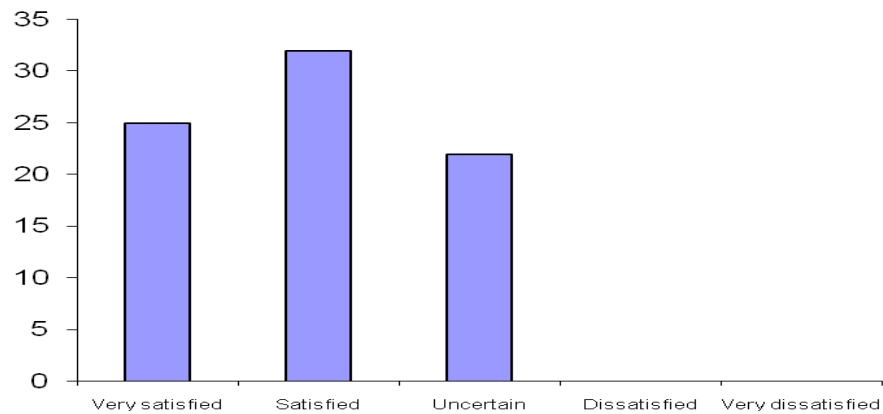




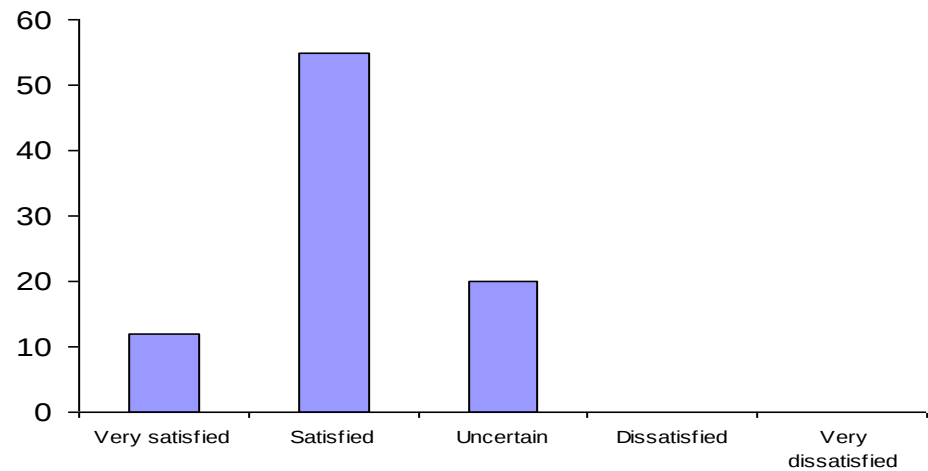
ANNEXURE III: RESULTS OF GRADUATING STUDENTS SURVEY

According to the results of Graduating Students Survey approximately 45% student were of view that “The program is effective in enhancing team working abilities”, “ the Program administration is effective in supporting learning”, “The program is effective in developing analytical and problems solving skills”, “The program is effective in developing written communication skills”, “The program is effective in developing planning abilities”, “The objective of program fully achieved” , “The environment was conducive for learning” and “Whether scholarships were available student in case of hardship”. Where a as 35% were uncertain regarding to above mention criteria.

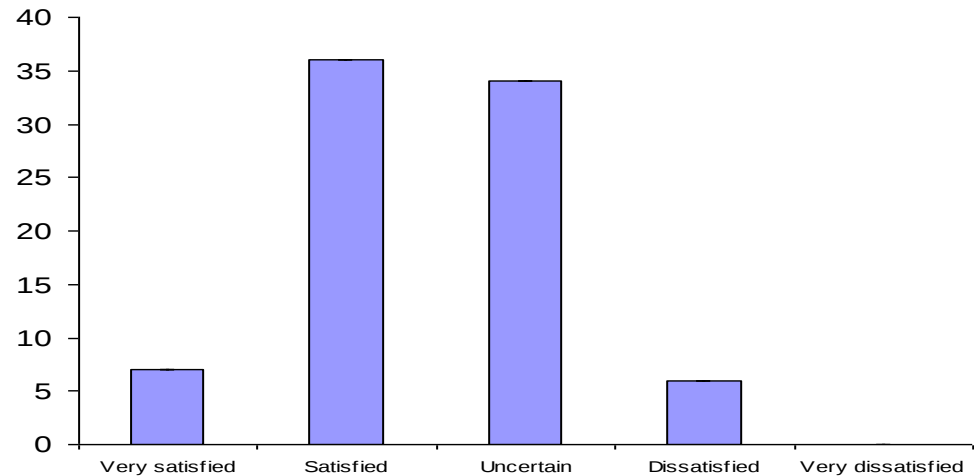
The work in the program is too heavy and induces a lot of pressure



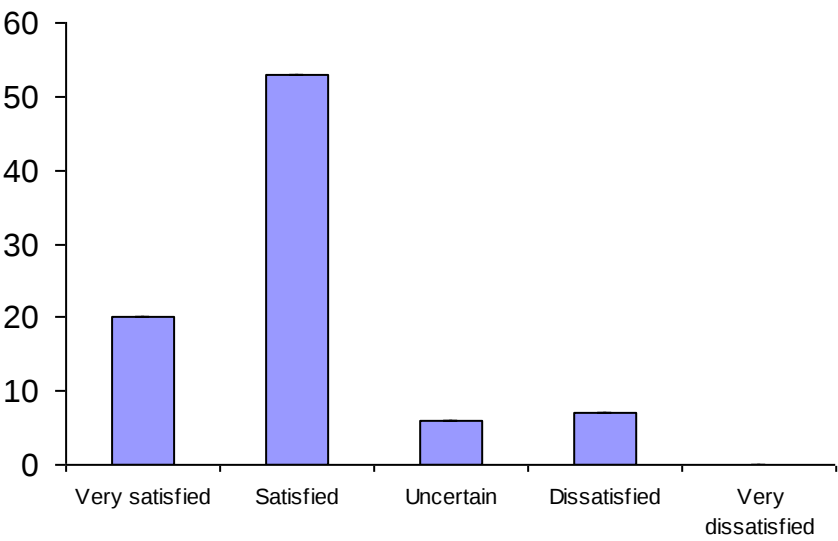
The program is effective in enhancing team working abilities



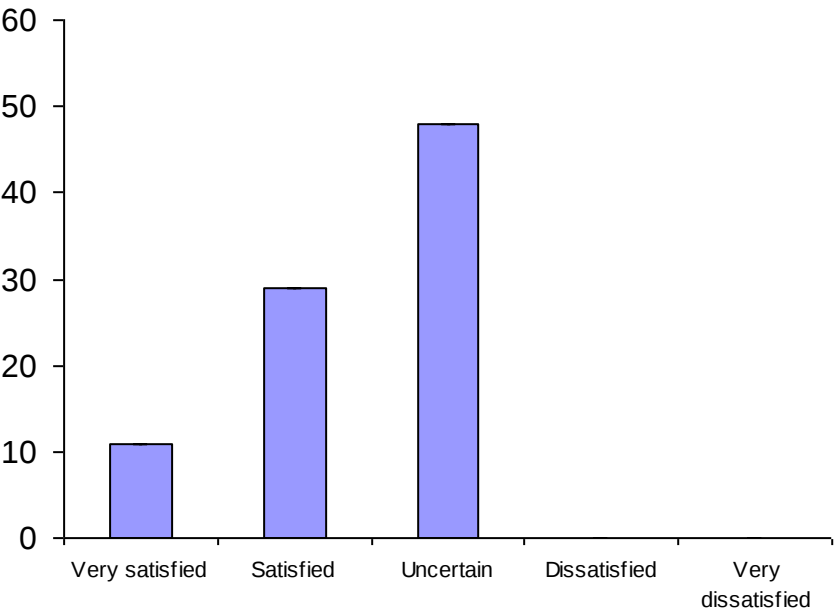
The program administration is effective in supporting learning



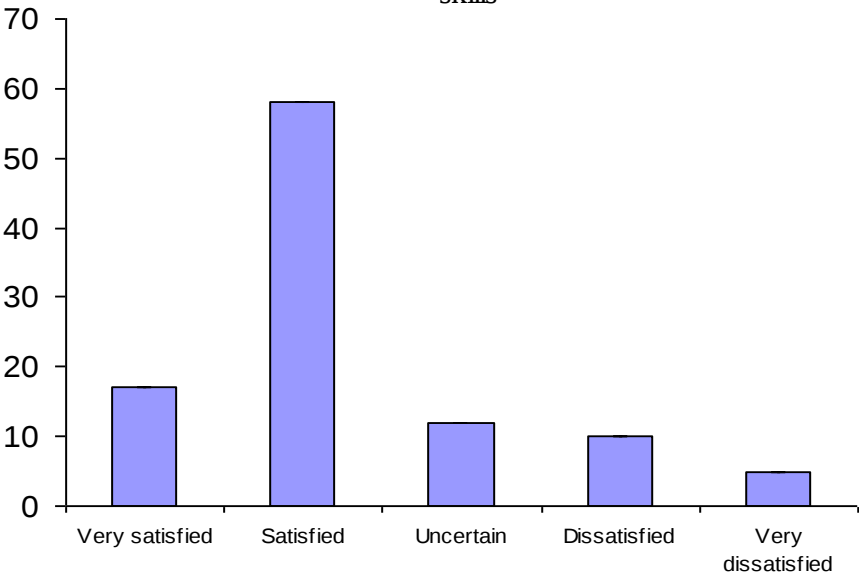
The program is effective in developing analytical and problem solving skills



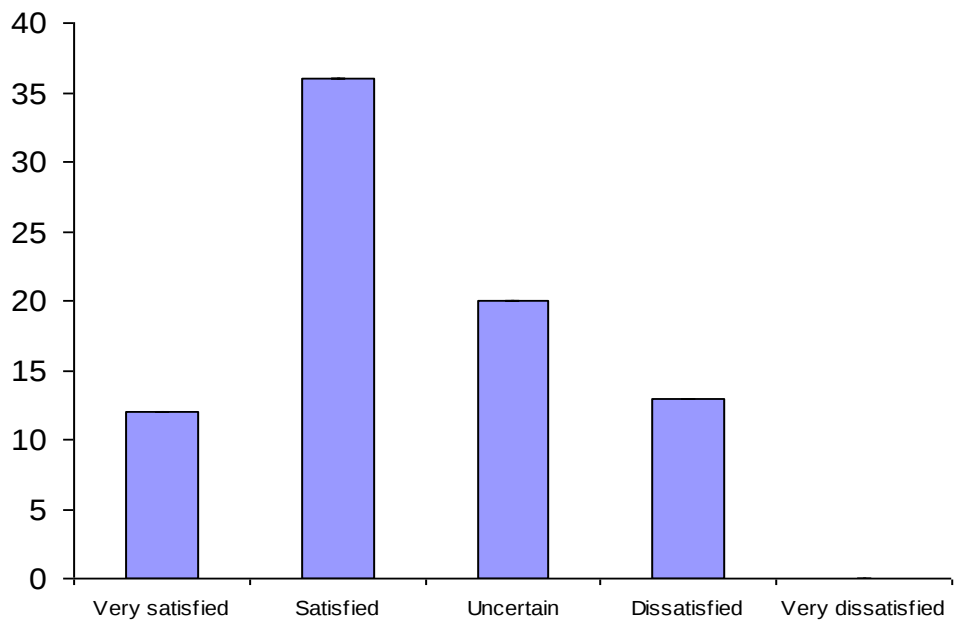
The program is effective in developing independent thinking



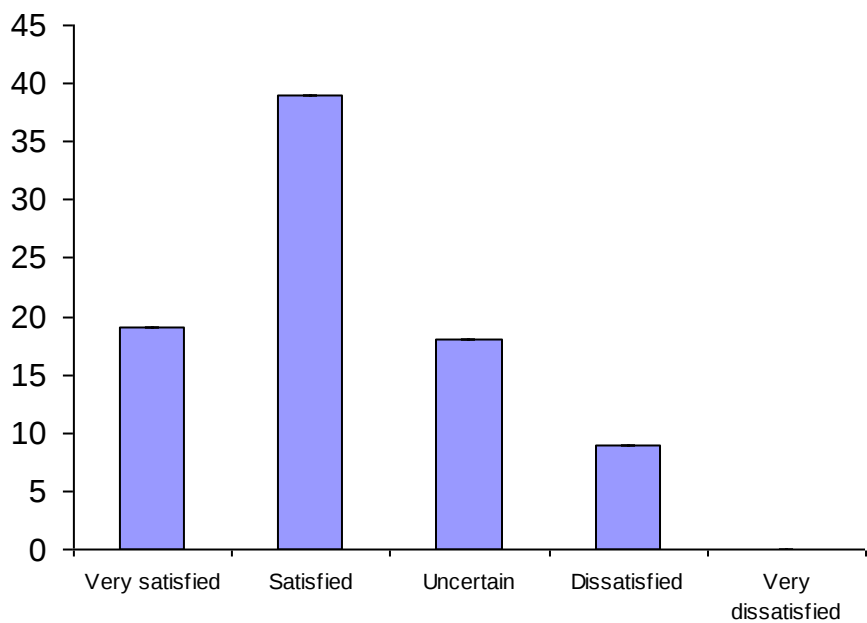
The program is effective in developing written communication skills



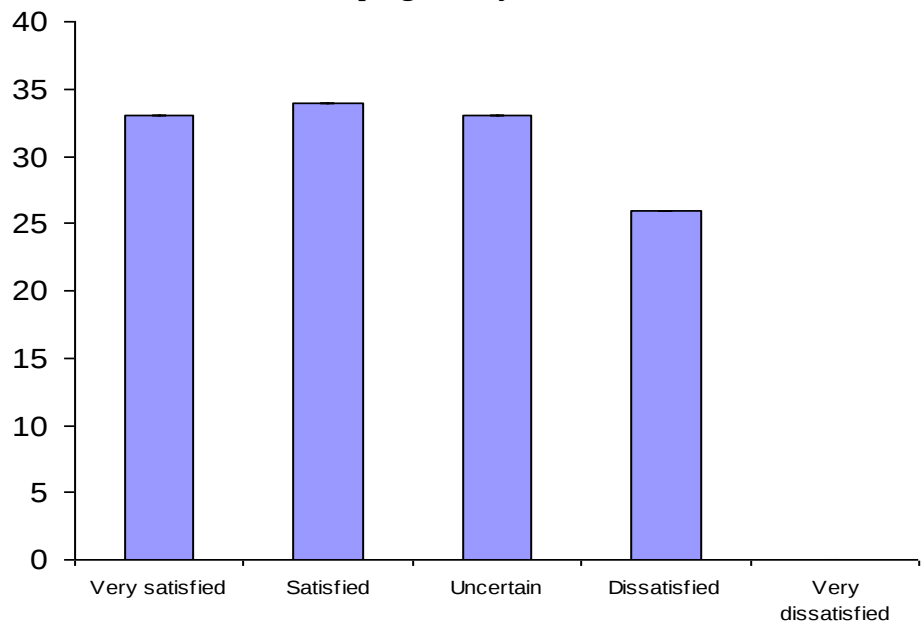
The program is effective in developing planning abilities



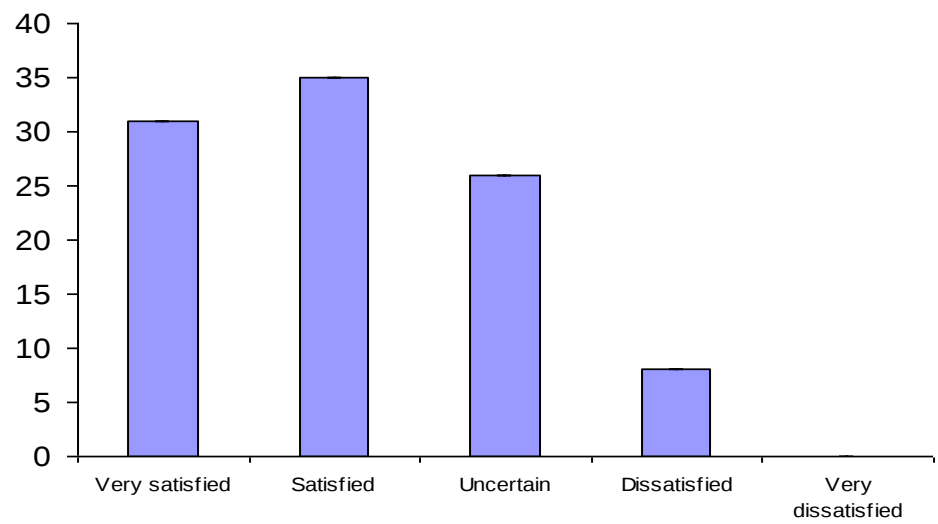
The objectives of the program have fully achieved



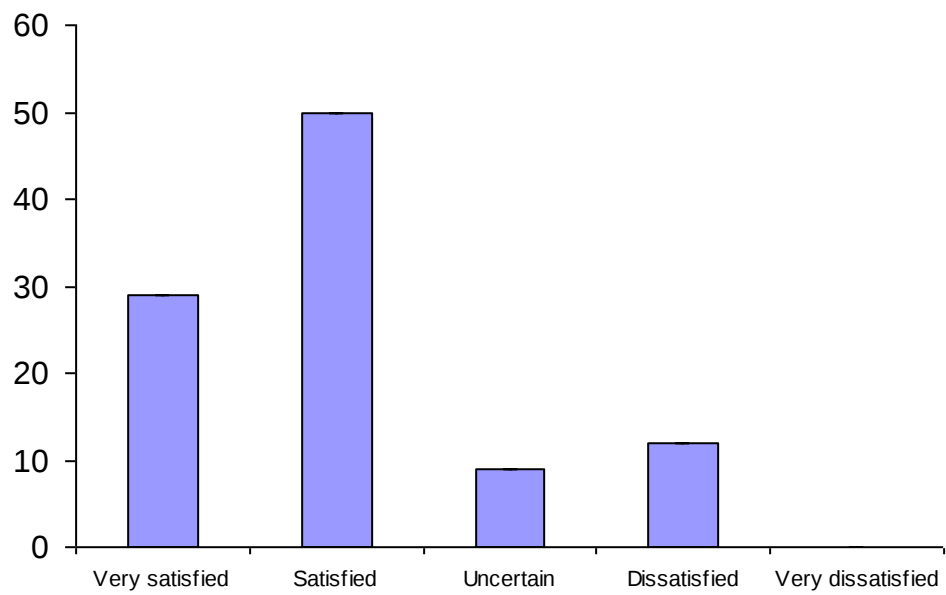
Whether the contents of curriculum are advanced and meet program objectives



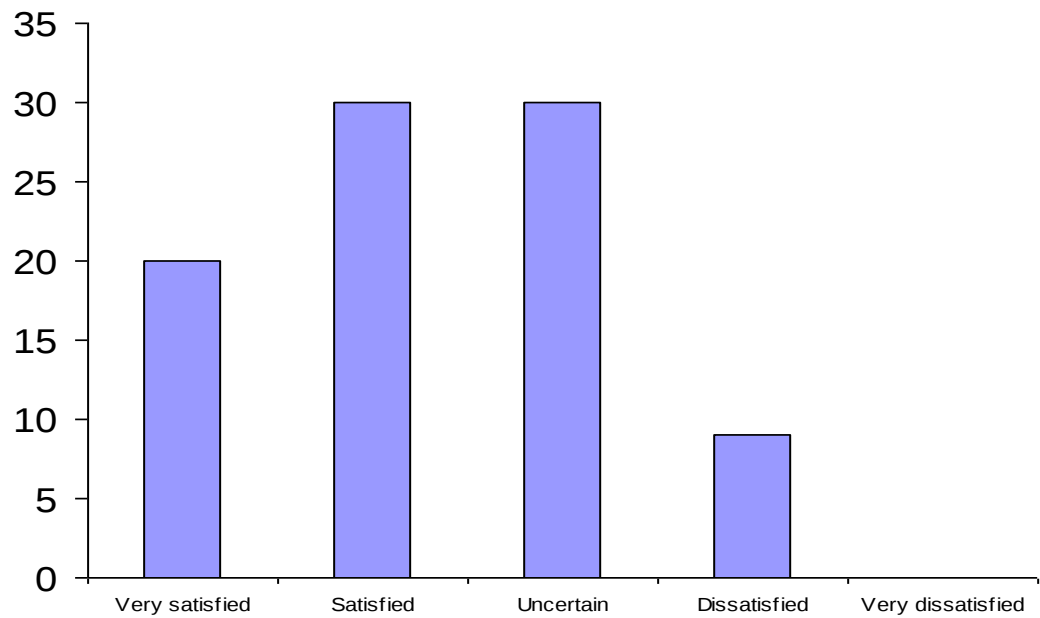
Faculty was able to meet the program objectives

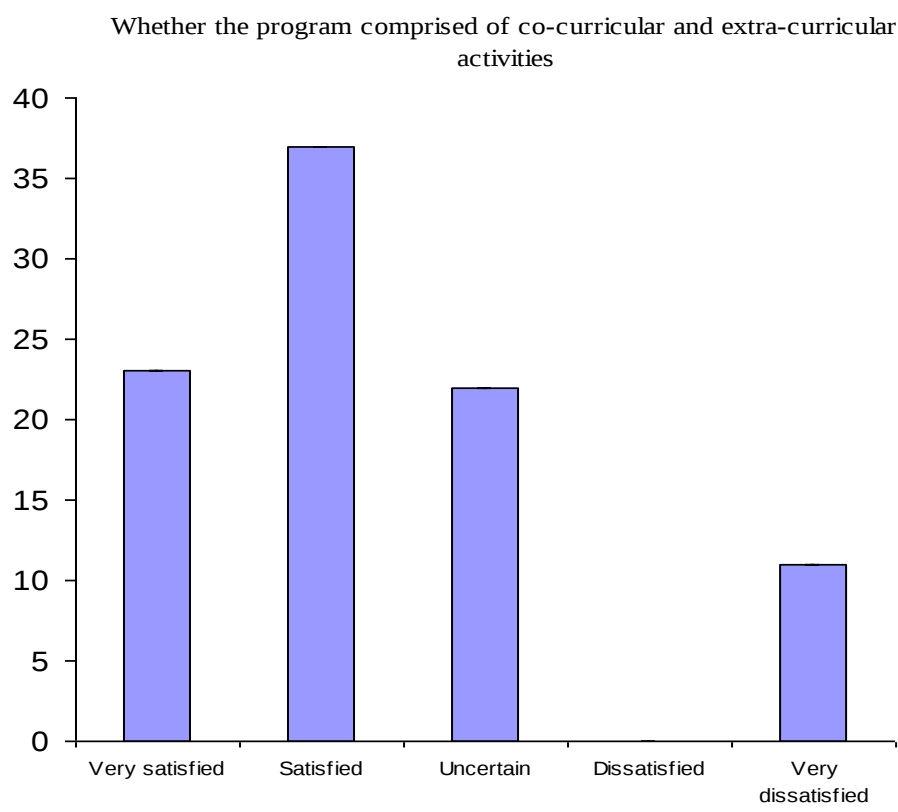
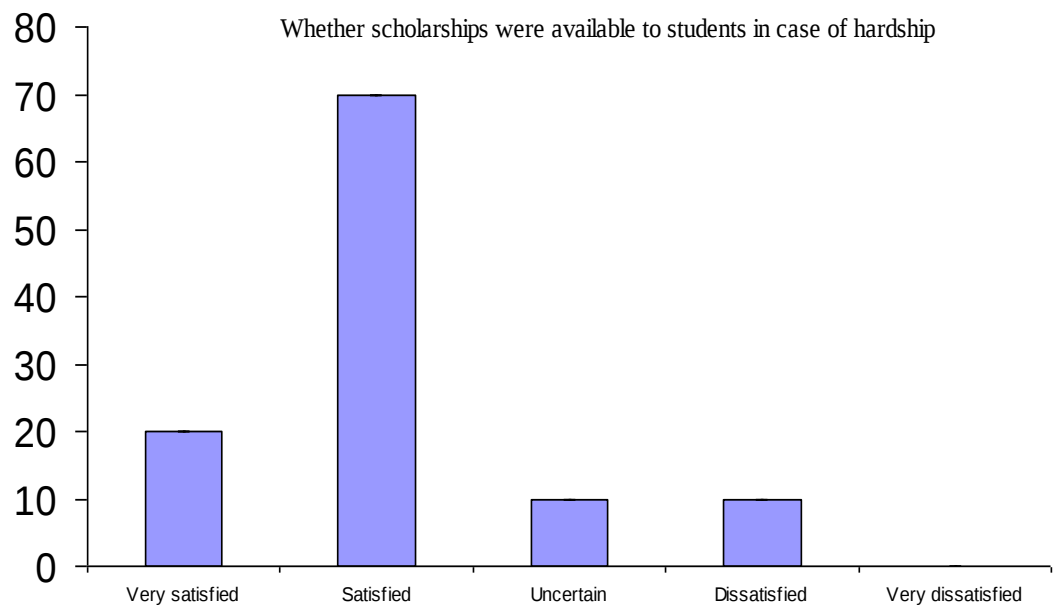


The environment was conducive for learningThe environment was conducive for learning



Whether the infrastructure of the department was good





Skills and Capabilities Reflected in Performance as Biochemistry:

Students develop ability to apply knowledge of Biochemistry and to work as professionals, to build confidence and communicate effectively in writing, oral and demonstration to use modern tools, techniques and skills for their profession, to formulate and design the experiments/project sand to work effectively in a team, to manage different problems and imbibe ability to recognize future needs.

Standard 1-3

Strength of the Department:

The department of Biochemistry have fully equipped laboratory with latest instruments. The main strength of the department is the availability of highly qualified and skilled teachers, with full acquaintance of their respective subjects, having vast knowledge of Biochemistry, Molecular Biology and Biotechnology. Majority of the faculty members have foreign degrees/post-doctoral expericne and are experts in their fields and knowledge of latest and modern molecular approaches. They have implemented National/International research projects and are highly conscious of the problems to be taken by the post-graduate students.

Weakness Identified in the Program:

There is shortage of faculty members in department and due to their heavy workload in teaching, activitieies are not at their full pace. Advanced teaching and research is being handicapped due to deficiency of lecture rooms and post-graduate laboratories. Access to literature has been erratic due to regular problem in internet.Though building of department is not sufficient and Unversity Institute of Biochemistry and Biotechnology (UIBB) in future will fulfill the purpose.

Major Future Improvement Plans:

- Developing of human resource for the highly advanced fields of biochemistry, biotechnology and bioinformatics to play a crucial role in national development.
- Strengthening graduate, post graduate and postdoctoral programmes in Biochemistry, Biotechnology and Bioinformatics.
- Up-gradation of research by integrating biochemistry, biotechnology and bioinformatics into existing traditional systems.
- To emphasize biochemical and molecular approaches in vitro techniques in plant propagation, crop improvement and plant disease management as well as animal disease management.
- Strengthening our capabilities in cloning animal, plant, viral and bacterial genes to be utilized in various ways.
- Introduction of genetic engineering of crops as a regular feature for crop improvement.
- Production of recombinant proteins, enzymes, hormones, antibiotics or vaccines etc for therapeutic use/diagnostic purposes for human, plants ,animals and industries.
- Development of efficient microbes for treatment of waste and other hazardous materials and to take care of environmental pollution

**TABLE-3: QUANTITATIVE ASSESSMENT OF THE DEPARTMENT
(Last three years)**

Sr. #	Particular	No.	Remarks
i	M.Sc produced	190	M.Sc. Graduates from the Department are working in public as well as private sector in research, teaching, diagnostics, pharmacenticulas, chemical and equipment supplies. Many ex-students have joined M.Phil. and Ph.D. programs in PMAS-AAUR, QAU, PU & UAF
ii	M.Phil	27	
iii	Ph.D.	14	In employment
iv	Post-Doc fellowship by faculty	4	USA, UK and Canada
v	Students: Faculty ratio	29:1	
vi	Technical : No Technical ratio	43:1	

Faculty

Table-3.1: Faculty Distribution in Biochemistry

Name	Position	Qualification	Specialization
Dr. S.M.Naqvi	Professor	Ph. D.	Molecular Biology/ Biotechnology
Dr. M.Gulfraz	Professor	Ph. D.	Biochemisry/Natural Product Chemistry
Dr. Ghazala Kakub Raja	Associate Professor	Ph. D.	Biochemistry/ Molecular Biology
Dr.M.Javid Asad	Assistant Professor	Ph. D	Industrial/Fermentation Biotechnology
Dr. M.Sheeraz Ahmad	Assistant Professor	Ph. D	Biochemistry/Plant Biotechnology
Ms. Pakeeza Arzoo	Lecturer	Ph.D. in progress	Human molecular genetics
Dr.Feroza Watoo	Assistant Professor	Ph. D.	Biochemistry
Dr. Azra Khanum	Professor	Ph. D.	Biochemistry/Biotechnology

Standard 1-4

TABLE- 4.1: PRESENT PERFORMANCE MEASURES FOR RESEARCH ACTIVITIES

Faculty	Journal Publications (National & International)	Conference Publications (Proceedings/ Abstract)	On going Projects
Dr. Azra Khanum	61	102	02
Dr. S.M. Saqlan Naqvi	55	58	01
Dr. M.Gulfraz	48	07	02
Dr. Ghazala Kaukab Raja	12	12	01
Dr.M.Javaid Asad	24	19	-
Dr. M.Sheeraz Ahmad	9	01	-
Total	209	199	06

The department is well established and its distinguishing feature is the availability of all expertise (Molecular Biology, Plant Biotechnology, Environment Biotechnology and Enzymology).

The Department is providing following community Services:

To enhance the quality and quantity of scientific trainings, the Department has organized the workshops and seminars. The basic aim is also to provide a forum for knowledge/information exchange between academic disciplines and raising general awareness about Biochemistry and Biotechnology.

Faculty Satisfaction Regarding the Administrative Services:

- The department maintains a ratio of 1:29, 1:43 and 1:57 for the academic, administrative and non-technical staff to the students respectively.
- Administrative meetings (departmental, university, academic council, and syndicate) are attended as and when required. Generally two meetings of academic council are held per year. Board of studies of the department meets quarterly.
- Quick office disposal; no complaint pertaining to delay has ever been received from authorities.
- Proper records of individuals, students and their theses are maintained.

CRITERION 2: CURRICULUM DESIGN AND ORGANIZATION
Degree Title: M.Sc. (Biochemistry)

Intent:

Curriculum design and update is initiated by the faculty members of the Department after the approval of Board of Studies which is comprised of senior faculty members and subject specialist who is taken from other faculties or from other Universities or research Institutions. It is headed by the Chairman of the Department. The approved curriculum is then sent to Board of Faculty, headed by the Dean Faculty of Sciences. This Board consist senior faculty members from all the Departments of the faculty and subject specialists. Finally the curriculum is presented before the Academic Council which is comprised of the Professor, Associate Professor, Faculty Representatives and very senior subject specialists.

Definition of Credit Hour:

A student must complete a definite number of credit hours. One credit hour is one theory lecture or two hours laboratory (practical / week). One credit hour carries 20 marks. A semester is of 18 weeks.

Presently following degrees are offered by the Department:

Credit Hours					
Degrees	Min. Course Hrs	Thesis	Duration (in Semesters)		Passing CGPA
			Min	Max	
M.Sc. (without thesis)	55	-	4	6	2.50
M.Sc (with thesis)	45	10	4	6	2.50
M.Phil.	30	10	4	6	2.50
Ph.D.	18	50	8	10	3.00

Pre-requisites

Minimum Academic Requirements:

A person holding B.Sc. in science or equivalent degree from any recognized institute with at least second division or overall 45 % marks is eligible to get admission.

The admission to the University is on merit which is determined by the percentage of last degree.

Degree Requirements:

Degrees are awarded after completing the required number of credit hours (courses). Minimum Grade Point Average for obtaining the degree in 2.50. To remain on the roll of the university, a student shall be required to maintain the following minimum GPA/CGPA in each semester

Semester	CGPA
First	1.50
Second	1.75
Third	2.00
Fourth	2.50

Examination & Weight-age:

a) Theory

In course work, student's evaluation is done by mid-term examination, assignments/quizzes and final examination. A student, who misses the mid-term examination, is not allowed a make-up examination and is awarded zero marks in that examination. In case a student does not appear in the final examination of a course, he shall be deemed to have failed in that course. In theory, weightage to each component of examination is as prescribed here under:

Mid Examination	30%
Assignments	10%
Final Examination	60%

b) Practical

For practical examination (if applicable) 100% weightage is given to practical as scored final examination

Eligibility for Examination:

A student is eligible to sit for the examination provided that he/she has attended not less than 75% of the classes in theory and practical, separately.

The minimum pass marks for each course are 40 % for M.Sc. and M.Phil. while 50% for Ph.D.

TABLE-5: SCHEME OF STUDIES FOR M.SC. IN BIOCHEMISTRY

First semester

Course No.	Course Title	Credit Hours
BCH-701	Biochemistry	3(2-2)
BIOL-701	Cellular Biology	3(2-2)
BIOL-709	Fundamentals of Microbiology and Immunology	3(2-2)
STAT-700	Elements of Statistics and Biometry	3(3-0)
ZOOL-703	Principle of Genetics	3(2-2)

Second semester

Course No.	Course Title	Credit Hours
BCH-703	Metabolism	3(2-2)
BCH-704	Molecular Biology	3(2-2)
BCH-705	Enzymology	3(2-2)
BCH-707	Cellular Signaling Mechanisms	3(3-0)
BIOL-703	Plant Physiology	3(2-2)

Third semester

Course No.	Course Title	Credit Hours
BCH-702	Bioinformatics	3(2-2)
BCH-709	Biological Methods and Instrumentation	2(0-4)
BCH-710	Protein Chemistry	2(2-0)
BCH- 712	Genetic Engineering	3(2-2)
BCH-720	Seminar I	1(1-0)
BIOL-711	Research Planning and Report Writing	3(1-4)

Fourth semester

Course No.	Course Title	Credit Hours
BCH-706	Tissue and Cell Culture	3(2-2)
BCH-708	Human Physiology	3(2-2)
BCH-711	Biomembranes	2(2-0)
BCH-713	Biotechnology	3(2-2)
BIOL-729	General Pharmacology	3(2-2)
BCH-714	Clinical Biochemistry	3(0-6)
BCH-716	Nutrition and Dietetics	3(2-2)
BCH-721	Environmental Biochemistry	3(2-2)

TABLE-6: POST GRADUATE COURSES (M.Phil/Ph.D)

Course No.	Course Title	Credit Hours
BCH-701	Biochemistry	3(2-2)
BCH-702	Bioinformatics	3(2-2)
BCH-703	Metabolism	3(2-2)
BCH-704	Molecular Biology	3(2-2)
BCH-705	Enzymology	3(2-2)
BCH-706	Tissue and Cell Culture	3(2-2)
BCH-707	Cellular Signaling Mechanism	3(3-0)
BCH-708	Human Physiology	3(2-2)
BCH-709	Biological Methods and Instrumentation	2(0-4)

BCH-710	Protein Chemistry	2(2-0)
BCH-711	Biomembranes	2(2-0)
BCH-712	Genetic Engineering	3(2-2)
BCH-713	Biotechnology	3(2-2)
BCH-714	Clinical Biochemistry	3(0-6)
BCH-715	Medical Microbiology	3(2-2)
BCH-716	Nutrition and Dietetics	3(2-2)
BCH-718	Plant Biochemistry	3(3-0)
BCH-719	Special Problem	1(1-0)
BCH-720	Seminar-I	1(1-0)
BCH-720	Seminar-II	1(1-0)
BCH-721	Environmental Biochemistry	3(2-2)
BCH-722	Recent Topics in Molecular Biology	3(3-0)
BCH-723	Current Topics in Microbiology	3(3-0)
BCH-724	Fundamentals of Biotechnology	4(3-2)
BCH-725	Trends in Immunology	3(3-0)
BCH-726	Advanced Biochemistry	3(3-0)
BCH-727	General Microbiology	3(2-2)
BCH-728	Immunology and Immunochemistry	3(2-2)
BCH-731	Advances in Biochemistry	3(3-0)
BCH-732	Medical Nutrition Therapy	3(2-2)
BCH-733	Plant Molecular Physiology	3(3-0)
BCH-734	Numerical Problems in Biochemistry	3(3-0)
BCH-735	Principles of Advanced Biochemical Techniques	3(3-0)
BCH-736	Proteomics	3(2-2)
BCH-751	Advances in Biotechnology	3(3-0)

Standard 2.1: Assessment of the Biochemistry Curriculum

The assessment of curriculum is given in the following table and courses are cross-tabulated according to the program outcomes.

TABLE-7: CURRICULUM VS PROGRAMM OUTCOME

Course/Group of Courses	Outcomes				
	1	2	3	4	5
BCH-701,BCH-707.BCH-703.BCH-704,BCH-705,BCH-706,BCH-707,BCH-708,BCH-709,BCH-710,BCH-711,BCH-712,BCH-713,BCH-714,BCH-715,BCH-716,BCH- 717	XX XX	XX XX	XXX	XX	X
BCH-718,BCH-719,BCH-720,BCH-721,BCH-722,BCH-723,BCH-724,BCH-725,BCH-726,BCH-727,BCH-728,BCH-731,BCH-732,BCH-733,BCH-734,BCH-735,BCH-736 and BCH-751	XX	XXX	XX	X	XX

- x

=

Satisfactory
- x x

=

Relevant & satisfactory
- x x x

=

Very relevant & satisfactory
- x x x x

=

Highly relevant & highly satisfactory

- The curriculum fulfills and satisfies the core requirements for the program, as specified by the respective accreditation body and HEC.

Standard 2-2: Theoretical backgrounds, problem analysis, solution design given as under

Meeting Standard 2-2: Percentage of Elements in Courses

Elements	Courses
Theory only	BCH – 701,BCH – 703,BCH – 704,BCH – 705, BCH – 706,BCH – 707,BCH – 708,BCH – 710, BCH – 711,BCH – 712,BCH – 713,BCH – 715, BCH – 716,BCH – 718,BCH – 719,BCH – 720, BCH – 721,BCH – 722,BCH – 723,BCH – 724, BCH – 725,BCH – 726,BCH – 727,BCH – 728, BCH – 731,BCH – 732,BCH – 733,BCH – 734, BCH – 735,BCH – 736,BCH – 101,BCH – 102, BCH – 201,BCH – 302,
Theory + Practical	BCH – 701,BCH – 703, BCH-702,BCH-704, BCH – 705,BCH – 706,BCH – 708, BCH-712, BCH – 713,BCH – 715,BCH – 716, BCH – 721, BCH – 724,BCH – 727,BCH – 728,BCH – 101, BCH – 102,BCH – 302,
Only Practical	BCH-709, BCH-714

- Standard 2-3:

The curriculum satisfied the core requirements for the programmes as specified by HEC
- Standard 2-4:

The curriculum satisfied the core requirements for the programmes as specified by HEC
- Standard 2-5:

The curriculum satisfied the core requirements for the programmes as specified by HEC
- Standard 2-6:

Inforamtion technology components of the curriculum has been applied by offeing a different course like Experimental Design and Computer Applications,
- Standard 2-7:

Enhancing Oral and Written Communication Skills of the students

• One seminar in M.Sc. and two seminars carrying one credit hour each at M.Phil. and Ph.D. level are compulsory .

• Students are assigned to present generally the recent status/ status on various global and local issues/problems.

• Assignments are given to M.Sc, M.Phil & Ph.D. students on specific titles (part of the course) which are submitted as written report, to increase their writing skills.
- Criterion 3:

Laboratories and Computer Facilities

There are four laboratories in the department. The facilities and shortcomings of these laboratories are listed as under.

1. Biotchmistry and Molecular Biology Lab I

2. Biochemistry and Molecular Biology Lab II

3. Biotechnology Lab

4. General Biochemistry Lab

5. Biochemistry Lab 4

• Location:

Faculty of Sciences 1st Floor, Main Campus Academic Block

• Objectives:

Laboratories are used for: Practical exercise and demonstrations to the students in their introductory and major courses. Research work for the graduate and post-graduate students. For implementing the projects funded by the University, HEC, PSF, PARC and other agencies.

- **Shortcoming:** Laboratories are reasonably equipped but not spacious and adequate. However these problems will be circumvented in the near future when the Department will be shifted to new building.
- **Safety Regulations:** Fire extinguishers and first aid kits are available. However, the University maintains a Medical Dispensary for such incidents.

Standard 3-1: Laboratory Manuals:

Laboratory manuals for each subject are available. The departmental library **has** all the relevant books. However, **teachers also** have their own books to prepare the lectures.

Standard 3-2: Support/Laboratory Personal for Maintenance of Laboratory

One Lab Assistant is available to maintain laboratory, equipments, glassware, chemicals, materials etc. Three laboratory attendants assist the students in practicals, cleaning and washing. The laboratory attendants may not have the relevant knowledge.

Standard 3-3:

Computing Infrastructure and Facilities

- **Computing facilities support:** Not available to all faculty members and the post graduate students.
- **Shortcoming in computing infrastructure:** Computers with internet facilities should be available to all faculty members and postgraduate students.
- **Safety Arrangements: There are proper safety arrangements and security plan is available in case of emergency.** The department is located on the 1st floor; there are no emergency exits for the labs.

Criterion 4: Student Support and Advising

Our University organizes support programs for students and provide information regarding admission, scholarship schemes etc. Department in its own capacity arranges orientation and guided tours of the department. Director Students Affairs is also arranges various cultural activities and solves the students' problems. However currently there is no Parent/Teacher or student association/student union.

Standard 4-1: Frequency of Courses

- Courses are taught as per policiy at the University/Academic Council.
- Elective courses are offered as per policy of HEC and the University.
- For post graduate programs, a variety of courses is offered according to demand of the profession.

Standard 4-2: Structure of the Courses

To ensure effective interaction between students, faculty and teaching assistants, at the time of course formulation both theoretical and practical aspects are focused. Theoretical problems are explained and assignments are also given to the students whereas practical are carried out in the labs. Study tours to various research organizations are also organized to keep them update on the latest developments in the area and to stimulate them for discussion through teacher/ student interaction.

Standard 4.3: Guidance to the students

Several steps have been taken to provide students guidance such as:

- Students are informed about the program requirement through the office of the head of the department.
- Through the personal communication of the teachers with the students.
- In case of some problem Director Student Affairs appointed by the university, helps the students. Students can interact with the teachers/scientist in universities or research organization whenever they needed and there is an open option for the students to get the membership in the professional societies.
- Realizing the need for exploring job opportunities for the university graduates, Directorate of Placement Bureau has been established.

Criterion 5: Process Control

It includes students admission, students registration and faculty recruitment activities which are dealt by various statutory bodies and the university administration.

Standard 5.1: Program Admission Criteria

- The process of admission is well established and followed as per rules and criteria set by HEC and the University. For this purpose an advertisement is published in the National News Papers by the Registrar Office.
- Admission criteria for M.Sc in Biochemistry is B.Sc.(with Chemistry) or equivalent.
- Admission criteria for M.Phil and Ph.D. are same as mentioned in section 2.
- Admission criteria are revised whenever needed.

Standard 5.2: Process of Registration

- The student name, after completion of the admission process, is forwarded to the Registrar Office for proper registration in the specific program and the registration number is issued to the student.
- Students are evaluated through Mid, Final and Practical exams and through Assignments.

- Registration is done for one time for each degree but evaluation is done through the result of each semester. Only those students who fulfill the criteria of the University, they are promoted to the next semester.
- In general, the students are registered on competition bases keeping in view the academic and research standards.

Standard 5.3: Recruiting Process for Faculty

Recruitment policy followed by the University is recommended by HEC. Induction of all posts is done as per rule:

- Vacant and newly created positions are advertised in the national newspapers, applications are received by the Registrar office, call letters are issued to the short-listed candidates on the basis of experience, qualification, publications and other qualities/activities as determined by the University.
- The candidates are interviewed by the University Selection Board and Vice Chancellor and alternate candidates are selected.
- Selection of candidates is approved by the Syndicate for issuing orders to join within a specified period.
- Induction of new candidates depends upon the number of approved vacancies.
- Standards set by HEC are followed.
- **Tenure Track System (TTS) recommended by HEC has been adopted by the University.**
- HEC also supports appointment of highly qualified members as foreign faculty Professors, National Professors and deputes them in concerned departments of the University.

Standard 5.4: Teaching and Delivery of Course Material

- To provide high quality teaching, department periodically revises the curriculum depending upon requirements, innovations and new technology.
- With the emergence of new fields, new courses are introduced, and included in the curriculum.
- Students usually buy cheap Asian editions of technology books. These are also available in the University library, where modest documentation, copying and internet facilities are available.
- Almost all the lectures are supplemented by multimedia, overheads, slides and animations.
- All efforts are made that the courses and knowledge imparted meet the objectives and outcome. The progress is regularly reviewed in the staff meetings.

Standard 5.5: Completion of Program Requirements

- The controller of examinations announces the dates of commencement of examination. After each semester, the controller office notifies the results of the students. The evaluation procedure consists of quizzes, mid and final examinations, practicals, assignments/reports, oral and technical presentations. The minimum pass marks for each course is 40% for undergraduate and Master degree and 50 % for Ph.D. in theory and practical separately.
- In theory, weightage to each component of examination is as prescribed here under:

Mid Examination	30%
Assignments	10%
Final Examination	60%

- Grade points are as follows

Marks obtained	Grade	Grade point	Remarks
80-100 %	A	4	Excellent
65-79 %	B	3	Good
50-64 %	C	2	Satisfactory
40-49 %	D	1	Pass
Below 40 %	F	0	Fail

- Gold medals are awarded to the M.Sc. students who secure highest marks. Degrees are awarded to the students on the annual convocation that is held every year.



Proforma 6

SURVEY OF DEPARTMENT OFFERING Ph.D. PROGRAMS

Information regarding Ph.D. program offered by the Department of Biochemistry

1	General Information:	
1.1	Name of Department	Biochemistry
1.2	Name of Faculty	Sciences
1.3	Date of initiation of Ph.D. program	2001
1.4	Total number of academic journals subscribed in area relevant to Ph.D. program.	HEC Digital Library Journals
1.5	Number of Computers available per Ph.D. student	Total 9
1.6	Total Internet Bandwidth available to all the students in the Department.	2 MB for whole Campus
2	Faculty Resources:	
2.1	Number of faculty members holding Ph.D. degree in the department.	7out of 7
2.2	Number of HEC approved Ph.D. Advisors in the department.	7
3	Research Output:	
3.1	Total number of articles published last year in International Academic Journals that are authored by faculty members and students in the department.	In 2006 = 12 In 2007 = 06 In 2008= 25 In 2009= 13 In 2010 = 12
3.2	Total number of articles published last year in Asian Academic Journals that are authored by faculty members and students in the department.	In 2006 = 05 In 2007 = 13 In 2008= 00 In 2009= 00 In 2010= 02
3.3	Total number of ongoing research projects in the department funded by different organizations	07
3.4	Number of post-graduate students in the department holding scholarships/fellowships.	12
3.5	Total Research Funds available to the Department from all sources. (Research Project + University Funding)	Rs. 8,588,052/-
3.6	Number of active international linkages involving exchange of researchers/students/faculty etc. (Attach Details).	1

4	Student Information:	
4.1	Number of Ph.D. degrees conferred to date to students from the Department during the past three academic years.	17
4.2	Number of Ph.D. students currently enrolled in the department.	25
4.3	Ratio of number of students accepted to total number of applicants for Ph.D. Program.	60%
5	Program Information	
5.1	Entrance requirements into Ph.D. Program (M.Sc. / M.Phil.) Indicate subjects or M.Sc. / M.Phil.	M.Phil.
5.2	Is your Ph.D. program based on research only? (Y/N)	No.
5.3	Maximum number of years in which a Ph.D. degree has to be completed after initial date of enrollment in Ph.D. program.	5 years 10 semester
5.4	Total number of post M.Sc. (16 year equivalent) courses required for Ph.D.	30+18=48 credit
5.5	Total number of M.Phil. level courses taught on average in a Term / Semester.	4
5.6	Total number of Ph.D. level courses taught on average in a Term / Semester.	2
5.7	Do your students have to take/write:	
	a. Ph.D. Qualifying examination (Y/N)	Y
	b. Comprehensive examination (Y/N)	Y
	c. Research paper in HEC approved Journal	Y
	d. Any other examination (Y/N)	International GRE
5.8	Total number of International examiners to which the Ph.D. dissertation is sent.	54
5.9	How is the selection of an examiner from technologically advanced countries carried out?	Based on Position Experience Relevance
5.10	Is there a minimum residency requirement (on campus) for award of Ph.D. degree?	Six Semesters
6	Additional Information	
6.1	Any other information that you would like to provide.	TTS

Faculty Resume



Proforma 9

Faculty Resume

Name	Prof. Dr. S. M. Saqlan Naqvi			
Personal	Chairman Department of Biochemistry Pir Mehr Ali Shah Arid Agriculture University Rawalpindi 46300-Pakistan. Ph. No. 92(51)962246, 4845623, 92(51)9290151~2, Ext. 146			
Experience	List current appointment first, each entry as follows: <i>Date, Title, Institution.</i> Attached Annex-I			
Honor and Awards	List honors or awards for scholarship or professional activity. Attached Annex-II			
Memberships	List memberships in professional and learned Societies, indicating offices held, committees, or other specific assignments. Attached Annex-III			
Graduate Students Postdocs Undergraduate Students Honour Students	List supervision of graduate students, postdocs and undergraduate honors theses showing: <table><tr><td>Years</td><td>Degree</td><td>Name</td></tr></table> Show other information as appropriate and list membership on graduate degree committees. Attached Annex - VI	Years	Degree	Name
Years	Degree	Name		
Service Activity	List University and public service activities. Attached Annex - V			
Brief Statement of Research Interest	RESEARCH INTERESTS ◆ Tissue culture for genetic transformation ◆ Cloning of genes, cDNAs and regulatory elements and their application in agriculture/food industry. ◆ Construction of transgenic plants for improved agricultural productivity. ◆ Bioinformatics & Nanobiotechnology; applications, teaching and tools development			
Publications	List publications in standard bibliographic format with earliest date first. ○ Manuscripts accepted for publication should be included under appropriate category as “in press;” ○ Segment the list under the following standard headings: • Articles published by refereed journals. (Annex – VI) • Books. (Annex – VII) • Scholarly and / or creative activity published through a refereed electronic venue. • Contribution to edited volumes.			

	• <i>Papers published in refereed conference proceedings.</i> (Annex – VIII) • <i>Paper or extended abstracts published in conference proceedings. (refereed on the basis of abstract)</i> • <i>Articles published in popular press.</i> • <i>Articles appearing in in-house organs.</i> • <i>Research reports submitted to sponsors.</i> • <i>Articles published in non-refereed journals.</i> • <i>Manuscripts submitted for publication. (include where and when submitted).</i>			
Research Grants and Contracts.	<i>Entries should include:</i> <table><tr><td><i>Date</i></td><td><i>Title</i></td><td><i>Agency / Organization</i></td></tr></table> <i>Total Award Amount</i> <i>Segment the list under following headings:</i> • <i>Completed</i> • <i>Funded and in progress</i> • <i>In review</i> <i>Attached Annex-IX</i>	<i>Date</i>	<i>Title</i>	<i>Agency / Organization</i>
<i>Date</i>	<i>Title</i>	<i>Agency / Organization</i>		
Other Research or Creative Accomplishments	<i>List patents, software, new products developed, etc.</i>			
Selected Professional Presentations				

Annex– I

Higher Education

Date	Title	Institution
May 2010- to date	Professor TTS	Department of Biochemistry University of Arid Agriculture Rawalpindi, 46300-Pakistan
Aug 2006-May 2010	Professor	Department of Biochemistry University of Arid Agriculture Rawalpindi, 46300-Pakistan
Dec 1999-Aug2006	Associate Professor	Department of Biochemistry University of Arid Agriculture Rawalpindi, 46300-Pakistan

Research

Date	Title	Institution
May 1995~Nov 1999	Senior Scientific Officer	Agricultural Biotechnology Institute Pakistan Agricultural Research Council Islamabad, Pakistan
Jan 1986~April 1995	Scientific Officer	Agricultural Biotechnology Institute Pakistan Agricultural Research Council Islamabad, Pakistan
July 1985~Jan 1986	Assistant Director	National Research Institute for Reproductive Physiology National Institute of Health Islamabad, Pakistan
June 1985~July 1985	Abstractor/Indexer	Pakistan Scientific & Technological Information Center Pakistan Science Foundation Islamabad, Pakistan

Industry

Date	Title	Institution
Mar 1979~May 1985	Assistant Manager II	(Quality Control/Production) Ghee Corporation of Pakistan.

Honor and Awards

- Focal Personal for Plant Biotechnology, Research and Development HEC, Islamabad.
- Member Technical Review Board of the International Research Support Initiative Program of HEC
- Member Technical Committee of the NSLP of Pakistan Science Foundation
- Selection of the theme of title page of the highly reputed journal the “**Plant Physiology Volume 39(3), November 2005**” from my research paper. (see publication list).
- **Research Productivity Award** (2001-2) from Ministry of Science & Technology, Government of Pakistan
- **Accredited Ph.D. Supervisor** declared by Higher Education Commission of Pakistan
- **Merit Scholarship** for Ph.D. from Turkish Government.
- **First position** in M.Phil. from Quaid-i-Azam University, Islamabad.
- **Second position** in M.Sc. Biology from Quaid-i-Azam University, Islamabad.
- **Merit Scholarship** during M.Sc.
- **Fauji Foundation Scholarship** during B.Sc.
- **Merit Scholarship** during Higher Secondary Schooling.
- **Merit Scholarship** during Secondary Schooling.

Memberships**MEMBER PROFESSIONAL SOCIETIES**

- ♠ **Life Member & Vice President** Botanical Society of Pakistan
- ♠ **Member** International Society for Computational Biology
- ♠ **Member** Pakistan Phytopathological Society
- ♠ **Life Member** Pakistan Society for Biochemistry & Molecular Biology

RESEARCH SUPERVISION

Year	Degree	Name
<u>B.Sc. Computer Science</u> (Completed) Development of Software for DNA restriction analysis, translation and ORF search		
<u>M.Sc Thesis</u> (Completed)		
2006	M.Sc. Biochemistry	Saima Riaz
2004	M.Sc. Biochemistry	Pakeeza A. Malik
2003	M.Sc. Biochemistry	Tasawar Sultana
2003	M.Sc. Biochemistry	Uzma Rani,
2003	M.Sc. Biochemistry	S. Tanzeel-ur-Rehman
2001	M.Sc. Biochemistry	S. Qasim Raza
2001	M.Sc. Biochemistry	M. Zeeshan Hyder
2001	M.Sc. Biochemistry	Zahida Shamim
(Member Supervisory Committees) M.Sc. ~15 (Degrees in Biochemistry, Botany, Biology & Zoology)		
<u>M.Phil., M.Sc (Hons)</u> <i>In progress</i>		
2006	M.Phil. Biochemistry	Shahzad H. Shah
2006	M.Phil. Biochemistry	Iram Batool
2006	M.Phil. Biochemistry	Tauseef Tabassum
2006	M.Phil. Biochemistry	Saira Hussain
2006	M.Phil. Biochemistry	Muhammad Fiaz
<u>M.Phil., M.Sc (Hons)</u> <i>Completed</i>		
2010	M.Phil. Biology	M. Usman Farooq
2010	M.Phil. Biochemistry	Farah Deebea
2010	M.Phil. Biochemistry	Farah Deebea
2010	M.Phil. Biochemistry	Safia Janjua
2010	M.Phil. Biochemistry	Sidra Younas
2009	M.Phil. Biochemistry	Sidra Batool
2009	M.Phil. Biochemistry	Nadia Majeed
2009	M.Phil. Biochemistry	Tasawar Sultana
2009	M.Phil. Biochemistry	Fariha Khan
2009	M.Phil. Biochemistry	Irtiza H. Shah Gardezi
2009	M.Phil. Biochemistry	Dure Shahwar
2009	M.Phil. Biochemistry	Shahzad H. Shah
2009	M.Phil. Biochemistry	Muhammad Fiaz
2008	M.Phil. Biochemistry	Tauseef Tabassum
2008	M.Phil. Biochemistry	Amna Khan
2008	M.Phil. Biochemistry	Saira Hussain
2008	M.Phil. Biochemistry	Iram Batool
(Member Supervisory Committees) (Completed) ~25 (Degrees in Food Technology, Plant Pathology, and Plant Breeding & Genetics)		
(In Progress) (Member Ph.D. Synopses Committees) Department of Biochemistry Department of Plant Breeding & Genetics		
<u>Ph.D. Thesis</u> <i>Completed</i>		
2010	Ph.D. Biochemistry	Saeeda Raza
2009	Ph.D. Biochemistry	Tayyaba Yasmin

2009	Ph.D. Biochemistry	M. Zeeshan Hyder
2008	Ph.D. Biochemistry	Aish Muhammad
2007	Ph.D. Biochemistry	Tariq Mahmood
2007	Ph.D. Biochemistry	Abid Mahmood
(Membership in Supervisory Committees)		
Department of Biochemistry		3
Department of Botany		2
Department of Zoology		2
Department of Entomology		1
Department of Food Technology		2
Department of Plant Pathology		2
Department of Plant Breeding & Genetics		1
Department of Agronomy		1

SERVICE ACTIVITY

Total experience (>28 YEARS)
HIGHER EDUCATION

- May 2009 (todate) Chairman/Professor TTS
Department of Biochemistry
University of Arid Agriculture
Rawalpindi, 46300-Pakistan
- May 2007-May 2009 Chairman/Professor
Department of Biochemistry
University of Arid Agriculture
Rawalpindi, 46300-Pakistan
- Aug 2006-May 2007 Professor
Department of Biochemistry
University of Arid Agriculture
Rawalpindi, 46300-Pakistan
- Dec 1999-Aug2006 Associate Professor
Department of Biochemistry
University of Arid Agriculture
Rawalpindi, 46300-Pakistan
- Dec 1990-May 1993 Teaching/Research Assistant
Biology Department
Middle East Technical University,
Ankara, Turkey

RESEARCH

- May 1995-Nov 1999 Senior Scientific Officer
Agricultural Biotechnology Institute
Pakistan Agricultural Research Council
Islamabad, Pakistan
- Jan 1986-April 1995 Scientific Officer
Agricultural Biotechnology Institute
Pakistan Agricultural Research Council
Islamabad, Pakistan
- July 1985-Jan 1986 Assistant Director
National Research Institute for Reproductive Physiology
National Institute of Health
Islamabad, Pakistan
- June 1985-July 1985 Abstractor/Indexer
Pakistan Scientific & Technological Information Center
Pakistan Science Foundation
Islamabad, Pakistan

INDUSTRY

- Mar 1979-May 1985 Assistant Manager II (Quality Control/Production)
Ghee Corporation of Pakistan.

Misc. ASSIGNMENTS/MEMBERSHIPS
In UAAR

- ♣ **Chairman**, Department of Biochemistry, UAAR (02.05.2007~todate)
- ♣ **Acting Chairman**, Department of Biochemistry, UAAR (16.8.2005 to 08.09.2005)
- ♣ **Acting Chairman**, Department of Biological Sciences, UAAR (05.8.2002 to 22.10.2002)
- ♣ **Incharge Biochemistry, development Program**, UAAR (Since 12.02.2001)
- ♣ **Member Academic Council**,. UAAR (1999~todate)

- ♠ **Associate Editor**, Journal of Arid Agriculture, UAAR (2001~2003)
- ♠ **Member Advanced Studies & Research Board**, UAAR (2000~2003)

Other Institutions

- ♠ **Vice President**, Pakistan Botanical Society.
- ♠ **Member**, HEC National Curriculum Revision Committee for Bioinformatics
- ♠ **Technical Expert (Biotechnology), Selection Board**, NWFP Agriculture University, Peshawar (Since 2002).
- ♠ **Member Institutional Review Board**, Quaid-i-Azam University, Islamabad. (2003-2006).
- ♠ **External Examiner** of Quaid-i-Azam University, NWFP Agriculture University, University of AJ&K and Bahauddin Zakaria University for M.Sc./M.Phil. and Ph.D. examination.
- ♠ **Resource person** for College Teachers Refresher Courses by HEC.

TEACHING

Post-Graduate courses

- ♣ Plant Molecular Physiology (2007)
- ♣ Molecular Biology (2000~2007)
- ♣ Cell and Tissue Culture (1999~2007)
- ♣ Advances in Biotechnology (2002~ 2006)
- ♣ Bioinformatics (2004, 2007)
- ♣ Plant Biochemistry (2003)
- ♣ Research Planning & Report Writing (2001, 2002)
- ♣ Biochemistry (2000)

Publications in HEC Journal carrying Impact Factor

1. **Naqvi, S.M.S.**, Raza, S.Q., Hyder, M.Z., Ozalp, C.V., Oktem, H.A. and Yucel, M. (2009). Sub-cellular distribution of two salt-induced peptides in roots of *Oryza sativa* L. var Nonabokra. **Afr J Biotechnol.**, **8(18):4613-4617**.
2. Hussain, A., Abbasi, N.A., Hafiz, I.A., Ahmad, Z. and **Naqvi, S.M.S.** (2009). Molecular characterization and genetic relationship among loquat (*Eriobotrya japonica* Lindl.) genotypes of Pakistan assessed by RAPD markers. **Pak J Bot.**, **41(5):2437-2444**
3. Dunwell, J.M., Gibbings, J.G., Mahmood, T. and **Naqvi, S.M.S.** (2008). Germin and Germin-like Proteins: Evolution, Structure, and Function. **Crit Rev Plant Sci.**, **27(5):342-375**.
4. Yasmin, T., Mahmood, T., Hyder, M.Z., Akbar, S., and **Naqvi, S.M.S.** (2008) Cloning, sequencing and *in silico* analysis of germin-like protein gene 1 promoter from *Oryza sativa* L. ssp. Indica. **Pak J. Bot.**, **40(4):1627-1634**.
5. Munir, R., Tanzeel ur Rehman, S., Kausar, R., **Naqvi, S.M.S.** and Farooq, U. (2008). Indirect enzyme linked immunosorbent assay for diagnosis of brucellosis in buffaloes. **Acta Vet. Brno.** **77(3):401-406**.
6. Mahmood, A., Anwar, M., **Naqvi, S.M.S.**, (2008). Motility, acrosome integrity, membrane integrity and oocyte cleavage rate of sperm separated by swim-up or Percoll gradient method from frozen-thawed buffalo semen. **Anim. Reprod. Sci.**, **111:141–148**
7. Mahmood, T., Zar, T., and **Naqvi, S. M.S.** (2008). Multiple pulses improve electroporation efficiency in *A. tumefaciens*" **Electronic Journal of Biotechnology.** : **11(1): [In Press]** DOI: 10.2225
8. Muhammad, A., H. Rashid and I. Hussain, **S.M.S. Naqvi.** (2007). Proliferation Rate Effects of BAP and Kinetin on Banana (*Musa* spp. AAA Group) ‘Basrai. **HortScience:** **42(5):1253–1255**.
9. Hyder, M.Z., S.Q. Raza, S. Hameed, S. Khalid and **S.M.S. Naqvi.** (2007). Phylogenetic relationship of TJ1 isolate of Banana bunchy top virus from Pakistan by DNA-1 sequence1 analysis. **Can. J. Plant Pathol.** **29(1):63-68**.
<http://pubs.nrc-cnrc.gc.ca/tcjpgp/k07-013.html>
10. Mahmood, T., M. Z. Hyder and **S.M.S. Naqvi.** (2007) Cloning and Sequence Analysis of a Germin-like Protein Gene Promoter from *Oryza sativa* L. ssp indica. **DNA Sequence** **18(1):26-32** DOI: **10.1080/10425170600986688**
[http://journalsonline.tandf.co.uk/\(ugmgta45cusgwn45l3qdkrab\)/app/home/issue.asp](http://journalsonline.tandf.co.uk/(ugmgta45cusgwn45l3qdkrab)/app/home/issue.asp)
11. Carter, C., R. Healey, **S.M.S. Naqvi,** H.T. Horner and R.W. Thornburg. (2007). Tobacco Nectaries Constitutively Express a Novel NADPH oxidase that is Implicated in the Defense of Floral Reproductive Tissues. **Plant Physiol.** **143(1): 389–399**.
Published On November 17, 2006 DOI:10.1104/pp.106.0893260
<http://www.plantphysiol.org/future/143.1.shtml#RESEARCHPAPER>
12. Mahmood, A., **S.M.S. Naqvi.** (2007). Capacitation of frozen thawed buffalo (*Bubalus bubalis*) bull spermatozoa with higher heparin concentrations. **Reprod Domest Anim.** **42:376-379** DOI **10.1111/j.1439-0531.2006.00794**
<http://www.blackwellpublishing.com/journal.asp?ref=0936-6768&site=1>
13. **Naqvi, S.M.S.**, T. Sultana, T. Yasmin, A. Waheed, S.A. MAJID and M.S. Akhtar. (2006). Efficient embryogenic system from tissue cultures of mature embryos for some coarse varieties of rice (*Oryza sativa* L.). **Pak. J. Bot.** **38(4): 969-975**
<http://www.pjbot.org/>
14. Hafiz, I.A., N.A. Abbasi, A. Hussain, A. Waheed and **S.M.S. Naqvi.** (2006). The methylation-sensitive amplification polymorphism in juvenile and adult phase crab apple (*Malus micromalus*). **Pak. J. Bot.** **38 (4):1149-1157**
<http://www.pjbot.org/>
15. John, P., G. Ali, M.S. Chishti, **S.M.S. Naqvi,** S.M. Leal, W. Ahmad. (2006). Localization of a Novel Locus for Alopecia with Mental Retardation Syndrome to Chromosome 3q26.33-q27.3. **Human Genetics** 2006, **118(5):665-667**, DOI.**10.1007/s00439-005-0086-9**

16. Hussain, I., Z. Chaudhary, A. Muhammad, R. Asghar, **S.M.S. Naqvi** and H. Rashid. (2006). Effect of chlorocholine chloride, BAP and sucrose in *in vitro* tuberization in potato (*Solanum tuberosum* L. cv Cardinal). **Pak. J. Bot.** 38(2):275-282
<http://www.pjbot.org/>
17. **Naqvi, S.M.S.**, A. Harper, G. Ren, D.L. Yin, C. Carter, W.S. York, and R.W. Thornburg. (2005). Nectarin IV, a potent inhibitor of fungal xylanases secreted into the nectar of ornamental tobacco plants: Isolation, cloning and characterization. **Plant Physiology** 139 (3):1389-1400 DOI: 10.1104/pp.105.065227
www.plantphysiol.org/cgi/content/abstract/139/3/1389
18. Hussain, I., A. Muhammad, Z. Chaudhary, R. Asghar, **S.M.S. Naqvi** and H. Rashid. (2005). Morphogenic potential of three potato (*Solanum tuberosum*) cultivars from diverse explants a prerequisite in genetic manipulation. **Pak. J. Bot.** 37(4): 889-898
<http://www.pjbot.org/>
19. **Naqvi, S.M.S.**, R. Sultana and H. Rashid. (2005). Tissue culture studies in *Oryza sativa* L. cvs. Basmati 385 and Super Basmati. **Pak. J. Bot.** 37(4): 823-828
<http://www.pjbot.org/>
20. Yasmin, T., **S.M.S. Naqvi**, H. Shah and S. Khalid. (2005). RFLP based relationship of Pakistan isolate of banana bunchy top virus with south pacific virus group. **Pak. J. Bot.** 37(2):399-406.
<http://www.pjbot.org/>
21. Muhammad, A., I. Hussain, **S.M.S. Naqvi** and H. Rashid. (2004). Banana plantlet production through tissue culture. **Pak. J. Bot.** 36(3):617-620.
[http://www.pjbot.org/pjbot/abstracts/36\(3\)/617.htm](http://www.pjbot.org/pjbot/abstracts/36(3)/617.htm)
22. Ozalp, V.C., **S.M.S. Naqvi**, H.A. Oktem and M. Yucel. (2000). Photosystem II and cellular membrane stability evaluation in Hexaploid wheat seedlings under salt stress conditions". **J. Plant Nutrition**, 23(2): 275-283
<http://www.tandf.co.uk/journals/titles/01904167.asp>
23. **Naqvi, S.M.S.**, K.S. Park, S.Y. Yi, H-W Lee, S.H. Bok and D. Choi. (1998). A glycine-rich RNA-binding protein gene is differentially expressed during acute hypersensitive response following Tobacco Mosaic Virus infection in tobacco. **Plant Mol. Biol.**, 37(3): 571-576
[http://www.springerlink.com/\(i0dmjb2rjvyqpa552s0jpy55\)/app/home/issue.asp?referrer=parent&backto=journal,127,152;linkingpublicationresults,1:100330,1](http://www.springerlink.com/(i0dmjb2rjvyqpa552s0jpy55)/app/home/issue.asp?referrer=parent&backto=journal,127,152;linkingpublicationresults,1:100330,1)
24. **Naqvi, S.M.S.**, V.C. Ozalp, H.A. Oktem and M. Yucel. (1995). Salt induced synthesis of new proteins in the roots of a salt tolerant Rice variety. **J. Plant Nutrition**, 18(6): 1121-1137.
<http://www.tandf.co.uk/journals/titles/01904167.asp>
25. **Naqvi, S.M.S.**, V.C. Ozalp, H.A. Oktem and M. Yucel. (1994). Two dimensional electrophoresis of proteins with a modified approach to isoelectric focusing. **The Analyst**, 119:1341-1344.
<http://www.rsc.org/Publishing/Journals/an/index.asp>
26. Ahmed, W., **S.M.S. Naqvi**, N. Fatima and A. Khanum. (1989). Isoelectric profiles of epididymal androgen dependent proteins of immature and mature goats (*Capra hircus*). **Pak. J. Zool.**, 21(3): 267-272. [Biol. Abs.]
27. Nasir, J., M.H. Qazi, S.A. Malik, A. Qazi and **S.M.S. Naqvi**. (1988). Isolation, purification and characterization of carcinoembryonic antigen extracted from rectal carcinoma. **Pak. J. Zool.**, 20(1):13. [Biol. Abs.]
28. Arslan, M., S. Mehmood, S. Khurshid, **S.M.S. Naqvi**, M.A. Afzal and S.M. Baig. (1986). Changes in the circulating levels of immunoreactive follicle stimulating hormone, luteinizing hormone and testosterone during sexual development in *Macaca mulata*. **J. Med. Primatol.**, 15(5):351-9.
29. Ahmed, W., **S.M.S. Naqvi**, M.Z. Haider and A. Khanum. (1987). Studies on the soluble proteins in the epididymis of goat (*Capra hircus*). **Pak. J. Zool.**, 19(3):231-237.
30. Qadri, M.I., M.Z. Haider, W. Ahmed, **S.M.S. Naqvi** and A. Khanum. (1985). Identification of cAMP binding protein in the leydig cells and seminiferous tubules of mouse. **Pak. J. Zool.**, 17(4):339.

In other HEC recognized Journals

- 1 H. Shah, **S.M.S. Naqvi**, and Saif Khalid. (2004). A simple method for screening cotton germplasm against CLCuV begomovirus. **Sarhad J. Agric. Res.**, 20(3):453-458.
- 2 Rashid, H., S.N.R. Bokhari, Z. Chaudhary and **S.M.S. Naqvi**. (2003). Studies on genotype response of to callus induction from three Basmati cultivars (*Oryza Sativa* L.) **Pak. J. Biol. Sci.** 6(5):445-447. [Thompson Master List]
- 3 **Naqvi, S.M.S.**, T. Yasmin, H. Rashid, Chaudhary, Z and A. Quraishi. (2002). Callus induction from seeds of *Zia mays* var EV-2097. **Pak. J. Biol. Sci.** 5(9):956-958 [Thompson Master List]
- 4 Shah, S.S.; Swati, Z.A., . **Naqvi, S.M.S.** (2002). Genotype and hormonal effect on callus formation and regeneration in oat. **Sarhad J. Agric. Res.**, 18(3) p. 295-298
- 5 Gul, N., Z.A. Swati, **S.M.S. Naqvi**, I. Ullah and A. Quraishi. (2000). Magnitude of Somaclonal Variation in *Oryza sativa* L. cvs. Basmati-385, JP-5, Pakhal and Swat-II. *Plant Tissue Cult.* 10(2): 119-124. [Biol. Abs.] [Thomson Scientific Master Journal List]
<http://www.baptcb.org/ptc/titles.asp?YEAR=Vol.-10+No.-2>
- 6 Chaudhary, M.I., O. Kavuncu and **S.M.S. Naqvi**. (1998). Genetic diversity of gliadin proteins in hexaploid wheat by polyacrylamide gel electrophoresis. **J. Agric. Research**, 36(4):397-404.
- 7 Chaudhary, M.I., **S.M.S. Naqvi** and O. Kavuncu. (1999). Electrophoregrams of some Turkish wheat varieties based on separation of seed gliadins. **Sarhad J. Agric. Res.** 16(6):567-570.
- 8 Chaudhary, M.I., **S.M.S. Naqvi** and O. Kavuncu. (1997). Electrophoretic analysis of gliadins extracted from some Pakistani and Turkish wheat Varieties. **Pak. J. Sci. Res.**, 49(3-4).
- 9 **Naqvi, S.M.S.**, W. Ahmed and A. Khanum. (1993). Studies on testicular and epididymal LDH, Aldolase, Alkaline pyrophosphatase, Acid and Alkaline phosphatases in immature and mature *Capra hircus*. **Tr. J. Zool.**, 17: 207. [Biol. Abs.]
- 10 **Naqvi, S.M.S.**, V.C. Ozalp, H.A. Oktem and M. Yucel. (1992). Study of proteins synthesized in rice roots under salt stress conditions. **Int. Rice Res. Note**, 17(6):15-16. [Biol. Abs.]
<http://www.irri.org/publications/irrn/index.asp>
- 11 Oktem, H.A., V.C. Ozalp, D. Nalbant, F. Ozkan, **S.M.S. Naqvi**, A.R. Memon and M. Yucel. (1992). Identification of stress induced proteins in different varieties of Poppy (*Papaver somniferum* L.). **Tr. J. Bot.**, 16(3):395-403. [Biol. Abs.]
- 12 Khanum, A., M.Z. Haider, W. Ahmed, and **S.M.S. Naqvi**. (1990). Identification of Androgen dependent epididymal proteins in the *Capra hircus*. **Pak. J. Sci. Ind. Res.**, 33(12): 542. [Biol. Abs.]
- 13 **Naqvi, S.M.S.**, S.T. Abbas and A. Quraishi. (1989). Effect of sucrose, phytohormones and some aminoacids on callus culture and subsequent regeneration in "Basmati 385". **Pak. J. Agric. Res.**, 10(3): 224-130.
- 14 **Naqvi, S.M.S.**, S.T. Abbas and A. Quraishi. (1989). Effect of sucrose, phytohormones and some aminoacids on callus culture and subsequent regeneration in "Basmati 385". **Pak. J. Agric. Res.**, 10(3): 224-130.
- 15 Abbas, S.T., **S.M.S. Naqvi** and A. Quraishi. (1988). Phenotypic variation among progeny of Basmati somaclones. **Pak. J. Sci. Ind. Res.**, 31(11):388-390. [Biol. Abs.]
- 16 **Naqvi, S.M.S.**, W. Ahmed, M.Z. Haider, A. Khanum. (1988). Effect of androgen on epididymal enzymes of goat (*Capra Hircus*). **Pak. J. Biochem.**, 21(1-2):61-67.

Publications in Other National/International Journals

- 1 Hussain, S., F. Khan, T. Yasmin, S.Q. Raza, A. Rashid, **S.M.S. Naqvi**. (2006). Efficient *in vitro* regeneration of *Brassica Napus* L. using different explants. In: Proceedings of the International Conference, "Biotechnology: Shaping Future Agriculture" June 20-21, 2006, Rawalpindi, Pakistan.
- 2 Muhammad, A., H. Rashid and I. Hussain, **S.M.S. Naqvi**. (2006). Comparison of BAP

- and Kinetin on proliferation rate of Banana (*Musa* spp.) cv. Basarai. In: ACORBAT XVII International Meeting, 15-20 October 2006, Joinville, Santa Catarina, Brazil.
- 3 Rashid, H., R.A. Ghani, Z. Chaudhary and **S.M.S. Naqvi**, and A. Quraishi. (2002). Effect of media, growth regulators and genotypes on callus induction and regeneration in wheat (*Triticum aestivum*). **Biotechnology**, 1(1):49-54.
 - 4 Hameed, S., **S.M.S. Naqvi** and S. Khalid. (1996). Occurrence of B-biotype of *Bemisia tabaci* in Pakistan. **Brighton Crop Protection Conference Pests and Diseases**. 1:81-88.
 - 5 **Naqvi, S.M.S.** (1995). Micropropagation of Jojoba through tissue culture. **PARC Res. Digest**, 6(4):13.
 - 6 **Naqvi, S.M.S.**, V.C. Ozalp, H.A. Oktem and M. Yucel. (1995). Sub-cellular distribution of two salt induced peptides in rice roots. In: **Biotechnology for Sustainable Development** (K.A. Malik, A. Naseem and A.M. Khalid eds). NIBGE, pp: 165-170.
 - 7 Ozalp, V.C., **S.M.S. Naqvi**, H.A. Oktem and M. Yucel. (1993). "Characterization of salt induced proteins in wheat cultivars." MED Campus, Enzymes as Industrial Tools, .Biotechnology Center, Ege University, Izmir-Turkey (**Lecture Notes**). 31-34, 1993.
 - 8 **Naqvi, S.M.S.** (1993). Identification, characterization and sub-cellular localization of salt induced proteins in rice (*Oryza sativa* L.), Ph.D. thesis, **Middle East Technical University, Turkey**.
 - 9 **Naqvi, S.M.S. (1984)**. Studies of some testicular and epididymal enzymes in *Capra hircus*. M.Phil Thesis, Quaid-i-Azam University, Islamabad, Pakistan.

Annex - VII**Edited Books**

1. **Naqvi, S.M.S. and Ahmad, S.** (2006): Proceedings of the International Conference, “Biotechnology: Shaping Future Agriculture” June 20-21, 2006, ISBN:969-8374-06-X © University of Arid Agriculture Rawalpindi, Pakistan-46300Rawalpindi, Pakistan.

Research Reports Submitted to Sponsored

Completed Projects: Six monthly and annual technical progress of:-

- a. ALP Project No. 01-03-01-19
- b. PSF Project No. R&D/P-UAA/Biotech (220)

Research Grants and Contracts

Completed:

Date	Title	Agency/Organization
3 years	Co-Principal Investigator Marker assisted wheat breeding for rust resistance. Pak-China collaborative project. Cost: Rs. 3.5 million	Ministry of Sciences and Technology, Govt. of Pakistan
4 years	Principal Investigator Investigation of role of Germin-like proteins (Glps) during germination and early development by construction of rice plants engineered for sense and anti-sense expression of rice glps. Cost Rs. 2.473 million	Project No. 01-03-01-19 Agric. Linkages Prog., PARC.
4 years	Co-Principal Investigator Cloning, over-expression of somatotropin and its use as a lactogenic agent in indigenous buffalo breeds. Cost: Rs. 29.625 million	Higher Education Commission/ Ministry of Science and Technology, Govt. of Pakistan
4 years	Principal Investigator Tissue culture and genetic transformation studies in banana (<i>Musa</i>) for disease eradication/disease resistance. Cost Rs: 0.873 million	Project R&D/P-UAA/Biotech (220) Pakistan Science Foundation

On Going

Duration: 3 years	Principal Investigator Study of polyphenol oxidase activity and its association with molecular markers in different wheat genotypes. Cost Rs. 3.789 million	Project 250-584/R&D/06 Higher Education Commission
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Proforma 9

Faculty Resume

Name	Dr. Muhammad Gulfraz		
Personal	Professor Department of Biochemistry PMAS Arid Agriculture University Rawalpindi		
Experience	31-1- 2010 Professor PMAS Arid Agriculture University August 2003 Associate Professor February 1998 Assistant Professor February 1987 Lecturer		
Honor and Awards	One and half years scholarship awarded by DAAD 1992- 93 3 Months Scholarship awarded by DAAD 2002 3 Months Scholarship awarded by HEC 2005 One year post doctorate Scholarship awarded by HEC 2006-07		
Memberships	Member of Biochemical society of Pakistan		
Graduate Students Postdocs Undergraduate Students Honour Students	Years 2010 2009 December,2008	Degree Ph.D Biochemistry Ph.D Biochemistry Ph.D Biochemistry	Name Ms. Farida Iftakhar Mr. Asif Ahmed Mr. Sajid Mehmood
	12 M.Phil and 15 M.Sc thesis work was supervised		
Service Activity	Professor Department of Biochemistry Member Academic Council Member Examination committee 1997-98 Hostel Superintendent 1986-88 Member Board of Studies		
Brief Statement of Research Interest	Natural Product Chemistry (i) Isolation Purification and analysis of active ingredients for drug discoveries Fermentation Biotechnology (ii) Production of Bioethanol and Biodiesel from agriculture waste and plant sources		

Publications	<u>ISI Abstracted journals with impact factor (Total impact factor 13.728)</u>
	1. Asif A, Kakub, G., Mehmood, S., Khunum, R. and M. Gulfraz. 2007. Wound healing activity of root extracts of <i>Berberis lyceum</i> Royle in rats. <i>Phytotherapy Res.</i> 21(6):589-591 impact factor 1.764. 2. Kakub G and M.Gulfraz .2007. Cytoprotective effects of <i>Bergenia ciliate</i> Sternb, Extract on Gastric ulcer in Rats. <i>J. Phytotherapy Research</i> 21 (12:1217-1220 impact factor 1.764 3. Gulfraz M, N. Fatima, Z.Parveen and S.Mehmood 2007 . Antimicrobial activity of <i>Berberis Lyceum</i> Royle against different Microorganism Candian .<i>J Pure and Applied Science.</i> 1 (1) pp.15-21. 2007. 4. Jabeen N, R. Khanum, S. Shaukat, S. Mehmood and M. Gulfraz.2007. Protective effect of <i>Euphorbia Helioscopia</i> on different wound models in Rats. <i>Canadian . J of pure and applied science.</i> 2(1) 51-55 5. Gulfraz M, G. Qadir, N. Fatima and Z. parveen.2007. Antihyperglacemic effects of <i>Berberis lyceum</i> Royle in Alloxan induced Diabetic Rats. <i>Diabetologia Croatica</i> 36 (3): 49-54. impact factor 0.5 6. Mehmood S, Irshad ul Haq, K.S. Khan and M. Gulfraz.2008. Comparson of Regional varieties of sorghum for ethanol, proximate and Metal ions concentration. <i>Canadian J Pure and Applied Science</i> 2 (1): 133-137. 7. Gulfraz M, S. Mehmood, A. Ahmad, N. Fatima, Z. Parveen and E.M. Williamson. 2008. Comparison of Anti diabetic activity of <i>Berberis lyceum</i> Root extract and Berberine in Alloxan Induced Diabetic Rats. <i>J. Phytotherapy Research</i> 22, 1208-1212. impact factor 1.764 8. Sajid M, I. Ohran, Z. Ahsan, S.Aslan and M. Gulfraz.2008. Fatty acid composition of seed oil of different sorghum bicolor varieties. <i>Food Chemistry.</i>109:855-859. impact factor 3.50. 9. Sajid M, A. Bashir, A. Ahamd, Z. Akram, N. Jabeen and M. Gulfraz.2008.Molecular characterization of Regional sorghum Bicolor varieties from Pakistan. <i>Pak. J. Botany</i> 40(5):2015-2021. impact factor 0.5 10. Gulfraz M, M. J. Asad, G. Qaddir, S. Mehmood, S. Shaukat and Z. Parveen.2008. Phytochemical Constituents of <i>Berberis lycium</i> and <i>Justicia adhatoda</i>. <i>J. Chem. Soc. Pak.</i> 30 (3):453-457. impact factor 0.5. 11. Sajid M, M. Gulfraz, A. Ahmad and B.K. Ahring.2008. Fermentation of dilute acid pretreated and enzymatically saccharified <i>Sorghum bicolor</i> straw to ethanol. <i>J. Biotechnology.</i>136 (Suppl 1): S5409. impact factor 2.881 12. Gulfraz M. S. Mehmood, N. Minhas, N.jabeen, R. Kausar, K. Jabeen and G. Arshad.2008. Composition and antimicrobial properties of essential oil of <i>Foeniculum vulgare</i>.<i>Afr. J. Biotechnology.</i> 7(24): 4364-4368. impact factor 0.564 13. Farzana S and M. Gulfraz.2009. 2009. Quality Assessment of Fresh Milk obtained From different Sources. <i>Pak. J. Zoology.</i> 41 (4) 316-319 Impact factor 0.5 14. Gulfraz M, G. Arshad, S. Mehmood, N. Minhas, N. Jabeen, S Naz, S, Saukhat and F. Siddique.2009. Isolation and Characterization of edible oil from wild olive. <i>Afr.J.Biot.,</i>8 (12)3734-3738.Impact factor 0.564 15. Sajid M and M. Gulfraz. N. F. Rana, A.Ahmad, B.K. Ahring, N. Minhas and M.F. Malik 2009. Ethanol production from Sorghum bicolor by using both Separate and Simultaneous Saccharification and Fermentation in batch and fed batch Systems..8 (12) 2857-2865. <i>Afri.J. Biot.</i> Impact factor 0.564. 16. Faradia I , M. Arshad , F. Rasheed , D. Amraiz, P.Anwar and M. Gulfraz.2009. Treatment of various Wound Models in Rats with Acacia Honey. <i>Phytotherapy Res.,</i> 24 (4) 583-586 Impact factor 1.764

17. Irshad U. H, S. Ajmal, M. Munir and M. Gulfraz.2010. Genetic action studies of different Quantitative traits in maize. Pak. J. Bot. 42 (2); 1021-1030. impact factor 0.5
18. Nyla J, Bushra M, Zubada C, Hamid R and M. Gulfraz.2009. Study of the factors affecting *Agrobacterium* mediated gene transformation in tomato (*Lycopersicon esculentum* Mill.) cv. Riogrande using rice chitinase (*Cht- 3*) gene. Pak. J. Bot. 41(5): 2605-2614. **impact factor 0.50**
19. Faiza Rasheed and M. Gulfraz.2009. Antimicrobial and antioxidant activities of leaves extracts of *J. adhatoda.vesca*.African Journal of Biotechnology (Submitted).
20. Sajid M, M. Gulfraz, Z.Hyder and M.F. Malik.2009. Ethanol: A non –Fossible Based alternative energy Resource obtain from Sorghum Biomass. African journal of Biotechnology. (Accepted) **Impact factor 0.564**
21. Adil K.K, Saeed Q, Waqas K.K, Rahmatullah Q, Waheed A. M. Gulfraz and M. K. Laghari.2010 Assessment of wheat yield after cropping Mungban (*Vigna Radiata* (L). Pak. J. Bot. 42(3): 1535-1541. **Impact factor 0.5**
22. Muhammad Gulfraz, Farida Iftikhar , Muhammad Imran , Saira Asif, Kashif Sarfraz Abbasi , Asiya Zeenat and Imam Shah. 2010. Antimicrobial activity of various Honey types of Pakistan African journal of Biotechnology Vol. 9(41), pp. 6902-6906 . **Impact factor . 0.564**
23. M. Gulfraz. 2010.Quality assessment and antimicrobial activity of various honey types of Pakistan Australian journal of food and nutrition Accepted.
24. Muhammad Gulfraz, Alia Sadiq, Hira Tariq, Muhammad Imran, Rahmatullah Qureshi– and Asyia Zeenat **2010**. Phytochemical analysis and antibacterial activityof *eruca sativa* seed. Pak j. Bot (accepted). 0.564.
25. **Gulfraz. M** and T.Ahmad.2001. Concentration level of heavy metals in the fish and relevant water from Rawal and Mangla lakes .Pak.J. Biol.Sci. 1(5):414-416.
26. Noor. A, **M. Gulfraz** and B. Aslam.2001. Assessment of HBs Ag and Anti HCV in some area of Pakistan. Pak. J. Biol. Sci. 2 (3) :202-203.
27. **Gulfraz. M**, Y. Mussadddeq, R. Khanum and T. Ahmad 2002. Quality assessment of effluent from various industries in vicinity of Rawalpindi and Islamabad. Pak. J. Biol.Sci. 2 (10) 697-698.
28. Talib, M., **M. Gulfraz** and Y . Mussaddeq.2002 Effect of Crude extract of *Adhatoda vasica* Nees on Diabetic patients. Pak. J. Biol. Sci. 2(7): 436-437.
29. **Gulfraz. M**, Y. Mussadddeq, R. Khanum T.Ahmad. 2003. Metal Contamination in wheat crops (*Triticum aestivum*,L) irrigated with industrial effluents. Pak. J.Biol.Sci.3(3) 335-339
30. Naseem, S, T. Ahmad, **M. Gulfraz** and R. Khanum. 2005. Adverse Effects of Metal ions Pollution on Aquatic Biota and Seasonal variation. Pak .J. Biol. Sci. 8 (8) :1086-1089
31. M. Gulfraz, Rizwana P, Rizwana, K. and Awan R.2006.A new alternative edible olive oil.2006. Pak. J. Biol.Sci.9 (1). HEC non Recognized International Journals
32. **Gulfraz, M. M.** Arshad, N. Naiyyar, N. Kanwal and U. Nasir. 2004. Extraction of bioactive compounds from *Berberis lyceum* Roye and *Justicia adhatoda* (L.). Am. J. Econom. Botany (Ethano): (2) 1-6.
33. **Gulfraz, M. M.** Arshad, N. Uzma N. Kanwal and K. Shabir. 2004. Extraction and purification of bioactive compounds from Leave and Fruit of *Foeniculum Vulgare* Mill. Am. J. Econom. Botany (Ethano): (2) 2:4.
34. Wang, J. Sh, J. Wang and **M. Gulfraz**. 2005. Efficient Cellulose Production from Corn Straw by *Trichoderma reesi* L W 1 Through Solid State Fermentation Process. Am. J. Econom. Botany (Ethano): 1-7.

35. Guo, X. X., J. W, **M. Gulfraz** and L, Shi and J. Tian .2005. Study of Ageing and Production of Wine from Grape Fruit Fermentation Process by Am. J. Econom. Botany (Ethano): 1-8.
36. Gulfraz, M. R. Parveen, Y. Musseddque, U. Nisar, M. Ithisham and S. Rehman. 2006. Determination of essential oil content of wild olive and its comparison with olive oil.Am. J. Econom. Botany.(Ethno). 1-6

HEC non Recognized National Journals

37. **Gulfraz. M**, H.Afzal, M.A.Malik, M. Asrar and M.A.Hayat.1997. A study of water pollution caused by the effluents of various industries located in the vascinity of Sohan river. Pak. J. Sci. 49 (1-2):13-17.
38. Azim, M.,M, H. Rasheed, S. Ahmad and **M.Gulfraz**.1997. Response of two maize Hybrids to Defoliation and Fertilizer application under rainfed conditions .Pak. J. Sci 49(3-4):77-8.
39. **Gulfraz. M** and T.Ahmad. 2000. Level of selected trace metals in fish and relevant water from Ravi river.J.Sci & Tech.20(1) 22-27.
40. **Gulfraz. M**,T.Ahmad and H.Afzal.2001.Trace metals in the fish and relevant water from river Sohan.Pak.J.Sci. 53(1-2):7-9.
41. **Gulfraz. .M**, M.Arshad and T. Ahmad.2001. Determination of selected trace metals in the fish and relevant water of Sohan river.Pak. J. Arid Agric. 4(1-2):105-109.
42. **Gulfraz. M**, Y. Mussadddeq, T.Ahmad, S.Rehman and N.Jabeen. 2003 Level of trace metals in water and fish from Sohan rivre. Pak. J. Arid Agric 6 (1).
43. Yasmine. M , M. Sabar and **M. Gulfraz**.2003. Risk factors involved in Hepatitis C. Pak. J. Arid Agric. 6 (1).
44. **Gulfraz. M**,T.Ahmad and H.Afzal.2003 .Physico- chemical parameters and Trace Metals Concentration in Effluents from Various Industries in Vicinity of Lahore. Sci. Tech and Develop. 22: 9-11.
45. Sobia. W, Fahreen, K. Hina, F. Maryaum and **M. Gulfraz**. 2003. Metal contamination in food stuff due to polluted water.Proceed. Pak .Coun. Res water & Reso.261-264.
46. **Gulfraz. M**, A. Marriam , S. Malik, F Shazadi, A, Ahamad and S. Tabassam 2004. Production of Amino acids from feathers Keratin. Pak. J. Arid Agric 7 (1):21-24.
47. Aleem A, K.Ahmad, M. Gulfraz, N.S. Kisana and M. Asim.2006. DNA finger printing of wheat (Triticum aevstivum L) Genotypes as revealed by random amplified olmorphic dna(rapd) analysis. Pak. J. Seed. Technology. 1(8-9): 15-26.
48. Mehmood. S. M. Gulfraz, N.F. Rana and A. Ahmad.2008. Saccharomyces cereissiae strain BF001 Internal transcribed space, partial sequence 5.8S ribosomal RNA gene, complete sequence and internal transcribed spacer 2, partial sequence Accession No (GenBank) EU 551472

<i>Research Grants and Contracts.</i>	<table><tr><th>Date</th><th>Title</th><th>Agency / Organization</th></tr><tr><td>2004-2008 1.7 million</td><td>Production and utilization of biofuels from sweet sorghum</td><td>Funded by HEC (Completed)</td></tr><tr><td>2009- upto 3 years</td><td>Isolation purification and Monetary analysis of edible oil from wild olive</td><td>5.9 million Funded by HEC (In progress)</td></tr><tr><td>2010</td><td>Production of ethanol and butanol from Agricultural and municipal waste</td><td>4.2 million Funded by HEC (Grant sanction but fund not yet release)</td></tr></table>	Date	Title	Agency / Organization	2004-2008 1.7 million	Production and utilization of biofuels from sweet sorghum	Funded by HEC (Completed)	2009- upto 3 years	Isolation purification and Monetary analysis of edible oil from wild olive	5.9 million Funded by HEC (In progress)	2010	Production of ethanol and butanol from Agricultural and municipal waste	4.2 million Funded by HEC (Grant sanction but fund not yet release)
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2010	Production of ethanol and butanol from Agricultural and municipal waste	4.2 million Funded by HEC (Grant sanction but fund not yet release)											
<i>Other Research or Creative Accomplishments</i>	Organizing of works/ conferences 6 days works on separation techniques during 2006 2 days training workshop on biofuels during 2010												
<i>Selected Professional Presentations</i>	International seminar Utilization of Cellulosic Biomass of Agriculture Wastes for Production of Biofuel 14-15 October, 2010 Academy of Sciences Islamabad Pakistan Biofuels as source of energy 2 days training workshop, April 2010.												



Proforma 9

Faculty Resume

Name	Dr. Ghazala Kaukab Raja																																	
Personal	May include address(s) and phone number(s) and other personal information that the candidate feels is pertinent. Department of Biochemistry, Pir Mehar Ali Shah Arid Agriculture University Rawalpindi. Phone: 9062 215																																	
Experience	List current appointment first, each entry as follows: Date, Title, Institution. 28th April 2007-Present Associate Professor Department of Biochemistry, PMAS Arid Agriculture University Rawalpindi 27th October 2001- 28th April 2007 Assistant Professor Department of Biochemistry, PMAS Arid Agriculture University Rawalpindi 26th August 1999- 27th October 2001 Lecturer Department of Biochemistry, PMAS Arid Agriculture University Rawalpindi March 1999-July 1999 Visiting Lecturer Department of Biochemistry, PMAS Arid Agriculture University Rawalpindi																																	
Honor and Awards	List honors or awards for scholarship or professional activity. PhD Scholarship: Funded by John Crawford Scholarship Scheme, Australia Postdoctoral Research Fellowship November 2003-September 2004 Funded by Ministry of Science and Technology, Pakistan																																	
Memberships	List memberships in professional and learned Societies, indicating offices held, committees, or other specific assignments.																																	
Graduate Students Postdocs Undergraduate Students Honour Students	List supervision of graduate students, postdocs & undergraduate honors theses showing: <table><thead><tr><th>Years</th><th>Degree</th><th>Name</th></tr></thead><tbody><tr><td colspan="3">Show other information & list membership on graduate degree committees.</td></tr><tr><td>1. 2009</td><td>PhD</td><td>Nafeesa Qudsia Hanif</td></tr><tr><td>2. 2008</td><td>M.Phil</td><td>Rizwana Abdul Ghani</td></tr><tr><td>3. 2008</td><td>M.Phil</td><td>Abid Mehmood</td></tr><tr><td>4. 2008</td><td>M.Phil</td><td>Shagufta Jabeen</td></tr><tr><td>5. 2009</td><td>M.Phil</td><td>Abdul Rehman</td></tr><tr><td>6. 2009</td><td>M.Phil</td><td>Muhammad Saqlain</td></tr><tr><td>7. 2009</td><td>M.Phil</td><td>Nazia Shaheen</td></tr><tr><td>8. 2009</td><td>M.Phil</td><td>Nasib Zaman</td></tr><tr><td>9. 2010</td><td>M.Phil</td><td>Iffat Tahira</td></tr></tbody></table>	Years	Degree	Name	Show other information & list membership on graduate degree committees.			1. 2009	PhD	Nafeesa Qudsia Hanif	2. 2008	M.Phil	Rizwana Abdul Ghani	3. 2008	M.Phil	Abid Mehmood	4. 2008	M.Phil	Shagufta Jabeen	5. 2009	M.Phil	Abdul Rehman	6. 2009	M.Phil	Muhammad Saqlain	7. 2009	M.Phil	Nazia Shaheen	8. 2009	M.Phil	Nasib Zaman	9. 2010	M.Phil	Iffat Tahira
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8. 2009	M.Phil	Nasib Zaman																																
9. 2010	M.Phil	Iffat Tahira																																
Service Activity	List University and public service activities - Member Departmental (Biochemistry) Board of Studies - Member Faculty (Sciences) Board of Studies - Member University Academic Council - Member Biochemistry M.Phil, PhD Comprehensive Examination Committee - Member M.Sc. Hons. M.Phil, PhD Comprehensive Examination Committees - Member Biochemistry Scrutiny Committee for PhD Synopsis/Thesis - Departmental (Biochemistry) Student Advisor POST-GRADUATE COURSES TAUGHT/ TEACHING Lectures Courses: Protein Chemistry, Bio-membranes, Numerical problems in biochemistry, Proteomics, Principles of biotechnology, Fundamentals of biotechnology																																	

<i>Brief Statement of Research Interest</i>	<i>May be as brief as a sentence or contain additional details up to one page in length.</i> Current Research Interests: Exercise Biochemistry, Metabolism, Genetic polymorphism
<i>Research Grants and Contracts.</i>	<i>Entries should include:</i> Date Title Agency / Organization Total Award Amount Segment the list under following headings: - Completed - Funded and in progress - In review 2002-2003: Cloning of RG1 from Rat Skeletal Muscle University of Arid Agriculture Rawalpindi. (Completed) 2010: Prevalence of Non-alcoholic fatty liver disease (NAFLD) in Pakistani Population Pakistan Science Foundation (Funded and in progress) 2010, Identification of genetic risk factors for metabolic diseases in Pakistani populations INSPIRE (Submitted)
<i>Other Research or Creative Accomplishments</i>	<i>List patents, software, new products developed, etc.</i>
<i>Publications</i>	<i>List publications in standard bibliographic format with earliest date first.</i> - Manuscripts accepted for publication should be included under appropriate category as “in press;” - Segment the list under the following standard headings: - Articles published by refereed journals. - Books. - Scholarly and / or creative activity published through a refereed electronic venue. - Contribution to edited volumes. - Papers published in refereed conference proceedings. - Paper or extended abstracts published in conference proceedings. (refereed on the basis of abstract) - Articles published in popular press. - Articles appearing in in-house organs. - Research reports submitted to sponsors. - Articles published in non-refereed journals. - Manuscripts submitted for publication. (include where and when submitted). - Baig, S. A., Naqvi, S. S. M.,Saqlan., Raja,G., Muhammad,W., Muhammad, A. and Baig. S. M. Report of a family with congenital muscular dystrophy and review of literature. Genetics and Molecular Biology (MS2010/039) 2010. (Submitted) - Effect of ochratoxin A and a toxin deactivator (Mycofix® Plus^{MTV INSIDE}) on humoral response to Newcastle disease, Hydropericardium syndrome and Infectious bursal disease vaccines in broilers. (2010) British Poultry Sci (Submitted) - Hanif, N. Q., Muhammad, G., Muhammad, S., Khanum, A., Ahmed, A., Gadahai, J. A. and Kaukab, G. (2008). Clinico-pathomorphological, serum biochemical and histological studies in broilers fed ochratoxin A and a toxin deactivator (Mycofix® Plus^{MTV INSIDE}). British Poultry Sci. 49(5): 632-642 Raja, G., Brau, L., Palmer, T.N. and Fournier, P. A. (2008) Fiber-specific responses of muscle glycogen repletion in fasted rats physically active during recovery from high intensity physical exertion. Am J Physiol Regul Integr Comp Physiol. 295: R633-R641 - Hussain, R. R., Kaukab. G., Qayyum, M., Asim M. and Khanum A. (2007). Association of Diabetes with Hepatitis C. virus (HCV) infected male and

	female patients along with different risk factors. Int. J. Agri. Biol. 9 (5). 735-740 6. Kakub, G. and M, Gulfraz. (2007). 'Cytoprotective Effects of <i>Bergenia ciliata</i> Sternb Extract on Gastric Ulcer in Rats'. <i>Phytotherapy Res.</i> 21: 1217-1220 7. A. Asif, Kakub, G., Mehmood, S., Khunum, R. and M. Gulfraz. (2007). Wound healing activity of root extracts of <i>Berberis lyceum royle</i> in rats. <i>Phytotherapy Res.</i> 21 (6): 589-591 8. Raja, G., Mills, S., Palmer, T. N. and Fournier, P. A. (2004). Lactate availability is not the major factor limiting muscle glycogen repletion during recovery from an intense sprint in previously active fasted rats. <i>J Exp Biol.</i> 207(Pt 26): 4615-21 9. Raja, G., Brau, L., Palmer, T. N. and Fournier, P. A. (2003). Repeated bouts high intensity exercise and muscle glycogen sparing in the rat. <i>J. Exp. Biol.</i> 206 (Pt 13): 2159-2166 10. Fournier, P. A., Brau, L., Ferreira, L. D. M. C. B., Raja, G., Fairchild, T., James, A. and Palmer, T. N. (2002). Glycogen resynthesis in the absence of food ingestion during recovery from moderate or high physical activity. Novel insights from rat and human studies. <i>Comp. Biochem. Physiol. A Mol Integr Physiol.</i> 133 (3): 755-763 (9) Review article 11. Ferreira, L. D. M. C. B., Brau, L., Nikolovisky, S., Raja, G., Palmer, T. N. and Fournier, P. A. (2001). Effect of streptozotocin-induced diabetes on glycogen resynthesis in fasted rats post-high intensity exercise. <i>Am. J. Physiol. Endocrinol. Metab.</i> 280: E83-E91 12. Bräu, L., Ferreira, L. D. M. C., Nikolovisky, S., Raja, G., Palmer, T. N. and Fournier, P. A. Nikolovisky, S., Raja, G., Palmer, T. N. and Fournier, P. A. (1997). Regulation of glycogen synthase and phosphorylase during recovery from high-intensity exercise in the rat. <i>Biochem. J.</i> 322: 303-308 13. Peters, T. J., Nikolovisky, S., Raja, G., Palmer, T. N. and Fournier, P. A. (1996). Ethanol acutely impairs glycogen repletion in skeletal muscle following high intensity short duration exercise in the rat. <i>Addiction Biol.</i> 1: 289-295 14. Ahmed, M. M., Kaukab G., and Mufti, S. A. (1991). Effect of T₄ on experimentally induced soleus muscle in rat. <i>Pak. J. Zool.</i> 24 (2), 129-134			
Research Grants and Contracts.	<i>Entries should include:</i> <table><tr><th>Date</th><th>Title</th><th>Agency / Organization</th></tr></table> Total Award Amount Segment the list under following headings: - Completed - Funded and in progress - In review 1. 2002-2003: Cloning of RG1 from Rat Skeletal Muscle University of Arid Agriculture Rawalpindi. (Completed) 2. 2010: Prevalence of Non-alcoholic fatty liver disease (NAFLD) in Pakistani Population Pakistan Science Foundation (Funded and in progress) 3. 2010, Identification of genetic risk factors for metabolic diseases in Pakistani populations INSPIRE (Submitted)	Date	Title	Agency / Organization
Date	Title	Agency / Organization		
Other Research or Creative Accomplishments	<i>List patents, software, new products developed, etc.</i>			



Proforma 9

Faculty Resume

Name	Dr Muhammad Javaid Asad
Personal	Assistant Professor Department of Biochemistry Pir Mehr Ali Shah Arid Agriculture University Rawalpindi 46300-Pakistan. Ph. No. +92-51-9062268,92-51-9290151-2,Ext.171/146
Experience	14-10-06 to date Assistant Professor Department of Biochemistry PMAS Agriculture University Rawalpindi. 01-07-04 to 14-10-06 Lecturer Department of Chemistry and Biochemistry, University Faisalabad 11-01-01 to 30-06-04 Assistant Professor Department of Biochemistry, Independent Medical College, Faisalabad.
Honor and Awards	Availed Post Doctorate Fellowship awarded by HEC from 2009-2010 in Biotechnology. Approved Ph.D. supervisor (Biochemistry), Higher Education Commission of Pakistan. Issued appreciation letter by Vice Chancellor, University of Arid Agriculture Rawalpindi for delivering technical lecture as Resource person to participants of International Workshop on Techniques Related to Molecular Biology and Immunology, held at Department of Biochemistry University of Arid Agriculture Rawalpindi. (December 18-23, 2006) Issued appreciation letter by Vice Chancellor, University of Arid Agriculture Rawalpindi for delivering technical lecture as Resource person to participants of International Workshop on RT-PCR, held at Department of Biochemistry University of Arid Agriculture Rawalpindi. (June 8-11, 2010)
Memberships	Biochemical Society, Department of Chemistry and Biochemistry, University of Agriculture, Faisalabad. (Permanent Member) The Biochemical Society UK (2005-to date) Canadian Society of Biochemistry, Molecular and Cell Biology (CSBMCB), (2005-to date) Pakistan Society of Biochemistry and Molecular Biology (permanent member) Pakistan Society of Food Scientists and Technologists (permanent member). International Society of Environmental Sciences, University of Karachi (permanent member). Pakistan Society for Microbiology, Department Microbiology QAU Islamabad (permanent member) Pakistan Botanical Society (2007-to date) Pakistan Phyto Pathological Society (2007-to date)
Graduate Students Postdocs Undergraduate Students Honour Students	Member Supervisory Committees of M.phil/M.Sc. Department of Biochemistry 10 Department of Botany 6 Department of zoology 7 Department of Agronomy 1 Department of Plant Pathology 5 Department of Plant Breeding and Genetics 6 Member Supervisory Committees of Ph.D. Department of Biochemistry 5

	Department of Entomology 1 Department of zoology 2 M.Phil, M.Sc. students in progress. 2009 M.Phil. Biochemistry 3 2009 M.Phil Biology 1
Service Activity	Teaching and Research

Brief Statement of Research Interest	Fermentation process development Bioconversion of lignocellulosic biomass and production of amylases, cellulases and lignases, single cell protein, organic acids and other industrial products. Biocatalysis: Enzyme kinetics, purification, characterization, enzyme engineering, immobilization and industrial application of microbial enzymes; Liquid and solid waste management. Bioremediation of textile dyes and industrial effluents by white rot fungi, Biodiesel, Bioenergy and Nutrition.
Publications	1. Asad, M. J., M. Asgher, M.A. Sheikh and J.I. Sultan. 2006. Production of <i>Neurospora sitophila</i> cellulases in solid state cultures. J. Chem. Soc. Pak. 28(6):590-595. 2. Asgher, M., M.J.Asad and R.L. Legge. 2006. Enhanced lignin peroxidase synthesis by <i>Phanerochaete Chrysosporium</i> in solid state bioprocessing of a lignocellulosic substrate. World J. Microbiol. Biotechnol. 22(3): 449-453. 3. Asgher, M., M. J. Asad, S.U. Rahman and R.L. Legge. 2007. A thermostable α-amylase from a moderately thermophilic <i>Bacillus subtilis</i> JS-2004 for starch processing. J. Food Engineering, 79: 950-955. 4. Asgher, M., M. J.Asad, H. N. Bhatti, R.L. Legge.2007.Hyperactivation and thermostabilization of <i>Phanerochaete chrysosporium</i> lignin peroxidase by immobilization in xerogels. World J. Microbiol. Biotechnol. 23: 525-531. 5. Asgher, M., H. N. Bhatti, S.A.H. Shah, M. J. Asad and R.L. Legge.2007. Decolorization potential of mixed microbial cultures for some reactive and disperse textile dyestuffs. Biodegradation, 18: 311-316. 6. Kokub, D., Azam, F., Hussan. A., Ansar, M., M. J.Asad and Khanum, A. (2007). Comparative growth, morphological and molecular characterization of indigenous <i>Sclerotium rolfsii</i> strains isolated from different location of Pakistan. Pak. J. Bot., 39(5): 1849-1866 7. Gulfraz, M., M.J.Asad, M.Qaddir, S.Mehmood, S.Shaukat and Z. Parveen. 2008. Phytochemical Constituents of Berberis lycium Royle and Justicia Adhatoda vasica. J. Chem. Soc. Pak. 30 (4) 8. Asgher, M, S.Batool, H.N.Bhatti, R.Noreen, S.Rahman and M.J.Asad.2008.Laccase mediated decolorization of vat dyes by <i>Coriolus versicolor</i>.Intl.Biote.Biodeg.62:465-470. 9. Gulfraz,M.,R.Kausar,G.Arshad,S.Mehmood,N.Minhas,M.J.Asad,A.Ahmad and F.Siddique.2009.Isolation and characterization of edible oil from wild olive.Afri.J.Biotechnol.8:3734-37. 10. Asghar, M., A. Afzal, M.A. Sheikh and M.J. Asad. 2004. Development of solid state fermentation process for B-Glucosidase production by <i>Bacillus subtilis</i> using a lignocellulosic substrate. <i>J. Animal&Plant Sci.</i>, 14(1-2):1-4. 11. Nabi, N.G., M. Asgher, A.H. Shah, M.A. Sheikh and M.J. Asad. 2003. Production of pectinase by <i>Trichoderma harzianum</i> in solid state fermentation of citrus peel. <i>Pak. J. Agric. Sci.</i>, 40(3-4): 193-197. 12. Shafique, S., M. Asghar, M.A. Sheikh and M.J. Asad. 2004. Solid state fermentation of banana stalk for exoglucanase production. <i>Intl. J. Agric. Biol.</i>, 6(30):488-491. 13. Asghar, M., Z .Iqbal, M.A. Sheikh and M.J. Asad. 2003. Solid state fermentation of corn cobs for laccase production by <i>Pleurotus ostreatus</i>. <i>Pak. J. Biochem. Mol. Biol.</i>, 36(2):84-90. 14. Kokab, S., M. Asghar, K. Rehman, M.J. Asad and O. Adedayo. 2003. Bio-Processing of Banana peel for Alpha-amylase production by <i>Bacillus subtilis</i>. <i>Intl.J. Agric. & Biol.</i> 05(1):36-39. 15. Noreen, R., M. Asghar, M.J. Asad and O. Adedayo. 2003. Production of α-amylase from banana peel by <i>Bacillus subtilis</i>. <i>Pak. J. Agri. Sci.</i> 39(4):312-317. 16. Asghar M., S. Rafiq, U. Azhar and M.J. Asad. 2002. Kinetics of Glucoamylase production by <i>Arachniotus sp.</i> <i>Int. J. Agri and Biol.</i> 04(1):29-31.

	17. Asghar M., U. Azhar, S. Rafiq, M.A. Sheikh and M.J. Asad. 2002. Production of α -amylase by <i>Arachniotus sp.</i> using waste bread medium. Intl. J. Agri. Biol. 04(1):26-28. 18. Asghar, M., F. Aisha, M.J. Asad and Y. Saleem. 2002. Production of α-amylase through solid substrate fermentation of banana stalks by <i>Bacillus subtilis</i>. Pak. J. Agri. Sci. 39(4):307-311. 19. Asghar, M., K. Mukhtar, M.J. Asad and O. Adedayo. 2002. Solid state fermentation of banana stalks for glucoamylase production by <i>Bacillus subtilis</i>. Pak. J. Biochem. and Mol. Biol. 35:51-55. 20. Ashraf, M., M. Asghar, M.N. Khan, A. Batool and M.J. Asad. 2001. Chronic Hepatitis C. Effect of Ruibavirin Therapy of Liver Functions. Quarterly the Professional Journal. 579:487-490. 21. Lodhi, A., M. Asghar, M. Zia, S. Ambreen and M.J. Asad. 2001. Production of citric acid from waste bread by <i>Aspergillus niger</i>. OnLine J. Biol. Sci. 1(4):182-83. 22. Asad, M.J, M. Asghar, M. Yaqub and K. Shahzad. 2000. Production of single cell protein from delignified corn cob by <i>Arachniotus species</i>. Pak. J. Agri. Sci. 37(3-4):130-131. 23. Nadeem, M., M. Asghar, Y. Saleem and M.J. Asad. 2000. Influence of culture conditions on β-amylase production by <i>Aspegillus niger</i> in waste bread medium. Pak. J. Agri. Sci. 37(3-4):126-129. 24. Parveen, R., Z. Mahmood, Y. Saleem and M.J. Asad. 1999. Nutritional evaluation of fungal biomass protein produced from agro-industrial wastes by <i>Arachniotus sp.</i> Pak. J.Biol. Sci. 2(2):300-302.			
Research Grants and Contracts.	Entries should include: <table><tr><th>Date</th><th>Title</th><th>Agency / Organization</th></tr></table> Total Award Amount Segment the list under following headings: • Completed • Funded and in progress • In review	Date	Title	Agency / Organization
Date	Title	Agency / Organization		
Other Research or Creative Accomplishments	List patents, software, new products developed, etc.			
Selected Professional Presentations				



Proforma 9

Faculty Resume

Name	M. SHEERAZ AHMAD		
Personal	Assistant Professor Department of Biochemistry, PMAS-Arid Agriculture University Rawalpindi, Pakistan. Tel: +92-333-5706221 Email: dr. sheeraz@uaar.edu.pk		
Experience	Assistant Professor Ad-Hoc BPS-19 , (01-04-2010 to Continue), Department of Biochemistry, PMAS-Arid Agriculture University Rawalpindi, Pakistan. Lecturer BPS-18 , (10-09-2008 to 01-04-2010), Department of Biochemistry, PMAS-Arid Agriculture University Rawalpindi, Pakistan.		
Honor and Awards	HEC Approved PhD Supervisor Throughout First Divisions in Academic Career Position in M.Sc with 84.5 % marks Merit Scholarship of QAU in M.Phil on having 95% marks in M.Phil Merit List HEC PhD Scholarship (2004-2008) Pakistan IRSP, HEC Scholarship for PhD Research in Lancaster University UK GRE (Biochemistry, Cell and Molecular Biology) ETS, USA in April 2007		
Memberships	---		
Graduate Students	Years 2010	Degree M. Phil	Name Farzana Ramzan
Postdocs			
Undergraduate			
Students Honour			
Students			
Service Activity	Teaching M.Sc, M.Phil and PhD courses. Demonstrating practical to the graduate classes. Supervising PhD and M.Phil Research Students.		
Brief Statement of Research Interest	Biochemistry, Plant Biotechnology.		

Publications	<i>List publications in standard bibliographic format with earliest date first.</i> PUBLICATIONS: 1. Mukhtiar Hussain, Muhammad Hanif, Muhammad Sheeraz Ahmad, Saqib Ali, Bushra Mirza: Structure Elucidation and Inhibitory Effects of Self Assembled Organotin (IV) Esters of p-tolyl Acetic Acid on Bacterial, Fungal, Brine Shrimps and Potato tumor cells. <i>Drug & Chem. Toxicol</i>, 2010, 33(2), 183-192. Impact Factor: 1.409 2. Muhammad Hanif, Mukhtiar Hussain, Saqib Ali, Moazzam H. Bhatti, Muhammad Sheeraz Ahmad, Bushra Mirza and Helen S. Evans: <i>In Vitro</i> Biological studies and structural elucidation of Organotin(IV) derivatives of 6-nitropiperonylic acid: Crystal Structure of $\{[(CH_2O_2C_6H_2(o-NO_2)COO)SnBu_2]_2O\}_2$. <i>Polyhedron</i>, 2010, 29, 613–619. Impact Factor: 1.8 3. Mukhtiar Hussain, Muhammad Hanif, Saqib Ali, Saira Shahzadi, Muhammad Sheeraz Ahmad, Bushra Mirza and Helen S. Evans: In vitro Antitumor and Antibacterial Assay of Organotin(IV) Complexes of 2,3-Methylenedioxybenzoic Acid; X-Ray Crystal Structure of $[(C_2H_5)_2Sn(C_8H_5O_4)_2]$. <i>Journal of the Iranian Chemical society</i>, 7(1), 155-163. Impact Factor: 2.215 4. Mukhtiar Hussain, Muhammad Sheeraz Ahmad, Adnan Siddique, Muhammad Hanif, Saqib Ali, Bushra Mirza: Dimethyltin(IV) Derivatives of Biologically Potent Substituted Phenylacrylic Acids; Synthesis, Chemical Characterization and Inhibitory Effects on <i>Agrobacterium tumefaciens</i>. <i>Chem. Bio. & Drug Design</i>, 2009, 74, 183-189. Impact Factor: 2.237 5. Mukhtiar Hussain, Muhammad Hanif, Saqib Ali, Saira Shahzadi, Muhammad Sheeraz Ahmad, Bushra Mirza and Helen S. Evans: Synthesis and coordination chemistry of Organotin(IV) complexes of 2,3-methylenedioxyphenylpropenoic acid. <i>Journal of Coordination Chemistry</i>, 2009, 62(13), 2229-2238. Impact Factor: 0.732 6. Muhammad Sheeraz Ahmad, Mukhtiar Hussain, Muhammad Hanif, Saqib Ali, Mazhar Qayyum and Bushra Mirza: Di- and Tri-organotin(IV) Esters of 3,4-Methylenedioxyphenylpropenoic Acid: Synthesis, Spectroscopic Characterization and Biological Screening for Antimicrobial, Cytotoxic and Antitumor Activities. <i>Chem. Bio. & Drug Design</i>, 2008, 71: 568-576. Impact Factor: 2.237 7. Muhammad Sheeraz Ahmad, Bushra Mirza, Mukhtiar Hussain, Muhammad Hanif, Saqib Ali, Michael J Walsh and Francis L Martin: ATR FTIR Spectroscopy Detects Alterations Induced by Organotin(IV) Carboxylates in MCF-7 Cells at Sub-Cytotoxic/-Genotoxic Concentrations. <i>PMC Biophysics</i> 2008, 1:3. Marked as Highly Accessed at BioMed and Pubmed. Impact Factor: New Journal 8. Muhammad Sheeraz Ahmad, Mukhtiar Hussain, Muhammad Hanif, Saqib Ali and Bushra Mirza: Synthesis, Chemical Characterization and Biological Screening for Cytotoxicity and Antitumor Activity of Organotin (IV) Derivatives of 3,4-Methylenedioxy 6-nitrophenylpropenoic Acid. <i>Molecules</i> 2007, 12: 2348-2363. Impact Factor: 1.25 9. Muhammad Hanif, Mukhtiar Hussain, Saqib Ali, Moazzam H. Bhatti, Muhammad Sheeraz Ahmad, Bushra Mirza and Helen S. Evans: Synthesis, Spectroscopic Investigation, Crystal Structure, and Biological Screening, Including Antitumor
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	Activity, of Organotin(IV) Derivatives of Piperonylic Acid. Turk J Chem 2007, 31: 349 – 361. Impact Factor: 0.727 ACCEPTED MANUSCRIPTS: 1. Ihsan-ul-Haq, Nazif Ullah, Gulnaz Bibi, Semab Kanwal, Muhammad Sheeraz Ahmad, Bushra Mirza: Antioxidant/anticancer activities and phytochemical analysis of Euphorbia wallichii root extract and its fractions. Iranian Journal of Pharmaceutical Research (Resubmitted after minor changes, 2010) SUBMITTED MANUSCRIPTS: 1. Ihsan-ul-Haq, Gulnaz Bibi, Kahkshan Mazhar, Nazif Ullah, Muhammad Sheeraz Ahmad, Bushra Mirza: Pharmacological and phytochemical investigations of Bergenia ciliata rhizome extract and its fractions. Canadian Journal of Science and Technology (submitted, 2010). 2. Farzana Ramzan, Muhammad Sheeraz Ahmad: Biological Activities of <i>Polygonum amplexicaulis</i> rhizome extract. (under construction) ABSTRACT PUBLICATIONS: 1. Muhammad Sheeraz Ahmad, Mukhtiar Hussain, Muhammad Hanif, Saqib Ali, Ibrar Ahmed, Bushra Mirza. Antimicrobial investigation of organotin(IV) derivatives of 3, 4-Methylenedioxy-6-Nitrophenylpropenoic acid. 2nd International Symposium on Organic Chemistry, December 2008, Sofia, Bulgari, Book of Abstracts PI-42.
Research Grants and Contracts.	2009-2010 “Determination of antioxidant potential of Polygonum amplexicaule and its suitability for cosmetics” AAUR 2010-2010 “Determination of Biological Activities and Micropropagation of Polygonum amplexicaulis: a popular medicinal plant of North Pakistan.” Approved by PSF technical committee on biotechnology. Rs. 1.8 million
Other Research or Creative Accomplishments	--
Selected Professional Presentations	Resource person for “Basics of Laboratory Biosafety” Session in HEC/AAUR Workshop on RT-PCR Resource person for “Fermentation Biotechnology” Session in Two days “Training Workshop on Biofuel Production from Agriculture Waste”, PMAS-Arid Agriculture University Rawalpindi, Pakistan, April 13-14, 2010.



Faculty Resume

Name	Prof. Dr. Azra Khanum		
Personal	Professor of Biochemistry Pir Mehr Ali Shah Arid Agriculture University Rawalpindi (PMAS-AAUR) Murree Road, Rawalpindi 46300 - Pakistan Tel: 92-051-445 1772 Fax: 92-051-4845623 azrakhanum@uaar.edu.pk ; akhanum@hotmail.com ; azkiak@yahoo.com		
Experience	Date	Title	Institution
	Febrauary 9, 2009 to date	Professor	Department of Biochemitry Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Murree Road, Rawalpindi, 46300 Pakistan
	Febrauary 9, 2009 to date	Director	Division of Continuing Education, Home Econo & Women Development Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Murree Road, Rawalpindi,46300 Pa
	Febrauary 9, 2009 to date	Chairperson	Department of Sociology and Anthropology Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Murree Road, Rawalpindi, 46300 Pakistan
	April 24, 2007- Feb., 8, 2009	Dean	Faculty of Sciences Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Murree Road, Rawalpindi, 46300 Pakistan
	May, 2007 – Feb., 8, 2009	Acting Director	Division of Continuing Education, Home Econo & Women Development Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Murree Road, Rawalpindi,46000, Pakistan
	May, 2007 – Feb., 8, 2009	Acting Chairperson	Department of Statistics / Mathematics Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Murree Road, Rawalpindi, 46000, Pakistan
	May, 2007 – 15 January, 2009	Acting Chairperson	Department of Zoology / Biology Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Murree Road, Rawalpindi, 46000, Pakistan
	August 2003 to April 23, 2007	Chairperson & Professor	Department of Biochemistry Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Murree Road, Rawalpindi, 46000, Pakistan
	December 2002 to August 2003	Chairperson & Professor	Department of Biological Sciences Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Murree Road, Rawalpindi, 46000, Pakistan
	March 1998 to November 2002	Chairperson & Asst. Professor	Department of Biological Sciences Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Murree Road, Rawalpindi, 46000, Pakistan
	August 2002 to September 2002	Adjunct Scientist,	NICHD, NIH, Bethesda, MD, USA
	August 2001 to September 2001:	Adjunct Scientist	NICHD, NIH, Bethesda, MD, USA
	August 2000 to September 2000	Adjunct Scientist	NICHD, NIH, Bethesda, MD, USA
	July 1999 to September 1999	Adjunct Scientist	NICHD, NIH, Bethesda, MD, USA
	December 1997 to January 1998	TOKTEN Consultant	Department of Biological Sciences. Quaid-e-Azam University , Islamabad, Pakistan
	March 1995 to October 1997	Visiting Scientist,	NICHD, NIH, Bethesda, MD, USA
	February 1993 to	Guest Scientist,	Division of Cellular Biochemistry

	November 1994		The Netherlands Cancer Institute, The Netherlands
	July 1993 to September 1993	Adjunct Scientist,	NICHD, NIH, Bethesda, MD, USA
	May 1990 to September1990	Adjunct Scientist,	NICHD, NIH, Bethesda, MD, USA
	March 1984 to September 1991	Assistant Professor,	Department of Biological Sciences Quaid-e-Azam University Islamabad, Pakistan
	October 1984 to October 1987	Post-Doctoral Fellow	Fellow, NICHD, NIH, Bethesda, MD, USA
	January 1979 to February 1984	Lecturer	Department of Biological Sciences Quaid-e-Azam University, Islamabad, Pakistan
	October 1978 to Dec.1978	Research Officer	Department of Biological Sciences Quaid-e-Azam University, Islamabad, Pakistan
	March 1977 to July 1978:	Research Officer	Department of Biological Sciences Quaid-e-Azam University, Islamabad, Pakistan
	April 1974 to December 1976	Research Associate	Department of Physiology University of Karachi, Karachi Pakistan and Department of Biological Sciences Quaid-e-Azam University, Islamabad, Pakistan
	May 1972 to March 1974	Research Fellow	Department of Physiology, University of Karachi, Karachi, Pakistan
Honors and Awards	• Tamgha-e-Imtiaz, a civil award, 2008 • Pakistan Academy of Sciences Gold Medal in Biochemistry, 2003. • Productivity Allowance, Ministry of Science and Technology, 2001. • Best Teacher Award, HEC, 2001. • Approved Supervisor, Indigenous Ph. D Program, Higher Education Commission, Islamabad. • Consultant: TOKTEN (Transfer of Knowledge through Expatriate Nationals) Program at Quaid-e-Azam University, Islamabad, Sponsored by United Nation Development Project, National Talent Pool (UNDP-NTP), Ministry of Labor, Manpower and Overseas Pakistan, December 1997-January 1998 • Visiting Scientist, NIH, MD, USA 1995-1997 • International Fogarty Post Doctoral Fellow, NIH, MD, USA 1984-1987		
Memberships	• Fellow - Pakistan Academy of Sciences, Pakistan, 2005 • Fellow - Pakistan Academy of Medical Sciences, Pakistan, 2003 • Fellow - Zoological Society of Pakistan, 2000 • Member - Chemical Society of Pakistan, 2007 • Member - Agriculture Foundation Pakistan 2006 • Member - American Association for the Advancement of Science, USA, 2005 • Member - Endocrine Society, USA, 2002 • Member - American Society for Biochemistry and Molecular Biology, USA, 2001 • Member - Society for Biochemistry and Molecular Biology of Pakistan, 1999 • Member – New York Society of Sciences, USA, 1998		

Graduate Students Post Docs Under-graduateee Students Honor Students	Thesis Supervised		
	Year	Degree	Name
		M.Sc. (Biochemistry)	
	2006	-do-	Syed Irtiza Hussain
	2005	-do-	Azmat Sohail
	2005	-do-	Asima Zia
	2005	-do-	Jamil Akhtar
	2005	-do-	Muhammad Rizwan Alam
	2005	-do-	Khawar Sohail Abbasi
	2005	-do-	Sumera Naz
		M. Sc. (Biology)	
	2005	-do-	Saima Rehman
	2005	-do-	Muhammad Saqlain
	2005	-do-	Qudsia Bashir
		M. Sc. (Biochemistry)	
	2004	-do-	Muhammad Khan Jadoon
	2004	-do-	Sardar Faisal Mahmood
	2004	-do-	Irum Nawaz Awan
	2003	-do-	Imran Shahzad Mirza
	2003	-do-	Reheela Ashraf
	2003	-do-	Noreen Yaqoob
	2003	-do-	Amtul Wadood Wajeetha
	2003	-do-	Sidrah Saleem
	2002	-do-	Muhammad Zia-ul-Haq
	2000	-do-	Irum Mahmood
		M. Phil (Biochemistry)	
	2009	-do-	Aamir Ali Khattak
	2009	-do-	Munazza Fatima
	2009	-do-	Sadia Rahim
	2008	-do-	Nadia Sial
	2008	-do-	Hahaha Islam Butt
	2008	-do-	Sadiq Noor Khan
	2008	-do-	Syed Kumail Ali Rizvi
		M. Phil (Biology)	
	2009	-do-	Uzma Jabeen
	2009	-do-	Hafiz Muhammad Tahir
	2008	-do-	Saima Rehman
	2008	-do-	Qudsia Bashir
		M. Phil (Biochemistry/Molecular Biology)-QAU	
	1989	-do-	Ishrat Waheed
	1984	-do-	Wasim Ahmad
	1984	-do-	Syed Muhammad Saqalan Naqvi
	1983	-do-	Muhammad Ishtiaq Qadri
		Ph.D. (Biochemistry)	
	2009	-do-	Rakhshnada Munir
	2008	-do-	Sumbul Khalid
	2008	-do-	Tanvir Ahmad
	2008	-do-	Darakhshanda Kaukab
	2007	-do-	Raja Razi Ul Hussnain
	Member, Supervised Committee		
		M.Sc. Anthropology	
	2009	-do-	Shumaila Saleem
		M. Sc. (Biochemistry)	

	2005	-do-	Summaya Nazeer
	2005	-do-	Humaira Khanwal
	2005	-do-	Syeda Marriam Bakhtiar
	2004	-do-	Faisal Masood
	2004	-do-	Muhammad Aftab Iqbal
	2004	-do-	Kalsoom Sughra
	2004	-do-	Imran Ali
	2004	-do-	Pakeeza Arzoo Akram
	2004	-do-	Shahzad Hussain Shah
	2003	-do-	Uzma Rani
	2003	-do-	Shazia Rehman
	2002	-do-	Humaira Nazir
	2002	-do-	Zahida Shamim
		M. Sc. (Zoology)	
	2005	-do-	Ali Muhammad
	2005	-do-	Muhammad Sajjad Ansari
	2005	-do-	Shahnaz bibi
	2005	-do-	Sajid Mahmood
	2005	-do-	Nadia Afzal
	2005	-do-	Rashida Yasmin
	2005	-do-	Nasir Ahmed
	2005	-do-	Ishtiaq Ahmed
	2005	-do-	Wahab Munir
	2004	-do-	Sabiha Afzal
	2004	-do-	Muhammad Javed
	2003	-do-	Saima Jabeen
	2003	-do-	Rashid Hussain
	2003	-do-	Sumaira Bano
	2003	-do-	Saadia Khanum
	2003	-do-	Shaista Aslam
	2003	-do-	Sadaf Azad
	2003	-do-	Rakhshanda Saleem
	2003	-do-	Asma Gul
	2002	-do-	Uzma Malik
		M. Phil (Biochemsitry)	
	2009	-do-	Muhammad Faiz
	2009	-do-	Fariha Khan
	2008	-do-	Nazia Mahboob
	2008	-do-	Shagufta Jabeen
	2008	-do-	Zahida Parveen
		M. Phil (Zoology)	
	2009	-do-	Ayesha Masood
	2008	-do-	Saima Pervaiz
	2008	-do-	Samreen Tariq
		M. Phil (Biology)	
	2009	-do-	Muhammad Saqlain
	2008	-do-	Abid Mahmood
	2009	-do-	Safwan Ullah Khan
		Ph.D (Biochemistry)	
	2009	-do-	
	2009	-do-	Zeeshan Haider
	2008	-do-	Sajid Mahmood
	2008	-do-	Saima Siddiqui
	2007	-do-	Aish Muhammad
	2007	-do-	Abid Mahmood
		Ph.D in	
	2009	Soil Sciences	Muhammad Imran Latif
	2007	Zoology	Shahmim Akhtar
	2005	Entomology	Habib Javed Iqbal
		M.Sc. (Hons.) in	
	2009	Agronomy	Adnan Zahid
	2006	Horeticulture	Rabia Hasnat
		Food Technology	
	2006	-do-	Memoona Nosheen
	1999	-do-	Fasiha Fayyaz Khan
	1999	-do-	Raheela Yasmeen
	1999	-do-	Nasreen Akhtar

	Thesis Supervising		
		M.Phil in	
		Biochemistry	
	2009-onward	-do-	Sofia Naseem
	2009-onward	-do-	Madiha Khalid
	2009-onward	-do-	Maryam Yousuf
	2010-onward	-do-	Ayesha Iftikhar
	2010-onward	-do-	Irum Shaheen
		Biology	
	2009-onward	-do-	Irum Naheed
		Ph.D. (Biochemistry)	
	Submitted-2010	-do-	Imran Shahzad
	-do-	-do-	Irum Nawaz Awan
	2007 - on ward	-do-	Sadia Rehman
	2007 - on ward	-do-	Sadiq Noor Khan
	Member, Supervising Committee (Supervising)		
		M. Phil (Biochemsitry)	
		Biochmesitry	
	2008-onward	-do-	Ayesha Yasmin
	2008-onward	-do-	Noor ul sabah
		Ph.D (Zoology)	
	Submitted-2010	-do-	Zafarullah Bhatti
	2009-onward	-do-	Majid Mahmood
Service Activity	I. University Service Activities:		
	• Graduate/Post Graduate Courses taught – 20 • Subject Expert - Various selection boards of different Universities of Sindh, Punjab, NWFP and Federal • Curriculum Development - M.Sc., M.Phil & Ph.D. Biochemistry at PMAS-AAUR • Curriculum Revision - M.Sc., Sociology/Anthropology • Curriculum Development, M.Sc. and M. Phil Education • Organized - Seminars/Workshops sponsored by HEC/NCB • Organized Conference - Pakiostan Society for Biochmesitry and Molecular Biology • Organized short courses in English Language and Computer Application • Reviewer / Evaluator of Projects and Manuscripts - PSF, PCST, PARC, PTCL, PJC, HEC, MoST • Chairperson - Institutional Bio Safety Committee and Ethics Committee • Chaired/Co-Chaired - Various sessions in Seminars / Symposia / Conferences of National and International • Examiner/Evaluator - M.Phil / Ph.D thesis • Member - Board of Studies of Various Departments of different Universities of Sindh, Punjab, NWFP and Federal • Attended - Number of Symposia / Seminars / Workshops / Training Courses • Presentations - in National and International Institutes/Universities/Symposia/ Seminar/ Workshops / Conferences. • Submitted - 15 cDNA sequences in Gene Bank.		
Brief Statement of Research Interest	II- Public Service Activities.		
	• Life Member, Institute of Overseas Pakistani (IOP) • Member, Board of Directions, Institute of Overseas Pakistani (IOP) • Member, Executive Committee, Overseas Pakistanis Educational Network (OPEN) • Representative of OPEN on Management Committee of IOP sponsored schools with the cooperation of Prime Minister Literacy Commission (PMLC), 2001 • Wrote articles in Newspapers and Literary Magazines (1966-1972) • Did Radio Programs on Science (1978-1980) • Worked as Translator in Scientific Society of Pakistan (1972-74)		
	• To express and purify therapeutics using gene cloning techniques or isolate, purify antimicrobial peptide (s) against mammalian pathogens from vegetables like pea, kerala etc using conventional techniques • Development of Vaccine and Diagnostic method for tuberculosis • To understand signal transduction mechanisms in eukaryotic cell • To understand mechanism leads normal cell to become abnormal cell		

Publications	i. Cumulative Impact Factor: 53.284 ii. Total Citations: 265 Impact Factor Journals 1. Farhana Raiz Chaudhry, Mazhar Qayyum, M. Fatah ullah Khan, Tanveer Ahmad, Azra Khanum, M. Raiz Shakir, Dilshad Hussain and James A. Miller. Peri-parturient rise in faecal nematode egg count with reference to <i>Haemonchus contortus</i> in bulky ewes in Northern Punjab, Pakistan. Pak J Zool., 41(6), 437-443, 2009. Impact factor: 0.189. 2. Ahmad, T., Sohail K., Rizwan M., Mukhtar M., Bilal R. and Khanum A. Prevalence of <i>Helicobacter Pylori</i> pathogenicity-associated <i>cagA</i> and <i>vacA</i> genotypes among Pakistani dyspeptic patients. FEMS Immunol Med Microbiol., 492:1-5, 2008. Impact factor 1.972. 3. Mirza Imran Shahzad, Khalid Naeem Khawaja, Muhammad Mukhtar and Azra Khanum. Passive immunization against highly pathogenic Avian Influenza Virus (AIV) strain H7N3 with antiserum generated from viral polypeptides protects poultry birds from lethal viral infection. Virol J. 5:144, 1-6, 2008. Impact factor 1.882 4. Hanif, N. Q., Muhammad, G., Siddique, M., Khanum, A., Ahmad, T. , Gadahai, J. A. and Kaukab, G. Clinico-pathomorphological, serum biochemical and histological studies on broilers fed ochratoxin A and a toxin deactivator (Mycofix Plus MTV ^{INSIDE}). British Poultry Sci., 49(5): 632-642, 2008. Impact factor: 1.134 5. Sumbul Khalid, Sardar Faisal Mehmood, Mirza Imran Shahzad, Qudsia Bashir, Syeda Zareen Saba, Zartasha Mustansar, Ayesha Fatima and Azra Khanum. Cloning, over-expression and modeling studies of somatotropin cDNA of local buffalo breed-Nili ravi. J Chem Soc Pak., 30 (5): 712-725, 2008. Impact factor: 0.221 6. Darakhshanda Kokub, A. Hussan., M. Ansar., F. Azam and A. Khanum. Comparative growth, morphological and molecular characterization of indigenous <i>Sclerotium rolfsii</i> strains isolated from different location of Pakistan. Pak J Bot., 39(5): 1849-1866, 2007. Impact factor: 0.470 7. Dufau, M. L., Tasi-Morris, C. H., Tang, P. Z., and Khanum, A. Regulation of stereroidogenic enzymes and a novel testicular RNA helicase. J. Steroid Biochem. Mole. Biol., 76:187-197, 2001. Impact factor: 2.827 8. Tasi-Morris, C. H., *Khanum, A. Tang, P. Z., and Dufau, M. L. The rat 17β-hydroxysteroid dehydrogenase type III: Molecular cloning and gonadotropin-Regulation. Endocrinology, 140:3534 -3542, 1999 (*both as first authors). Impact factor: 4.945 9. Khanum, A., Ellen, Buckzo and Dufau, M. L. Essential role of ATP in activation of 17β-hydroxysteroid dehydrogenase in the Rat Leydig cells. Endocrinology, 138:1612-1620, 1997. Impact factor 4.095 10. Dufau, M.L., Miyagawa, Y., Takada, S., Khanum, A., Miyagawa, H, and Buczko, E. Regulation of androgen synthesis: The late stereroidogenic pathway. Steroids, 62:128- 132, 1997. Impact factor: 2.588 11. Alblas, J., van Etten, I., Khanum, A. and Moolenaar, W.H. C-terminal truncation of the neurokinin-2 receptor causes enhanced and sustained agonist-induced signaling: Role of receptor phosphorylation in signal attenuation. J. Biol. Chem. 270 (15): 8944-8951, 1995. Impact factor: 5.52 12. Khan, S., Anjum, S., Baig, S. M., Khanum, A., Haider, M. Z. and Qazi, M. H. Effect of anticancer chemotherapy on the circulating levels of follicle stimulating hormone, luteinizing hormone and prolactin in postoperative premenopausal breast cancer patients. Pak. J. Zool. 23 (4): 301-303, 1991. Impact factor: 0.189 13. Baig, S. M., Anjum, S., Khan, S., Khanum, A., Qazi, M.H., and Haider, M. Z. Circulating levels of 17β-estradiol, testosterone, and progesterone in postmenopausal breast cancer patients receiving anticancer chemotherapy. Pak. J. Zool. 23 (4): 335-338, 1991. Impact factor: 0.189 14. Baig, S. M., Khan, S., Anjum, S., Khanum, A., Haider, M. Z. M.H. Qazi, P. Zaidi and N. A. Kizilbash. Carcinoembryonic antigen (CEA) and beta human chorionic gonadotropin (beta -hCG) as markers in breast cancer. Pak. J. Zool. 24 (1): 71-76, 1992. Impact factor: 0.189 15. Mahmood, A., Baig, S. M., Khan, M. N., Malik, S. A. and Khanum, A. Production and characterization of antisera against steroids in rabbit. Pak. J. Zool. 23 (3): 277-283, 1991. Impact factor: 0.189 16. Khan, S., Anjum, S. M., Baig, S.M., Khanum, A., Haider, M.Z., and Qazi, M.H. Studies on the <i>in vitro</i> and <i>in vivo</i> release of hormonal steroids bound to a polymer base. Pak. J. Zool. 23 (3): 263-268, 1991. Impact factor: 0.189
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17. **Khanum, A.**, and Dufau, M.L. A cAMP independent inhibitory action of high doses of forskolin in rat Leydig cells. **J. Steroid Biochem.** 37(5): 669-674, **1990. Impact factor 2.827**
18. Dufau, M.L., Ulisse, S., Khanum, A., Buczko, E., Kitamura, M., Fabbri, A. and Namiki, M. III Steroids and the Central Nervous System: LH action in the Leydig cells: Modulation by angiotensin II and corticotrophin releasing hormone, and regulation of P450 17 α mRNA. **J. Steroid Biochem.** 34 (1-6), 205-217, **1989. Impact factor 2.827**
19. Ahmad, W., Naqvi, S. M. S., Fatima, N. and **Khanum, A.** Isoelectric profile of epididymal androgen-dependent proteins of immature and mature goats (*Capra hircus*). **Pak. J. Zool.** 21(3): 267-272, **1989. Impact factor: 0.189**
20. **Khanum, A.** and Dufau, M.L. Angiotensin II receptors and inhibitory action in Leydig cells. **J. Biol. Chem.** 263 (11): 5070-5074, **1988. Impact factor 5.52**
21. Fatima, N., Ahmad, W., Khanum, A., Ahmad, R. and Qazi, M. H. Effect of anticalmodulin drug on testosterone synthesis in hCG stimulated mouse Leydig cells. **J. Endocrinol. Invest.** 11(1): 1-6, **1988. Impact factor 1.888**
22. **Khanum, A.**, Fatima, N., Lobo, J., Ahmad, W., Salim, M. and Qazi, M.H. Mechanism of action of hCG using isolated mouse Leydig cells: Stimulation of DNA, chromosomal and cytosolic protein biosynthesis. **Pak. J. Zool.** 20 (3): 253-265, **1988. Impact factor: 0.189**
23. **Khanum, A.**, Ali, A., Fatima, N., Salim, M. and Qazi, M.H. Mechanism of action of hCG using isolated mouse Leydig cells: Phosphorylation and acetylation of chromosomal proteins. **Pak. J. Zool.** 20 (3): 225-237, **1988. Impact factor: 0.189**
24. Siddiqi, A., Ahmad, W., Fatima, N., **Khanum, A.** and Qazi, M. H. Purification and characterization of mouse Leydig cells and their use in bioassay of pituitary luteinizing hormone. **Pak. J. Zool.** 20 (2): 121-136, **1988. Impact factor: 0.189**
25. Dufau, M.L., Khanum, A., Winters, C.A. and Tasi-Morris, C.H. Multistep regulation of Leydig cell function. **J. Steroid Biochem.** 27 (1-3): 343-350, **1987. Impact factor 2.827**
26. Ahmad, W., Naqvi, S.M.S., Haider, M.Z. and **Khanum, A.** Studies on soluble proteins in the epididymis of goat (*Capra hircus*). **Pak. J. Zool.** 19 (3): 231-237, **1987. Impact factor: 0.189**
27. Qadri, M. I., Ahmad, W., Haider, M.Z. and **Khanum, A.** Mechanism of transfer of cAMP from cytoplasm to intact nuclei. **Pak. J. Zool.** 19 (1): 63-68, **1987. Impact factor: 0.189**
28. Khanum, A. and Dufau, M.L. Inhibitory action of forskolin in adenylate cyclase activity and cyclic AMP generation. **J. Biol. Chem.** 261 (25): 11456-11459, **1986. Impact factor 5.520**
29. **Khanum, A.**, Fatima, N., Lobo, J., Ahmad, W., Salim, M. and Qazi, M.H. Mechanism of action of hCG using isolated mouse Leydig cells: Short term biochemical events. **Pak. J. Zool.** 17(2): 113-125, **1985. Impact factor: 0.189**
30. **Khanum, A.**, Siddique, M., Lobo, J. and Qazi, M.H. Studies on the distribution of histone species in reproductive tissues and liver of immature and mature rat. **Pak. J. Zool.** 17(4): 381-385, **1985. Impact factor: 0.189**
31. Qadri, M.I., Haider, M.Z., Ahmad, W., Naqvi, S. M. S. and **Khanum, A.** Identification of cAMP binding proteins in Leydig cells and seminiferous tubules of mouse. **Pak. J. Zool.** 17(4): 339-348, **1985. Impact factor: 0.189**
32. Haider, M.Z., Qazi, M.H., Khanum, A. and Arslan, M. Effect of testosterone on epididymal proteins in castrated rhesus monkeys. **Amer. J. Primat.** 4:73-80, **1983. Impact factor 1.681**
33. **Khanum, A.**, Siddique, M., Lobo, J. and Qazi, M.H. Age-dependent changes in nonhistone chromosomal proteins of rat reproductive tissues and liver. **Pak. J. Zool.** 15 (2): 115-127, **1983. Impact factor: 0.189**
34. Mansur, G., Zia, A., Huda, Z., **Khanum, A.** and Qazi, M.H. Mechanism of action of luteinizing hormone: Change in cAMP and testosterone production. **Pak. J. Zool.** 15 (1): 9-16, **1983. Impact factor: 0.189**
35. Khan, M., **Khanum, A.**, Salim, M. and Qazi, M.H. Studies on the effect of testosterone on the aldolase activity of ventral prostate and epididymis in rat. **Pak. J. Zool.** 15(1): 1-8, **1983. Impact factor: 0.105**
36. **Khanum, A.**, Lobo, J., Salim, M. and Qazi, M.H. Studies on protein kinase and ribonuclease activities associated with nonhistone chromosomal proteins. **Pak. J. Zool.** 13 (1&2): 197-202, **1981. Impact factor: 0.189**
37. Bano, S., **Khanum, A.**, Qazi, M.H., and Salim, M. Studies on the intracellular transport of 5- α dihydrotestosterone in epididymis and prostate: Rat. **Pak. J. Zool.** 8 (2): 221-228,

	1976. Impact factor: 0.189 38. Khanum, A., Bano, S., Qazi, M.H. and Salim, M. Effect of testosterone on mechanism of gene activation in the ventral prostate and epididymis of rat. Pak. J. Zool. 8 (2): 199-207, 1976. Impact factor: 0.189 39. Qazi, M.H., Khanum, A., Bano, S. and Salim, M. Characterization of serum testosterone-binding proteins of some vertebrates. Pak. J. Zool. 7 (2): 191-197, 1975. Impact factor: 0.189 HEC Recognized Journals 40. R. Munir, M. Afzal, M. Hussain, S. M. S. Naqvi and A. Khanum. Outer membrane proteins of <i>Brusella abortus</i> vaccinal and field strains and their immune response in buffaloes. Pak Vet J., 30(2): 110-114, 2010. 41. Saima Siddiqi, Anjum Siddiq, Kamran Majeed, Atika Mansoor, Raheel Qamar, Kehkashan Mazhar, Naseem Ashraf, Salma Kakeel, Azra Khanum and Khalid Mahmood Khan. Y-chromosome deletions- a risk factor for male infertility. Int J Agri Biol., 11 (1):110-112, 2009. 42. Tanveer Ahmad, Rakhshanda Bilal and Azra Khanum. Prevalence of <i>Helicobacter pylori</i> infection in asymptomatic children of Islamabad suburbs (Pakistan). Int J Agri Biol., 10(6): 685-688, 2008. 43. Sumera Naz, Agha Sadaruddin, Azra Khanum, and Rukhsar Osmani. Frequency of microalbuminuria in diabetic patients of Islamabad and Rawalpindi. Pak J Med Res., 46(3), 70-74, 2007. 44. Raja Razi-ul-Hussnain, Ghazala Koukab, Mazhar Qayyum, Muhammad Asim and Azra Khanum. Association of diabetes with hepatitis C virus (HCV) infected male and female patients along with different risk factors. Int J Agri Biol., 9 (5): 736-740, 2007. 45. R. Munir, D. Shahwar, U. Farooq, I. Nawaz, I. Shahzad and A. Khanum. Outer membrane protein profiling of <i>Pasteurella multocida</i>. Pak Vet J., 27 (1):1-4, 2007. 46. I. Nawaz, R. Munir, U. Farooq, R. Kausar and A. Khanum. Whole cell protein profiling of <i>Pasteurella multocida</i> field isolates in Pakistan. Pak Vet J., 26 (4):157-162, 2006. 47. R. Munir, U. Farooq, N. Badar,. A. Khanum, and A. Wadood. Restriction endonuclease analysis of <i>Pasteurella multocida</i> field isolates by <i>Hha-I</i>. Pak Vet J., 26 (2): 80-84, 2006. 48. Najam-us-Sahar Zaidi, Faheem Tahir, Fazali Subhan, Sikandar Sultan, Fariyal Deepa, Mazhar Qayyum, Ali Abbas Qazilbash, A. Khanum, Birjees Mazhar Kazi, and Ather Saeed Dil. Evaluation of serum testosterone level among Pakistani women with a history of infertility. Pak J Med Res., 43 (1): 19-21, 2004. 49. Aisha Bano, Faheem Tahir, Fazali Subhan, Sikandar Sultan, Deepa Fariyal, Syed Shakeel Raza Riziv, Mazhar Qayyum, Ali Abbas Qazilbash, A. Khanum, Birjees Mazhar Kazi, and Ather Saeed Dil. A preliminary study of gonadotropin ratios among infertile Pakistani men. Pak. J. Med. Res. 42 (4): 185-187, 2003. 50. Saadia Iram, Faheem Tahir, Fazali Subhan, Sikandar Sultan, Fariyal Deepa, Mazhar Qayyum, Ali Abbas Qazilbash, A. Khanum, Birjees Mazhar Kazi, and Ather Saeed Dil. Evaluation of serum FSH levels in various pubertal stages among Pakistani populace. Pak. J. Med. Res. 42 (1): 10-13, 2003. 51. S. Anjum, S. Khan, S. M. Baig, A. Khanum, M. Z. Haider, and M. H. Qazi. Effect of Chemotherapy on circulating steroid hormone levels in postoperative premenopausal breast cancer patients. J. Pak. Med. Associat. 41 (12): 296-298, 1991. 52. Azra Khanum, M. Z. Haider, W. Ahmad and S. M. S. Naqvi. Identification of androgen-dependent epididymal proteins in the goat (<i>Capra hircus</i>). Pak. J. Sci. Ind. Res. 33 (12), 1990. Other Journals and Proceedings 53. Mirza Imran Shahzad, Rehana Rani, Qudsia Bashir and Azra Khanum. Cloning and expression studies of ovine somatotropin cDNA of local sheep breed-Lati. Proceedings of the International Conference on Biotechnology: Shaping Future Agriculture, July20-21, 2006, University of Arid Agriculture Rawalpindi. 168-174, 2006. 54. Saadia Iram, Faheem Tahir, Fazali Subhan, Sikandar Sultan, Fariyal Deepa, Mazhar Qayyum, Ali Abbas Qazilbash, A. Khanum, Birjees Mazhar Kazi, and Athar Saeed Dil. Serum FSH levels in prepubertal and per-pubertal Pakistani males – A preliminary study. Hamdard Medicus. 47 (4): 65-67, 2004. 55. Nusrat ullah Khan, Syed Yasir, Zafar Malik and Azra Khanum. Evaluation of concentration of cardiac enzymes, lipids and their relationship with myocardial
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	infarction. Pak. J. Biochem. Mol. Biol. 37 (2), 78-80, 2004. 56. Saadia Iram, Fahim Tahir, Fazali Subhan, Sikandar Sultan, Fariyal Deepa, Mazhar Qayyum, M., Qazilbash, A. A., Khanum, A., Kazi, B. M. and Dil, A. S. Serum FSH levels among various age groups of the male population of Pakistan. Hamdard Medicus. 46 (3): 58-61, 2003. 57. Fazl-i-Subhan, Faheem Tahir, Sikandar Sultan, Fauzia Siddique, Athar Saeed Dil, and Azra Khanum. Multiple patterns of thyroid dysfunction exhibited by the Pakistani populace. Annual Res. J. 6: 75-81, 1999. 58. Syed Mohammad Saqlan Naqvi, Waseem Ahmed, and Azra Khanum. Studies on testicular and epididymal LDH, aldolase, alkaline pyrophosphates in immature and mature Naqvi, S Goat (<i>Capra hircus</i>). Tr. J. Zool. 17: 207-214, 1993. 59. Masood A. Shammass, Mohammad Zaheer, Azra Khanum, Muhammad Ashraf and Mahmood Hussain Qazi. Ultrastructural and physiological studies of chick (Desi) pituitary gonadotropin and effects of L-Dopa. Proc. Pak. Congr. Zool. 9, pp157-168, 1989. 60. Mohammad Zaheer, Masood A. Shammass, Azra Khanum, Muhammad Ashraf and Mahmood Hussain Qazi. Ultrastructural studies of spermiogenesis in the mouse. Proc. Pak. Congr. Zool. 9, pp135-145, 1989. 61. S. M. S. Naqvi, W. Ahmad, M. Z. Haider and Khanum, A. Effect of androgen on epididymal enzymes of goat (<i>Capra hircus</i>). Pak. J. Biochem. 21(1-2), 61-67, 1988.			
	Completed			
	Date	Title	Agency/Organization	Total Amount
	September 1984-August 1985	Study of epididymal function in the Rhesus monkey (<i>Macaca mulata</i>): Androgen dependent proteins, their characterization and regional distribution	Pakistan Science Foundation, Islamabad	Rs. 86,200
	1989-1990	Development of sensitive in vitro bioassay for the measurement of circulating LH	Quaid-e-Azam University, Islamabad.	Rs. 20,000
	1989-1990	Studies on the mechanism of action of LHRH: The role of arachidonic acid and its metabolites.	University Grants Commission, Islamabad.	Rs. 100,000
	1989-1991	Mechanism of action of human chorionic Gonadotrp (hCG).	National Scientific Research and Development Board, Islamabad	Rs. 565,000
	2002-2005	Cloning, over-expression of somatotropin and its use as a lactogenic agent in indigenous buffalo breeds	Ministry of Science and Technology/ HEC, Islamabad	Rs. 29.625 millions
	2002-2005 Acted as PI from Sept. 2003 – Sept. 2004	Investigation of role of Germin-like proteins (Glps) during germination/early development by construction of rice plants engineered for sense and anti-sense expression of rice glps.	Agricultural Linkage Programme (ALP), Pakistan Agricultural Research Council, Islamabad	Rs. 2.41 millions
	On-going			
	2007-2010	Multiplex immunoassays for the detection of tuberculosis	HEC-USA	\$ 181,535
	2008-2010	Mutator <i>M. tuberculosis</i> in Tehran and Rawalpindi; A comparative study on fingerprinting, mutator genes and antibiotic resistance genes of the isolates.	EMRO-COMSTECH	\$ 15,000
Other Research or Creative Accomplishments	List patents, software, new products developed, etc. -N/A-			

Selected Professional Presentations	1. In vitro effect of hCG on the mechanism of gene activation in mouse Leydig cells. Abstract: First European Workshop on Molecular and Cellular Endocrinology of the Testis. Geilo, Norway. pp. 128, 1980. 2. Mechanism of action of hCG using isolated mouse Leydig cells: Short term biochemical events. Paper presented: 2nd Pak. Congress of Zoology, Tandojam, Pakistan, 1982. 3. Mechanism of action of hCG using isolated mouse Leydig cells: Long term biochemical events. Paper presented: 3rd Pak. Congress of Zoology, Peshawar, Pakistan, 1983. 4. Forskolin also inhibits adenylate cyclase activity and cAMP production. Abstract/Poster: 6th International Conference on Nucleotides, Calcium and Protein Phosphorylation. Bethesda, MD, USA, 1986. 5. Inhibitory action of angiotensin II in rat Leydig cells. Paper presented: 69th Annual Meeting of Endocrine Society, Indiana, USA, 1987. 6. Leydig cell Function: Role of guanyl nucleotide binding inhibitory unit of adenylate cyclase (Gi). Paper presented: 2nd International Symposium on Biologically Active Macromolecules Quetta, Baluchistan, 1988. 7. Mechanism of action of human chorionic gonadotropin using isolated rat Leydig cells. Paper presented: 13th International Summer College on Physics and Contemporary Needs: Biotechnology. Nathiagali, NWFP, 1988. 8. A new angle of forskolin action: A cAMP independent event. Paper presented: 2nd Biennial Conference, Pakistan Physiological Society, Rawalpindi, Pakistan, 1989. 9. Effect of chemotherapy on the circulating levels of prolactin, luteinizing hormone and follicle stimulating hormone in premenopausal breast cancer patients under going chemotherapy. Abstract: 1st National Biochemistry Symposium, Karachi, Pakistan, 1991. 10. The rat 17-beta hydroxysteroid dehydrogenase type III gene: Molecular cloning and gonadotropin regulation. The Endocrine Society's 81st Annual Meeting. San Diego, USA, June 12-15, 1999. 11. Molecular cloning of rat beta hydroxysteroid dehydrogenase type III and gonadotrophin regulation. 2nd National Symposium on Plant Tissue Culture and Genetic Engineering. Islamabad, Pakistan, 1999. 12. Investigation of role of Germin-like proteins (Glps) during germination/early development by construction of rice plants engineered for sense and anti-sense expression of rice glps. Achievements of ALP Projects, PARC, Islamabad, April, 2004. 13. A lecture on Biochemistry at 5th Summer Camp for Talented Students at Lawrence College, Ghora Gali, Murree, 8-14 August, 2004, BI&SE Rawalpindi. 14. Cloning, over-expression of Somatotropin and its use as a lactogenic agent in Indigenous buffalo breed. 1st National conference on Industrial and Environmental Biotechnology, 29-30 September 2004, Islamabad. 15. Lectures on Molecular Biology of the Cell, Genetic Engineering and Recombinant DNA in HEC sponsored workshop for College teachers of Biology, 12-17 September, 2005, Department of Biochemistry, University of Arid Agriculture Rawalpindi. 16. A lecture on Nucleic Acid Modifying Enzymes in National Workshop on Application of Biotechnology for Livestock and Poultry Development, November, 28-December, 3, 2005, University of Veterinary and Animal Sciences, Lahore. 17. A lecture on Molecular Biology of Cell and Genetic Engineering in Teachers Training Workshop. December 19- 31, 2005, Mohammad Ali Jinnah University, Islamabad. 18. A lecture on Proteomics, at Workshop on Protein Molecular Modeling and Docking. January 23 -28, 2006, University of Arid Agriculture Rawalpindi, Rawalpindi.
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19. Report of work at Department of Biochemistry, University of Arid Agriculture Rawalpindi. March 11-12, 2006, CEMB, University of Punjab, Lahore.
20. Evaluation and characterization of antimicrobial agents from some seasonal vegetables – edible and inedible parts. April 10-12, 2006, International Conference on Biotechnology and Bioinformatics. Faculty of Biotechnology and Informatics, Blochistan University of Information Technology and Management Sciences, Quetta, Pakistan.
21. A lecture on Applications of Biotechnology in Teacher’s workshop. May 15, 2006. F 7/2 College, Islamabad.
22. A lecture on Protein Structure and Function in NCB/UAAR Workshop on Biotechnology for Secondary School Teachers. 5-9 December, 2006, Department of Biochemistry, University of Arid Agriculture Rawalpindi
23. A lecture on Protein sequencing – An important Tool in Life Sciences – HEC sponsored First National Pakistan proteomics Society Workshop. 3-5 February, 2007, Department of Biochemistry, University of Karachi, Karachi.
24. A lecture on Chromatographic Methods for Proteins and Carbohydrates Purification. First National Training Course on Biochemical Techniques. Department of Biochemistry, Shah Abdul Latif University, Khairpur. March 17-21, **2008**.
25. A lecture on Gene Cloning: From Basic to Advance. International Workshop on Molecular techniques in Biological Research. Department of Biochemistry, PMAS-AAUR, Rawalpindi. May 6-10, **2008**.
26. Expression studies of *Mycobacterium tuberculosis* specific antigenic proteins., National Conference on Health Biotechnology, National Commission of Biotechnology, Islamabad. May 27-28, **2008**.
27. Multiplex PCR for the diagnosis of bovine brucellosis in buffalo caused by *Brucella abortus*. National Conference on Health Biotechnology, National Commission of Biotechnology, Islamabad. May 27-28, **2008**.
28. Development of plasmid based growth hormone to be used as therapeutic agent. National Conference on Health Biotechnology, National Commission of Biotechnology, Islamabad. May 27-28, **2008**.
29. Development of serodiagnosis test and DNA based vaccine for tuberculosis. Symposium on Modern Biotechnology: A Resource for Sustainable Development. Department of Microbiology and Microbial Genetics, University of Punjab, Lahore. 4th July, **2009**.
30. Protein Sequencing: From Isolation to Structure Determination. Thematic Workshop in Frontier Technologies on “Proteomics in Health and Disease” Sponsored by HEC-COMSTECH-NCP, COMSTECH Secretariat, Islamabad. 17th -20th August, **2009**.
31. Development of Serodiagnostic (Multiplex) Test and DNA Based Vaccines for Tuberculosis. Thematic Workshop in Frontier Technologies on “Proteomics in Health and Disease” Sponsored by HEC-COMSTECH-NCP, COMSTECH Secretariat, Islamabad. 17th -20th August, **2009**.
32. Serodiagnosis of tuberculosis by multiplex microbead immunoassay. 5th International Symposium on Biotechnology, Institute of Biotechnology and Genetic Engineering, University of Jamshoro, Sindh. 4-7 October, **2009**.
33. Molecular Vaccines. Ist National Conference of Microbiology “New Horizons of Microbiology” at Shah Abdul Latif University, Khairpur, Sindh. 21-22 November, **2009**.
34. Regulatory Mechanisms Involved in Control of Steroidogenesis. 3rd National Symposium on “Recent Trends in Endocrinology and Reproductive Sciences Sponsored by the Pakistan Academy of Sciences, Centre for Research in Molecular Medicine, University of Lahore, Lahore. 15-16 May, **2010**.

	35. Molecular Vaccines. Ist National Conference of Microbiology “New Horizons of Microbiology” at Shah Abdul Latif University, Khairpur, Sindh. 21-22 November, 2009. 36. Regulatory Mechanisms Involved in Control of Steroidogenesis. 3rd National Symposium on “Recent Trends in Endocrinology and Reproductive Sciences Sponsored by the Pakistan Academy of Sciences, Centre for Research in Molecular Medicine, University of Lahore, Lahore. 15-16 May, 2010. 37. Molecular Vaccines. Ist National Conference of Microbiology “New Horizons of Microbiology” at Shah Abdul Latif University, Khairpur, Sindh. 21-22 November, 2009. 38. Regulatory Mechanisms Involved in Control of Steroidogenesis. 3rd National Symposium on “Recent Trends in Endocrinology and Reproductive Sciences Sponsored by the Pakistan Academy of Sciences, Centre for Research in Molecular Medicine, University of Lahore, Lahore. 15-16 May, 2010.
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Criterion 7: Institutional Facilities

The institution must have the infrastructure to support new trends in learning such as e-learning including digital publications, library, video conference room and journals etc.

- The library must possess an up-to-date technical collection relevant to the program and must be adequately staffed with professional personnel.
- These aspects need to be strengthened in number and space.
- Class rooms must be air conditioned and adequately equipped and offices must be adequate to enable faculty to carry out their responsibilities.
- The university did not provide computer facility to faculty members which adversely affect the quality of education.

Standard 7-1: Infrastructure:

The faculty has access to E-library which is very helpful for the high quality education and producing research of international standard. They also have access to the internet. However the department has the following shortcomings/problems:

- Majority of the faculty members have their own PCs. Computers are not provided by the university.
- The Internet services provided by the university are poor. The speed of internet is slow and often internet does not work. The telephones are also connected with the internet and the services are often breached.
- Breach of power intermittently, due to which research and academic work both are suffered, however university has provided quite a reasonable back-up by local generator
- Untrained supporting staff.
- Scanty budget for consumables.
- Water coolers are out of order and are not properly and timely repaired.
- Washrooms are inadequate for males and females and as well for staff.
- The common rooms for male and female are not available in whole university
- Lifts are not available.

Standard 7-2: Library Facilities:

The University Central Library has very limited number of books, journals and periodicals. It's a small library in term of space and facilities with no catalogue systems. It does not meet the standards of a University Library. However department itself owns few books.

Standard 7.3: Class Room and Faculty Offices

Currently the class rooms are not enough and the space is not only limited but also some basic facilities are lacking. Multimedia are not available for the lecture halls. Lecture rooms are not air conditioned and well ventilated, due to which teachers and students face extreme difficulty in summer. Many time students faint in class-rooms and need to be transported to medical facility/hospitals. Practical lab space is also lacking. This affects the quality of teaching. The faculty offices are another serious problem of the department. Some faculty members are sharing small rooms and the others are having their desks in the laboratories.

Criterion 8: Institutional Support

Unfortunately, this aspect is very weak; however it will be addressed after moving in to new building.

- There must be sufficient support and financial resources to attract and retain high quality faculty and provide the means for them to maintain competence as teachers and scholars.

- Space limitation is the major constraint in the development and strengthening of discipline.
- Insufficient secretarial support, technical staff and office equipment Due to unavailability of classrooms, classes are taken in the labs.
- The department at present avails all the human resources.
- Faculty offices are inadequate and therefore two or three teachers share one office room

The university administration has been struggling hard to strengthen all the departments, up-gradation of departments and establishing new faculties and Institutes.

Support and Financial Resources

- At present department is having a very meager financial resource to maintain its present needs. Individual research grants for students and faculty are mainly supporting the departmental research activities. There is a dire need for increasing the financial resources allocated to the department to establish a library, laboratories and computer facilities. Biochemistry department has recently started a project for establishing a University Institute of Biochemistry and Biotechnology which will be one of the prime national institutions.

Standard 8-2: High Quality Graduate Students and Research Scholars

The M.Sc. and M.Phil students are admitted once in a year. However Ph.D. students may be enrolled in each semester. A strict merit policy is applied for admission coupled with GRE/NTS . A detail of the Students enrolled during the past years is given in the following Table.

TABLE-8: ENROLLMENT IN DIFFERENT PROGRAMS FROM 2001-10

Discipline	2001-2001	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
M.Sc.	61	61	59	69	70	70	70	67	71
M.Phil	-	-	-	-	-	14	14	15	15
Ph.D.	8	5	8	5	1	--	3	05	12

Standard 8-3: Financial Resources

Total budget of the department for the financial year 2009-10 is Rs. 57,81325/- which fulfill the departmental needs particularly for the purchase of equipments, chemicals for laboratories and books for the department library.

ANNEXURE I: DETAILED COURSE CONTENTS OF SCHEME OF STUDIES

STUDI

Sr.No. Course No. Course Title Credit Hours

Core Courses

1	BCH-701	Biochemistry	3(2-2)
2	BCH-702	Bioinformatics	3(2-2)
3	BCH-703	Metabolism	3(2-2)
4	BCH-704	Molecular Biology	3(2-2)
5	BCH-705	Enzymology	3(2-2)
6	BCH-706	Tissue and Cell Culture	3(2-2)
7	BCH-707	Cellular Signaling Mechanism	3(3-0)
8	BCH-708	Human Physiology	3(2-2)
9	BCH-709	Biological Methods and Instrumentation	2(0-4)
10	BCH-710	Protein Chemistry	2(2-0)
11	BCH-711	Biomembranes	2(2-0)
12	BCH-712	Genetic Engineering	3(2-2)
13	BCH-713	Biotechnology	3(2-2)
14	BCH-720	Seminar	1(1-0)
15		Comprehensive Examination	0(0-0)

Compulsory Courses:-

In addition to the above courses, the students are required to take compulsory course:

- i.) STAT-700 Elements of Statistics and Biometry 3(3-0)
- ii.) BIOL-711/BOT-712/ZOOL-711 Research Planning and Report Writing 3(1-4)
(This course would be compulsory only for non-thesis students)
- iii.) Thesis would be given to students in place of two optional courses and BIOL-711/ BOT-712/ZOOL-711 (Research Planning and Report Writing). Thesis would carry weightage of 10 credit hours. The thesis grading will be based on satisfactory/unsatisfactory.

Minor Courses

In order to fulfill the requirement of minimum of 55 credit hours for the M.Sc. degree in Biochemistry, the students will have to take 1/3rd of the total courses from other discipline in consultation with Major Supervisor.

Optional Courses

Remaining credit requirement to be fulfilled by the courses from those offered by the Department for post graduation studies in consultation with major supervisor.

**SCHEME OF STUDIES FOR M. Phil. BIOCHEMISTRY
PROGRAMME AT UAAR**

Sr. No.	Course No.	Course Title	Credit Hours
<u>Core Courses</u>			
1	BCH-719	Special Problem	1(1-0)
2	BCH-720	Seminar-I	1(1-0)
3	BCH-720	Seminar-II	1(1-0)
4	BCH-731	Advances in Biochemistry	3(3-0)
5		Comprehensive Examination	0(0-0)
6	BCH-799	Thesis	10(----)

Compulsory Courses:-

In addition to the above courses, the students are required to take compulsory course:

i.)	STAT-700	Elements of Statistics and Biometry	3(3-0)
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Minor Courses

In order to fulfill the requirement of minimum of 30 credit hours of course work for the M.Phil. degree in Biochemistry, the students will have to take 1/3rd of the total courses from other discipline in consultation with Major Supervisor.

Optional Courses

Remaining credit requirement to be fulfilled by the courses from those offered by the Department for post-graduate studies in consultation with major supervisor.

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**SCHEME OF STUDIES FOR Ph.D. BIOCHEMISTRY
PROGRAMME AT UAAR**

Sr. No.	Course No.	Course Title	Credit Hours
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Core Courses

1	BCH-720	Seminar-I	1(1-0)
2	BCH-720	Seminar –II	1(1-0)
3	BCH-751	Advances in Biotechnology	3(3-0)
4		Comprehensive Examination	0(0-0)
5	BCH-799	Thesis	50

Compulsory Courses:-

In addition to the above courses, the students are required to take compulsory course:

1.	BOT-751	Integrated Agro-biological Resource Management	3(3-0)
2.	ZOOL-751	Project Planning, Monitoring and Evaluation	3(3-0)
3.	STAT-702	Experimental Design and Computer Application	3(2-2)

Optional Courses

Remaining credit requirement to be fulfilled by the courses from those offered by the Department for post graduate studies in consultation with major supervisor.

LIST OF COURSES FOR UNDER-GRADUATES

Sr. No.	Course No.	Course Title	Credit Hours
1	BCH-101	General Biochemistry	4(3-2)
2	BCH-102	Applied Biochemistry	4(3-2)
3	BCH-201	Molecular Biology	2(2-0)
4	BCH-302	Introduction to Biochemistry	3(2-2)

BCH-101	General Biochemistry	4(3-2)
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THEORY

Introduction Hydrogen ion concentration, ionic product of water, The relationship between pH and pKa, Buffer solutions, Regulation of acid-base balance, functions of acid-base buffers, The Henderson Hasselbalch equation, The buffer systems of body fluids, Respiratory acids base balance, renal regulation of hydrogen ion concentration, Biomembrane; structure and related process, transport, passive diffusion, facilitated diffusion, Active transport, Carbohydrates; General characteristics, classification, Stereoisomerism, Optical isomerism and Optical activity, Cyclic forms of sugars, Glycosidic linkage, Chemical properties, Disaccharides, Polysaccharides, Proteins and amino acids; Structure, Amino acids occurring in protein molecules, Peptide linkage, Physiological significance, Classification, Amphoteric Properties, Isomerism, Structure, Primary secondary and tertiary, enzymes; General characteristics, Chemical nature, difference with non biological catalysts, Activity and unit, Mechanisms of enzyme reaction. Coenzymes, Factors affecting enzyme action, Inhibition, Importance in diagnosis. Lipids; Compound lipids, Derived lipids, fatty acids, Saturated and unsaturated with physical chemical properties. Triglycerides, Properties, Steroids and sterols, Cholesterol, 7-dehydrocholesterol, Ergosterol, Nucleic acids; Chemical composition and structures of DNA and RNA. Functions of DNA and different types of RNA in the cell. Extranuclear DNA and plasmids. Central DOGMA and its significance. Introduction to replication, transcription and translation process.

Practical

Preparation of buffers of definite pH. Determination of pH value of biological fluids. Preparation of solutions of different normalities and molarities and back titration, Qualitative analysis of carbohydrates. Estimation of glucose in biological fluids. Qualitative and quantitative analysis: of lipids and proteins. Determination of acid, saponification and iodine values of fats/oils. Estimation of lactose and casein in milk, lipid profiles.

Books Recommended

1. Ahmad, M., 2000. Essentials of Medical Biochemistry. Vol. I. 6th Ed. Ilmi Books House. Urdu Bazar, Lahore.
2. Ahmed M., 2002. Essentials of Medical Biochemistry. Vol. 2nd Merit publishers, Faisalabad.
3. Hawk, P.B., B.L. Oser and W. H. Summerson, 1968. Practical Physiological Chemistry, McGraw Hill Book Co. Inc., London
4. Khan, M. R., 1998. Biochemistry Vol. I. Garvan Book House Kutchery Road, Lahore.
5. Murray, R. K., D. K. Granner, P. A. Mayes and V. W. Rodwell, 2006. Harper’s Biochemistry. 27th Ed. Appleton and Lange Inc. USA.
6. Sawhney, S. K. and R. Singh, 2000. Introductory Practical Biochemistry. Norosa Publishing House, New Delhi.

BCH-102	Applied Biochemistry	4(3-2)
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THEORY

Comparative biochemistry, Carbohydrate metabolism: Glycolytic pathway, Glycolysis, Tricarboxylic acid cycle, Electron transport chain, Oxidative phosphorylation and formation of ATP, Pentose phosphate shunt, pathway. Glucuronic acid pathway, Glucogenesis, Glycogenesis and Gluconeogenesis, Metabolism of Fructose and Galactose, Integration with amino acid metabolism, Protein and amino acid metabolism: Plasma amino acids, synthesis of nonessential amino acids, Fate of amino acids, Urea formation, other pathways of ammonia utilization, Fate of non nitrogenous residues of amino acids, creatinine and urea formation. Lipids metabolism. The Lipoprotein and their special function in transporting cholesterol and phospholipids. Biosynthesis of fatty acid, Triglycerides, Cholesterol and prostaglandins. Role of adipose tissue in fat metabolism, Metabolism of free fatty acids, Use of triglycerides for energy and formation of ATP, Factors affecting plasma cholesterol concentration. Ketogenesis and utilization of ketone bodies, Ketosis, Metabolism of bile acids and salts. Integration of metabolisms of carbohydrates, Proteins and Fats. Spectroscopy. Fate of carbohydrates, lipids and proteins in monogastric and ruminant animals. Importance of volatile fatty acids in ruminants, Use of agro-industrial wastes for the production of antibiotics, enzymes, hormones, proteins, steroids etc.

PRACTICAL

Polarimetry, Measurements and calculations of degree of rotation for various optically active substances in solutions. Spectrophotometry, Blood glucose and protein determination by Spectrophotometry. Electrolyte determination by flame photometry. Chromatography. Tests for identification of carbohydrates. Tests for identification of carbohydrates. Tests for identification of lipids. Liver and kidney function test.

Books Recommended

1. Ahmad, M., 2000. Essentials of Medical Biochemistry. Vol. I. 6th Ed. Ilmi Books House. Urdu Bazar, Lahore.
2. Moo-Young, M., 1985. Comprehensive Biotechnology Vol. I and Vol. III, Pergamon Press Inc.
3. Murray, R.K., D.K., Granner, P. A. Mayes and V.W. Rodwell, 2006. Harper’s Biochemistry. 27th Ed. Appleton and Lange Inc. USA
4. Sarwar, M. and Zial-ul-Hasan, 2000. Nutrient Metabolism in Ruminants. University of Agriculture Press. Faisalabad.
5. Sarwar, M., and S.A. Chudhry, 2000. The Rumen: Digestive Physiology and Feeding Management. University of Agriculture Press, Faisalabad.

6. Champe,. P., C. Richard and A. Harvey, 2007. Lippincott’s Illustrated Reviews; Biochemistry. 2nd ed. J.B. Lippincott Company, Philadelphia.

7. Stryer, L., 1995. Biochemistry. W. H. Freeman Company, USA.

BCH-201	Molecular Biology	2(2-0)
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THEORY

Chromosome structure and genomic organisation, DNA as a carrier of genetic information, double helical structure of DNA, forces stabilising nucleic acid structures, supercoiled DNA, DNA replication general aspects and enzymes involved, prokaryotic and eukaryotic replication, mechanisms, repair of DNA, RNA, polymerase and transcription, post transcriptional processing, splicing, regulation of transcription in prokaryotes, genetic code, structure of transfer RNA, ribosome structure, translation mechanism, inhibitors of protein synthesis, post-translational modifications, nucleic acid fractionation and sequencing, chemical synthesis of oligonucleotides, DNA cloning technology. Vectors, hosts, enzymes involved in cloning Genomic and cDNA libraries, PCR and its use in forensics. Molecular Biology in veterinary medicine.

Books Recommended

1. Alberts, B., D. Bary, J. Lewis, M. Raff, K. Roberts and D. Watson 1989. Molecular biology of the cell. 2nd Edition. Carland Publisher. Inc. New York.

2. Lehninger, A. L., D. L. Nelson and M. M. Cox, 1993. Principles of Biochemistry. 2nd Edition. Worth Publisher. New York.

3. Singer, M. and P. Berg 1991. Genes and Genomes. University Scinece Books, Hill Valley, California, USA.

4. Voet, D. and T.G. Voet 1990. Biochemistry. John Wiley and Sons, New York.

5. Wilson k, Walker J, 2005. Principals & techniques of Biochemistry and molecular biology 6th edition Cambridge University Press.

BCH-302	Introduction to Biochemistry	3(2-2)
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Theory

Introduction: Scope of Biochemistry, cell, biomolecules and water. Carbohydrates: sources, importance, classification, chemical reactions: monosaccharides, disaccharides, trisaccharides and polysaccharides. Metabolism and intermediary metabolism of carbohydrates. Glycolysis, pentose-phosphate pathway and citric acid cycle. Proteins: sources, amino acids, and classification. Peptide and proteins: classification, structure and function.

Enzymes and coenzymes. Metabolism of proteins and amino acids.

Lipids: sources, classification and energy values. Complex and derived lipids. Fatty acid classification, sources and chemical reaction related to fat/lipid metabolism.

Nucleic acids: definition, nitrogeneous bases, purine and pyrimidine, nucleoside and nucleotides, DNA and RNAs. Replication, transcription and translation.

Vitamins and hormones: Classification and importance.

Practical

Preparation of laboratory solutions and pH determination. Estimation of sugars from different biological samples, differentiation of sugars like, monosaccharide and disaccharides, reducing and non-reducing sugars. Extraction and detection of proteins. Fat extraction from plant material by using soxhlet methods. Determination of moisture in plant samples Determination of vitamin C or ascorbic acid from citrus fruit. Determination of nucleic acids.

Books Recommended

1. Buchanam, B.B., Wilhelm, G. and Jones, R.L. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Physiology.

2. Murray, R. K., Granner, D. K., Mayes, P. A and Rodwell, V.W. 1998. Harper’s Biochemistry. 25th Ed. Appleton and longse, A simon and Schuster Co. USA.

3. Keith. W, and J. Walker 1997 Principles and techniques of Practical Biochemistry, 4th.Ed. Cambridge Univ. Press. U.K

4. Moore, R., W.D. Clark and K.R. Stern. 1995. Botany. Dubnque, I.A. W.C. Brown

5. Stryer, L. 1995. Principals of Biochemistry. 4th Ed. W.H. Freeman and Co. New York.

6. Galston, A.W. 1994. Life processes of plants. W.H. Freeman, N.Y.

7. Goodwin, T. and Mercer, T. I. 1983. Introduction to Plant Biochemistry. 2nd Ed. Pergamon Press.

8. Raven, P.H., and G.B. Jhonson. 1992. Biology. 3rd ed. Mosby Year Book, Inc. London

LIST OF COURSES FOR POST-GRADUATES

Sr. No.	Course No.	Course Title	Credit Hours
1	BCH-701	Biochemistry	3(2-2)
2	BCH-702	Bioinformatics	3(2-2)
3	BCH-703	Metabolism	3(2-2)
4	BCH-704	Molecular Biology	3(2-2)
5	BCH-705	Enzymology	3(2-2)
6	BCH-706	Tissue and Cell Culture	3(2-2)
7	BCH-707	Cellular Signaling Mechanism	3(3-0)
8	BCH-708	Human Physiology	3(2-2)
9	BCH-709	Biological Methods and Instrumentation	2(0-4)
10	BCH-710	Protein Chemistry	2(2-0)
11	BCH-711	Biomembranes	2(2-0)
12	BCH-712	Genetic Engineering	3(2-2)
13	BCH-713	Biotechnology	3(2-2)
14	BCH-714	Clinical Biochemistry	3(1-4)
15	BCH-715	Medical Microbiology	3(2-2)
16	BCH-716	Nutrition and Dietetics	3(2-2)
17	BCH-718	Plant Biochemistry	3(3-0)
18	BCH-719	Special Problem	1(1-0)
19	BCH-720	Seminar-I	1(1-0)
20	BCH-720	Seminar-II	1(1-0)
21	BCH-721	Environmental Biochemistry	3(2-2)
22	BCH-722	Recent Topics in Molecular Biology	3(3-0)
23	BCH-723	Current Topics in Microbiology	3(3-0)
24	BCH-724	Fundamentals of Biotechnology	4(3-2)
25	BCH-725	Trends in Immunology	3(3-0)
26	BCH-726	Advanced Biochemistry	3(3-0)
27	BCH-727	General Microbiology	3(2-2)
28	BCH-728	Immunology and Immunochemistry	3(2-2)
29	BCH-731	Advances in Biochemistry	3(3-0)
30	BCH-732	Medical Nutrition Therapy	3(3-0)
31	BCH-733	Plant Molecular Physiology	3(3-0)
32	BCH-734	Numerical Problems in Biochemistry	3(3-0)
33	BCH-735	Principles of Advanced Biochemical Techniques	3(3-0)
34	BCH-736	Proteomics	3(3-0)
35	BCH-737	Nanobiotechnology	3(3-0)
36	BCH-751	Advances in Biotechnology	3(3-0)

BCH-701	Biochemistry	3(2-2)
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Theory

An overview of biochemical structures and reactions that occur in living systems: cell, biomolecules and water. Protein structure and function: the building blocks of proteins; amino acids, peptides and polypeptides. The three dimensional structures of proteins, functional diversity of proteins. Enzymes. Nucleic acids: chemical structure and base composition, double helical structure, forces stabilizing nucleic acid structures, nucleic acid fractionation, super coiled DNA, RNA, mRNA, tRNA and rRNA. Diverse physiological functions of nucleotides. Nucleic acid synthesis and protein synthesis. Lipids and carbohydrates. Glycolysis, citric acid cycle, electron transport, chain, oxidative and photo phosphorylation and regulation of ATP production in brief. Vitamins and hormones.

Practical

Titration curves, pKa determination, buffer preparation, amino acid and proteins determination, protein precipitations, carbohydrate and lipid determination. Sugar identification using paper chromatography, amino acid separation by two dimensional paper chromatography, steroid separation by thin layer chromatography (TLC).

Books Recommended

1. Kensal E van Holde, Curtis Johnson, Pui Shing Ho. (2005). Principles of Physical Biochemistry 2nd Edition. Publisher: Prentice Hall; 2 edition
2. Pamela C Champe, Richard A Harvey & Denise R Ferrier. (2006). Lippincott's Illustrated Reviews: Biochemistry. Publisher: Lippincott Williams & Wilkins; 3rd edition
3. David, L. Nelson & Michael M. Cox. (2004) Lehninger Principles of Biochemistry. Publisher: W. H. Freeman; 4th edition
4. James, D. Watson *et al.* Molecular Biology of the Gene. (2003). 5th Ed. Publisher: Benjamin Cummings.
5. Harvey Lodish. Molecular Cell Biology. August 1, (2003). Publisher: W. H. Freeman; 5th edition
6. Berg, Jeremy M.; Tymoczko, John L.; and Stryer, Lubert. (2002) Biochemistry, W. H. Freeman and Co. New York:
7. Alberts, Bruce; Johnson, Alexander; Lewis, Julian; Raff, Martin; Roberts, Keith; Walter, Peter (2002) Molecular Biology of the Cell, New York and London: Garland Science
8. Lodish, Harvey; Berk, Arnold; Zipursky, S. Lawrence; Matsudaira, Paul; Baltimore, David; Darnell, James E (2000). Molecular Cell Biology. 4th ed. New York: W. H. Freeman & Co.
9. Boyer, R. (1999). Concepts in Biochemistry. Brooks. Cole Publishing Co. ITP, Co., USA.
10. Zubay, G. L. Parson, W. W. and Vance, D. E. (1995). Principles of Biochemistry. 4th Ed. Wm.C. Brown Publ. England.
11. Voet, D. and Voet, J. (1995). Biochemistry. 2nd Ed. John Wiley and Sons, Inc., N.Y.
12. Stryer, L. (1995). Biochemistry, 4th Ed. W.H. Freeman and Co., N.Y.
13. Moran, L. A., Scrimgeour, K. G., Horton, H. R., Ochs, R. S. and Rawn, J. D. (1994). Biochemistry, 2nd Ed. Neil Petterson Publ., Prentice Hall Inc., New Jersey.
14. Lehninger, A. L., Nelson, D. L. and Cox, M. M. (1993). Principles of Biochemistry. 2nd Ed. Work Publ. Inc., N. Y.

BCH-702	Bioinformatics	3(2-2)
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Pre-requisite BCH-702 (Molecular Biology)

Theory

Introduction to the course and Bioinformatics. **DNA Sequence Analysis:** DNA databases; submission, retrieval & storage, homology searches, sequence alignment. Codon Usage. Restriction analysis. Searching motifs; palindromic, repetitive & putative regulatory sequences. Primer design. Translation of DNA sequence into protein sequence, finding ORF and gene prediction in eukaryotes. **Protein Sequence Analysis:** Retrieval, Homology searches, motifs searching, hydropathy profile, motif search; Prediction of protein structure and function. **Sequence Alignment:** Local and global alignment. **Phylogenetic analysis:** based on molecular markers and macromolecular sequences.

Practical:

Introduction to Computers, DNA sequence manipulation tools, Codon usage analysis, Restriction digestion and analysis, Primer designing and primer analysis, ORF finding and Gene prediction in prokaryotes and eukaryotes, Homology searches, Global and local alignment using CLUSTAL and BLAST programs, Phylogenetic analysis.

Recommended Books

1. Mount D. (2004). Bioinformatics: Genome and Sequence Analysis. Cold Spring Harbor Laboratory.
2. Higgs, P.J. and Attwood, T.K. (2005). Bioinformatics and Molecular Evolution. Blackwell Publishing.
3. Jin, X. (2006). Essential Bioinformatics. Cambridge University Press, U.K

- 4. Krawetz, S.A. and Womble, D.D. (2003). Introduction to Bioinformatics: A Theoretical and Practical Approach. Humana Press; Book and CD-ROM edition.
- 5. Leon, D., Markel, S., LeJeune, L. (2003). Sequence Analysis in a Nutshell. O'Reilly & Associates; 1st edition.
- 6. Misener, S. and Krawetz, S.A. (2000). Methods in Molecular Biology (Vol 132): Bioinformatics, Methods and Protocols. Humana Press, Totowa, New Jersey.
- 7. Orengo, C.A. (2003). Bioinformatics Genes, Proteins and Computers (Advanced Text) Garland Science
- 8. Pennnington S.R. (2002). Proteomics from Protein Sequence to Function Garland Science

BCH-703	Metabolism	3(2-2)
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Theory
Introduction to Metabolism Bioenergetics, Basic concepts of bioenergetics. Metabolism of carbohydrates, Glucose, Glycogen, starch and other sugars relevant to metabolic routes. Metabolism of lipids, role of simple and compound lipids in production of energy, β oxidation and fatty acids biosynthesis, lipoprotein and their function in transporting cholesterol and phospholipid. Metabolism of proteins and amino acids: catabolism and anabolism of protein. Amino acids, essential and non essential amino acids, total nitrogen balance and formation of creatinine and urea. Nucleic acids Metabolism and uric acid synthesis. Over view of catabolic and anabolic process, Integration, regulation and organ specialization of metabolism with Phase I and Phase II reactions. Digestion of food and transport.

Practical

Analysis of milk, egg, meat, wheat flour, bread, potato and blood for amino acids, peptides, enzymes, lipids, nucleic acids and carbohydrates. Determination of vitamin A, carotenes, riboflavin, ascorbic acid (vitamin C). Techniques include a variety of chromatographic methods, electrophoresis, UV/Visible spectroscopy.

Book Recommended:

- 1. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). Biochemistry, 6th Edition, W.H. Freeman and Co., USA.
- 2. Lehinger, A. L., Neslon, D.L. and Cox, M.M. (2006). Principles of Biochemistry. 2nd Ed. Work Publ. Inc., N.Y.
- 3. Moran, L., Scrimgeour, K. G., Horton, H. R. Ochs, R. S. and Rawn, J. D. (1994). Biochemistry, 2nd Ed. Neil Petterson Publ., Prentice Hall Inc., New Jersey. USA.
- 4. Murray, R. K., Granner, D. K. Mayes, P. A and Rodwell, V. W. (2006). Harper’s Review of Biochemistry. Asian Edition Singa Pure.
- 5. Stryer, L. (2006). Biochemistry.4th Ed. W. H. Freeman and Co., N.Y.
- 6. Voet, D. and Voet, J. (2004). Biochemistry. 4th Ed. Von Hoffman Press.
- 7. Zubay, G. L., Parson, W.W and Vance, D. E. (2006). Principles of Biochemistry. 4th Ed. Wm. C. Brown Publ., England.

BCH-704	Molecular Biology	3(2-2)
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Theory

Introduction to molecular biology and macromolecules. Molecular evolution. Chemistry and structure of DNA and RNA. Genes & genomes. DNA replication, repair & recombination, comparison between prokaryotes & eukaryotes. RNA synthesis, modifications & splicing, parallels and anti-parallels between prokaryotes & eukaryotes. Protein synthesis in prokaryotes and eukaryotes, Post-translational modifications, Protein targeting and turnover. Regulation of gene expression in prokaryotes, eukaryotic chromatin & gene regulation.

Practical

Laboratory ethics. Spectrophotometry; Quantification of nucleic acids, Melting kinetics of DNA. Protein estimation by Lowry and Bradford methods. Protein separation by SDS-PAGE. Centrifugation; Density gradient centrifugation. Column and thin layer chromatography.

Books Recommended:

- 1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., and Walter, P. (2002). Molecular Biology of the Cell, 4th Edition. New York and London: Garland Science.
- 2. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). Biochemistry, 6th Edition, W.H. Freeman and Co., USA.
- 3. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2002). Biochemistry, 5th Edition, W.H. Freeman and Co., USA.
- 4. Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Scott, M.P., Bretscher , A. Ploegh, H. and Matsudaira, P. (2007). Molecular Cell Biology. 5th Edition. W.H. Freeman and Co., USA.
- 5. Stryer, L. (1998). Biochemistry, 3rd Edition, W.H. Freeman and Co., USA.
- 6. Voet, D. and Voet, J. (2004). Biochemistry. 4th Ed. Von Hoffman Press.

BCH-705	Enzymology	3(2-2)
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Theory

Introduction and basic concepts of enzymology. Nomenclature and classification of enzymes, the structure of enzymes, monomeric and oligomeric enzymes. Enzyme kinetics: kinetics of single-substrate and multi-substrate catalyzed reactions and sigmoidal kinetics. Mechanisms of enzyme substrate binding, chemical nature of the mechanisms of enzyme catalysis. The control/regulation of enzyme activity, enzyme inhibition, types of inhibitions. Coenzymes: classification and mechanism of action in enzyme catalysis. Biotechnological applications of enzymes and immobilized enzymes in medicine and industry.

Practical

Isolation, purification and characterization of α amylase and invertase. Effect of pH on enzyme stability and activity. Effect of temperature and time on the stability and proteolytic activity of enzyme. Effect of metal ions, inhibitors and activators on enzyme activity. Estimation of amylase, acid protease, acid phosphatase, lactate dehydrogenase (LDH). Separation of LDH isoenzymes by electrophoresis.

Books Recommended

1. Bruce, A., J. Alexander, L. Julian, R. Martin, R. Keith, and W. Peter. 2006. Molecular Biology of the Cell, New York and London: Garland Science
2. Jeremy, M.B., J. L. Tymoczko and L.Stryer. 2002. Biochemistry, 4th ed., Freeman and company New York.
3. Hiromi, S. 2007, The Enzyme Factor, Council Oak Books
4. Kensal, U. H., J. Custis and P. S. Hok, 2005, Principles of physical Biochemistry. Int. Prentice Hall. N.Y.
5. Moran, L. A., K. G. Scrimgeour, H. R. Horton, R. S. Ochs and J. D. Rawn, 1994. Biochemistry, 2nd ed. Niel Patterson Publishers, Prentice Hall Inc., N.Y.
6. Othway, J.H. 1988. Regulation of Enzyme Activity. 2nd ed. IRL Press Ltd, Oxford.
7. Palmer, T. 1991. Understanding Enzymes. 3rd ed. Ellis Horwood Ltd. England.
8. Price, N and S. L. 1989. Fundamentals of Enzymology. 2nd ed. McMillon. India Ltd. Bangalore.
9. Price, N. and S. L. 1999. Fundamentals of Enzymology. 3rd ed. Oxford University Press Inc. New York.
10. West, E., S. Todd and W.R. 1966. Text Book of Biochemistry. 4th d. The MacMillon Publishing Co., Inc. USA.
11. Zubay, G. L., W. W. Parson and D. E. Vance, 2006. Principles of Biochemistry. 4th ed. W M.C. Brown Publ. England.

BCH-706	Tissue and Cell Culture	3(2-2)
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Theory

Introduction, laboratory safety, culture environment, cell lines, media/components, cell culture theory, tissue types, genetic engineering of cultured animal and plant cells, selection strategies, virus elimination, micro-propagation, somaclonal variations, haploid culture, embryo rescue, protoplast culture and somatic hybridization, protoplast culture.

Practical

Aseptic technique, microscopy, screening for contamination, freezing cells, media preparations, growth cycle, histology, DNA transfection, selection and analysis of transformed cells, tobacco anther culture, fern micro-propagation, protoplast isolation.

Books Recommended:

1. Davis,J.M.,(2006) Basic cell culture 2nd Ed.Oxford university press USA.
2. Yadav P. R. and Rajiv Tyagi (2005) Cell Culture, Discovery Publishing Hpuse, New Delhi
3. Dixon R. A. and Gonzales R. A. (1994) Plant Cell Culture A Practical Approach, Oxford University Press Inc. New York, USA
4. Collin H. A. and Edwards S. (1998) Plant Cell Culture, BIOS Scientific Publishers Limited, UK
5. Susan R. Bamum. (2004). Biotechnology an Introduction
6. Kruse, P.F. and Patterson Jr. M.K. (1973). Tissue Culture, Methods and Application. Academic Press, N.Y.
7. Lindsey, K. and Jones M.G.K. (1989) Plant Biotechnology in Agriculture. Open Univ. Press Milton, Keynes.
8. Davis J.M. (1986). Basic Cell Culture. IRL Press.
9. Lodish, H., Baltimore, D., Erk, A., Zipursky, S. L., Matsudaira, P and Darnell, J. (1995). Molecular Cell Biology. 3rd Ed. Scientific American Books, N.Y.

BCH-707	Cellular Signaling Mechanism	3(3-0)
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Theory:

This course both basic and state-of-art knowledge in: I. Biosynthetic and secretion of steroids, peptides and other hormones, II. Modes and mechanisms of hormone action at the cellular and molecular levels with specific emphasis on receptor structure/function, receptor action and signal transduction mechanism that operates at the nuclear and cell surface levels and in normal and cancerous cells.

Books Recommended:

1. John D. Nelson. (August 30, 2007) Structure and Function in Cell Signalling. Publisher: John Wiley and Sons Ltd
2. Pramod C. Rath. (August 30, 2007) Cell Signalling. Publisher: Anshan Ltd
3. Dorothy T. Leeds. (April 18, 2006) Focus on Cellular Signalling Research. Publisher: Nova Science Publishers; 1st edition
4. Brian Henderson & A. Graham Pockley. (July 18, 2005). Molecular Chaperones and Cell Signalling. Publisher: Cambridge University Press
5. John T. Hancock. (April 15, 2005) Cell Signalling. Publisher: Oxford University Press, USA; 2nd edition
6. Fairweather. (December 31, 2003) Cell Signalling in Prokaryotes and Lower Metazoa. Publisher: Springer; 1st edition
7. Bastien D. Gomperts. (October 15, 2003) Signal Transduction. Publisher: Academic Press; New Ed edition
8. Ernst J. M. Helmreich. (August 20, 2001) The Biochemistry of Cell Signalling. Publisher: Oxford University Press, USA Lodish, H., Berk, A., Zipursky, S.L., Matsdaira, P. and Darnell, J. (1999). 4th Ed. W.H. Freeman and Co., USA.
9. Lodish, H., Baltimore, D., Erk, A., Zipursky, S. L., Matsudaira, P. and Darnell, J. (1995). Molecular Cell Biology. 3rd Ed. Scientific American Books, N.Y.
10. Stryer, L. (1995). Biochemistry. 4th Ed. W.H. Freeman and Co., N.Y.
11. Alberts, B., Bary, D., Lewis, J., Raff, M., Roberts, K. and Watson, J. D. (1994). Molecular Biology of Cell. 3rd Ed. Garlands Publishing Inc., N.Y.
12. Recent review papers.

BCH-708	Human Physiology	3(2-2)
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Theory

Introduction to Physiology. Functional organization of human body and Homeostasis Blood cell, anemia and its types. Nutrition and Physiology of digestion, movement of the food to the alimentary canal, digestion and absorption in the gastrointestinal tract-Respiration, pulmonary ventilation, physical principles of gaseous exchange, transport of oxygen and carbondioxide in the blood and body fluid and regulation of respiration. Circulatory system. Heart as a pump, circulatory system as a circuit. Nervous system organization, three major levels of nervous system. Skeletal system, bone anatomy, histology, development and growth and remodeling. Urinary system, formation of urine by kidney, glomerular filtration, tubular function and regulation of acid-base balance. Endocrinology and Reproduction, male and female reproductive systems and their hormones.

Practical

Estimation of the amount of hemoglobin in human blood. Enumeration of red and white blood carpusles by haemocytometer. Coagulation of blood Bleeding and clotting time of blood. Preparation of haemin crystal. Effect of osmolarity of salt solution and hemolytic agents on red blood carpusles. Study of circulation of blood in the capillaries of the web of frog. Record frog’s heart and muscular contraction beat by using Sherrington drum. Determination of wiping reflex in frog.

Books Recommended

1. Gerhard,M and W.H.Simmons (2006) Principles of Medical Biochemistry 2nd Ed.Mosby.N.Y.
2. C. Guyton ad John E. 2000. Text Book of Medical Physiology. 10th Edition. William Schmitt. W. B. Saunders Company, NY USA.
3. Rod R. Seeley, Trent D. Stephens and Philip Tate. 1998. Anatomy and Physiology 4th Edition. Mosby-Year Book, Inc, USA.
4. John W. Hole. 1992. Essential of Human Anatomy Physiology, 4th Edition. Collin. H. Wheatley. Win. C. Brown Publishers, USA.
5. Stuart Ira Fox. Human Physiology. 5th Edition. Colin H. Wheatley. The McGraw Hill Companies, USA.
6. Silverthorn. Human Physiology. 2001. An intergrated approach (2nd edition). Preutice Hall, ISBN 0130176974.
7. Vander, Sherman and Luciano. 2001. Human Physiology: the mechanisms of body function (8th edition). McGraw Hill ISBN 0072908017.
8. Tortora & Grabowski. 2002. Principles of Anatomy and Physiology. (10 edition). Wiley ISBN 0471224.
9. Reed, Holmes, Weyers & Jones. 1998. Practical Skills in Bimolecular Sciences. Longman ISBN 0582298261.

BCH-709	Biological Methods and Instrumentations	2(0-4)
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Practical

Students will get knowledge of theoretical and practical uses of various equipments required for analysis of sugars, proteins and fatty acids, and similar other compounds. Ultracentrifuge, various type of chromatography’s , paper, thin layer, liquid-liquid and affinity chromatography. High performance liquid chromatography and gas chromatography, GC-MS, LC–MS etc. Nuclear magnetic resonance; visible, ultraviolet, and luminescence, spectrometry. Flame atomic absorption, spectroscopy, Fluorescence and emission spectroscopy, X-ray diffraction.

Books recommended

1. Chung, C.C., Lee, Y.C., Zhang X.M. (2005). Analytical Methods validation and Instrument Performance verification, ICH Procedure CVA Scientific organization, Canada.
2. David, L.N. and Michael, M.C. (2000) Lehinger Principles of Biochemistry of Biochemistry, 3rd Ed, Worth publisher.

3. Donald, W. (2006) Handbook of preparative HPLC, Elsevier, CPL Scientific Publishing Service limited.

4. Mendham, J, Denney, R.D., Barnes J.D and Thomas, M.(2000). Vogel’s Textbook of Quantitative Chemical analysis. Prentice Hall, Addison Wesley Longman Singapore (Pte) Ltd.

5. Sharma, B.K (2005) Instrumental Method of Chemical analysis, 1st Ed., Goel Publishing House Meerut., India.

BCH-710	Protein Chemistry	2(2-0)
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Theory

An introduction to protein structure and function. Amino acids: Physical and chemical properties. The covalent structure of proteins: Hierarchy of protein structure. Primary protein structure, structural implications of peptide bond. Secondary structures of proteins: types, chemical and structural properties. Super-secondary structures: types, structural and functional properties. Domains: types/ classification, types, structural and functional properties. 3-Dimensional structure of proteins: covalent and non-covalent forces affecting protein structures, models to represent protein 3D-structures, diversity of proteins.. Protein folding (*in vivo* and *in vitro*). Globular proteins: structure and function with examples. Fibrous proteins: structure and function with examples. Protein synthesis, processing and turnover. Methods of determining protein structure: physical, chemical and bioinformatics. Protein structure: designing and engineering

Books Recommended

1. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry: 6th International Edition. W.H.Freeman & Co Ltd

2. Branden, C. and Tooze, E. J. (1999). Introduction to Protein Structure. 2nd Ed. Garland Publishing, Inc. N.Y.

3. Buxbaum, E. (2007). Fundamentals of Protein Structure and Function 1st edition. Springer

4. Cox, M. M., Philips, G. N. and Philips, Jr. (2008). Handbook of Proteins: Structure, Function and Methods. Wiley- Interscience

5. Kyte, J. (2006). Structure in Protein Chemistry 2nd edition. Garland Science

6. Lesk, A. M. (2004). Introduction to Protein Architecture: The Structural Biology of Proteins 1st edition. Oxford University Press, USA

7. Lesk, A. M. (2004). Introduction to Protein Science: Architecture, Function, and Genomics 1st edition. Oxford University Press, USA

8. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Scott, M. P., Bretscher, A., Ploegh. H. and Matsudaira, P. T. (2007). Molecular Cell Biology 6th Rev. edition. W. H. Freeman & Co Ltd

9. Petsko, G. A. and Ringe, D. (2003). Protein Stucture and Function (Primers in Biology) 1st edition. New Science Press, Ltd.

10. Voet, D., Voet, J. G. Voet. And Pratt, C. W. (2005). Fundamentals of Biochemistry: Life at the Molecular Level 2nd edition. John Wiley & Sons

11. Whitford, D. (2005). Proteins: Structure and Function. John Wiley & Sons

BCH-711	Biomembranes	2(2-0)
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Theory

Introduction to biomembranes: structure and function. Structural components of biological membranes. Lipids: types of membrane lipids, physical and chemical properties. Proteins: types of membrane proteins structure and function, methods for the study of membrane proteins. Oligomeric components of membranes: structure and function. Membrane associated carbohydrates: glycoproteins and glycolipids. Molecular models of cell membranes: supra-molecular membrane structure. Membrane associated cellular components: cytoskeleton, types, prokaryotic and eukaryotic components and interactions. Putting membrane to work: bioenergetics, transport across membranes, receptors and responses. Membrane fusion, formation and flow.

Books Recommended

1. Alberts, B., Johnson, A., Walter, P., Lewis, J., Raff, M. and Roberts, K. (2008). Molecular Biology of the Cell 5th Rev. edition. Garland Publishing Inc, US.

2. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry: 6th International Edition. W.H.Freeman & Co Ltd

3. Buehler. (2009). Membrane Biology 1st edition. Garland Science

4. Cambell, M. and Farrell, S. (2007). Biochemistry International Student Ed edition. Brooks Cole

5. Champe, P. C., Harvey, R. A., Ferrier, D. R. (2007). Biochemistry (Lippincott's Illustrated Reviews) 4th Rev edition. Lippincott Williams & Wilkins, US

6. Gaber, B. P. and Easwaran, K. R. K. (1992). Biomembrane Structure and Function. Adenine Pr

7. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Scott, M. P., Bretscher, A., Ploegh. H. and Matsudaira, P. T. (2007). Molecular Cell Biology 6th Rev. edition. W. H. Freeman & Co Ltd

8. Petty, H. R. (1993). Molecular Biology of Membranes: Structure and Function. Plenum Press, N.Y.

9. Vance, D. E. and Vance, J. E (3rd March 2008). Biochemistry of Lipids, Lipoproteins and Membranes 1st edition. Elsevier Science

10. Voet, D., Voet, J. G. and Pratt, C. W. (2005). Fundamentals of Biochemistry: Life at the Molecular Level 2nd edition. John Wiley & Sons

11. Wilson, J. and Hunt, T. (2008). Molecular Biology of the Cell: The Problems Book 5th Rev edition. Garland Publishing Inc, US

BCH-712	Genetic Engineering	3(2-2)
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Theory

Introduction, working with nucleic acids: isolation of DNA and RNA, quantification, radio-labeling, hybridization, electrophoresis, sequencing. Polymerase chain reaction. The tools of trade: restriction enzymes, DNA, modifying enzyme, DNA ligase. Biology of genetic engineering: host cell types, vectors, transformation. Cloning strategies. Selection, screening, and analysis of recombinants. Genetic engineering in action: analysis of gene structure and function, making proteins, transgenic plants and animals. Spin-off techniques: recombinant technology and medicine, food industry, diagnosis, human genome project.

Practical

Growth of bacteria on solid medium, preparation of bacterial culture, preparation of plasmid DNA, restriction enzyme digestion of DNA preparation, separation and identification of DNA fragment by agarose gel electrophoresis, purification of DNA fragment by electroporation after digestion and separation on agarose, PCR, sequencing, DNA extraction, preparation of probe for DNA fragment analysis, Southern blot and hybridization, RNA extraction and determination, RNA electrophoresis, probe preparation for RNA analysis, Northern blot.

Books Recommended

1. Brown, T.A (2002) Genomes, New York and London: Garland Science

2. Burden, D. W. and Whitney, D. B. (1995). Biotechnology: Proteins to PCR. Birkhauser, Boston.

3. Lodish, H., Baltimore, D., Berk, A., Zipursky, S. L., Matsudaira, P and Darnell, J. (1995). Molecular Cell Biology. 3rd Ed. Scientific American Book, N.Y.

4. Nicoll, D. S. T. (1994). An introduction to Genetic Engineering. Cambridge Univ. Press, England.

5. Peters, P. (1993). Biotechnology: A Guide to Genetic Engineering. Wm. C. Brown Publishers, England.

6. Recent review papers.

BCH-713	Biotechnology	3(2-2)
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Theory

Introduction, molecular diagnostic: immunological diagnostic procedures, monoclonal antibodies, DNA diagnostic systems, molecular diagnosis of genetic disease. Microbial production of therapeutic agents: pharmaceuticals, enzymes, monoclonal antibodies as therapeutic agents, production of antibodies in E. coli, HIV therapeutic agents. Vaccines. Synthesis of commercial products by recombinant microorganisms: antibiotics and biopolymers. Bioremediation and biomass utilization: microbial degradation of xenobiotics. Plant growth promoting bacteria: nitrogen fixation (nitrogenase, hydrogenase, nodulation, biocontrol of pathogens, growth promotion by free-living bacteria. Microbial insecticides: Insecticidal toxins of Bacillus thuringiensis, baculovirus as biocontrol agents. Large scale production of proteins from recombinant microorganisms. Transgenic plants and animals. Human molecular genetics and gene therapy.

Practical

Production of monoclonal antibodies and its use in immunological diagnosis. DNA diagnosis using PCR. Study tours to various biotechnological laboratories.

Books Recommended

1. Brown, T.A (2002). Genomes, New York and London: Garland Science

2. Glick, B. R. and Pasternak, J. J. (1998). Molecular Biotechnology: 2nd Ed. ASM Press, Washington, D. C.

3. Burden, D. W. and Whitney, D. B. (1995). Biotechnology: Proteins to PCR.

4. Old, R. W. and Primrose, S. B. (1994). Principle of Gene Manipulations. Blackwell Science, England.

5. Peters, P. (1993). Biotechnology: A guide to Genetic Engineering. Wm. C. Brown Publisher, USA.

6. Walker, J. M. and Gingold, E. B. (1993). Molecular Biology and Biotechnology. Royal Society of Chemistry, London.

7. Primrose, S. B. (1991). Molecular Biotechnology. Blackwell Scientific Publications, London.

Recent review papers.

BCH-714	Clinical Biochemistry	3(1-4)
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Theory

Introduction to Clinical biochemistry. Role of clinical biochemistry in health and disease. Factors causing disease. Water and electrolyte balance and imbalance. Renal diseases, associated disorders and diagnosis. Liver disease and associated disorders. Liver function tests and diagnostics value. Gastrointestinal tract diseases and related disorders.

Acid-base balance and oxygen transport. Blood and urine chemistry: related disorders. tests. Glucose metabolism and diabetes. Hematology: bleeding time, clotting time, blood CP. Cerebrospinal fluid (CSF): related disorders and clinical significance. PCR based diagnostic tests.

Practical

The clinical biochemistry laboratory: Good laboratory practices. The role of laboratory in collection, handling and processing of specimens/ biological samples. Instrumentation in clinical laboratory. SOPs of laboratory instruments. Laboratory calculations. SI and conventional units, requesting and interpreting results. Point of care testing. Blood Chemistry. Urine Chemistry. Liver function tests. Renal function related tests. Gastrointestinal tract related tests.

Books Recommended

1. Beckett, G. J., Walker, S. W., Rae, P. and Ashby, P. (2005). Lecture Notes: Clinical Biochemistry 7th edition. Wiley-Blackwell
2. Cameron, A. T. (2007). A Course in Practical Biochemistry - For Students Of Medicine. Cameron Press
3. Gaw, A., Cowan, R., O'Reilly, D., Stewart, M. and Shepherd, J. (2004). Clinical Biochemistry: An Illustrated Colour Text 3rd edition. Churchill Livingstone
4. Hoffbrand, V., Moss, P. and Pettit, J. (2006). Essential Haematology (Essential) 5th Rev. edition. Blackwell Publishing
5. Keshav, S. (2003). The Gastrointestinal System at a Glance. Blackwell Science Ltd
6. Marshall, W. J and Bangert, S. K. (2008). Clinical Biochemistry 2nd Rev. edition. Churchill Livingstone
7. Mohanty, B. (2006). Fundamentals of Practical Clinical Biochemistry. B.I. Publications
8. O'Callaghan, C. A. (2006). The Renal System at a Glance 2nd rev. edition. Blackwell Publishing
9. Reed, R., Holmes, D., Weyers, J., Jones, A. and Cummings, B. (2005). Practical Skills in Biomolecular Sciences (Practical Skills) 3rd. John Wiley & Sons
10. Smith, C., Marks, A. and Lieberman, M. A. (2004). Marks' Basic Medical Biochemistry: A Clinical Approach 2nd edition. Lippincott Williams & Wilkins .
11. Varcoe, J. S. (2001). Clinical Biochemistry: Techniques and Instrumentation - A Practical Course. World Scientific Publishing Company

BCH-715	Medical Microbiology	3(2-2)
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Theory

Introduction: microbiology and medicine: some basic concepts. Epidemiology of infectious diseases and their control. Classification of pathogens: conventional and non-conventional agents. Structure and mode of infection of pathogenic agents: protoza, fungi, bacteria, viruses, and other non-conventional agents. Host-pathogen relationship: Humans infections. Classification of anti-microbial agents and their mode of action at cellular and molecular level. Use of recombinant DNA technology: study of virulence factors of pathogenic agents and rational drug design. Molecular diagnostics: fundamental concepts and their application to human infectious agents.

Practical

Microbial techniques for isolation, culturing, identification of pathogenic microbes. Epidemiological studies. Koch’s postulates Susceptibility / resistance studies of pathogenic microbes.

Books Recommended

1. David,W.,The physiology and Biochemistry of Prokaryotes 3rd Ed.Oxford university press USA.
2. Janeway, Charles A.; Travers, Paul; Walport, Mark; Shlomchik, Mark (2001) Immunobiology, New York and London: Garland Science
3. Brogden, Kim A.; Guthmiller, Janet M., editors (2002) Polymicrobial Diseases, Washington (DC): ASM Press
4. Pelczar Jr., MJ., Chan, ECS., Krieg, NR. (1997). Microbiology: concepts and Applications. Mc Graw Hill Inc. N.Y.
5. Cappuccino, J.G. and Sherman, N. (1996). Microbiology. A Laboratory Manual. 4th Ed. Benjamin/Cummings Publishing Co., Inc. N.Y.
6. Baron, S. (editor). (1995). Medical Microbiology. Churchill Livingston Publications, London.
7. Boyd, R.F. (1995). Basic Medical Microbiology. 5th Ed. Little, Brown and Co., Boston, USA.
8. Mahon, C.R. and Mauselis Jr., G.W.B. (1995). Textbook of Diagnostic Microbiology. Saunders Co., Pennsylvania.
9. Baron, E. J., Chang, R. S., Howard, D. H., Miller, J. N., Turner, J. A. (1994). Medical Microbiology: A Short Course. Wiley-Liss, Inc. USA.
10. Schaechter, M., Medoff, G., Einsenstein, BL. (1993). Mechanisms of Microbial Disease. 2nd Ed. Williams & Wilkins, Maryland.
11. Topley and Wilson’s. (1990). Principles of Bacteriology, Virology and Immunity. (Vol. 1-5). 8th Ed. Parket, M.T. and Collier, L.H. (general editors). Edward Arnold Publications, London.

BCH-716	Nutrition and Dietetics	3(2-2)
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Theory

Nutrition: Basic concepts, history, present status and future prospects. Selection of an adequate diet, balanced diet and its importance, food composition and food quality. Digestion and absorption in GIT, sources and role of digestive enzymes and hormones. Nutrients: Definition, types, major functions, nutrient density, dietary requirements, essentiality and associated toxicities, deficiencies and nutrient supplements. Energy metabolism: energy value of foods, body’s need for energy, respiratory quotient, basal metabolism, specific dynamic action, Water and electrolytes: Distribution in the body, functions and requirements, human water balance system, human acid-base (electrolyte) balance system, alkalosis, acidosis and dehydration. Nutritional requirements of humans:, requirement for individual nutrient during different stages of human development and physiological states, body height, weight and nutrient requirements. Assessment of nutritional status and diet therapies for AIDS, Cancer, diabetes and other clinical situation. Nutrition and diseases: nutritional disorders, food-borne infections, food allergies and intolerance, natural food toxicants (antinutritional factors) and environmental contaminants. Nutrition during special situations; obesity & slimming, aging, and sports. Food additives, flavors, processing and its effects on nutritional quality. Biotechnology and food industry.

Practical

Proximate analysis of food. Analysis of food for minerals and vitamins. Assay of digestive enzymes and hormones. Determination of antinutritional factors (trypsin inhibitors, tannin). Measuring the energy contents of food. Estimation of total energy needs. Measurements of body composition. Determination of human nutritional requirements. Formulation of balanced daily diet for different age groups and during different physiological states. Survey of the market for human nutritional products, mineral and vitamin supplements. Visit to commercial units preparing human nutritional products.

Books Recommended

1. Eleanar,N.W and S.R. Rolfes. (2007) Understanding Nutrition. 11th Ed. Wadsworth publishing
2. Dean, Laura; McEntyre, J.R. (2004) The Genetic Landscape of Diabetes, Bethesda (MD): National Library of Medicine (US), NCBI
3. Varki, Ajit; Cummings, Richard; Esko, Jeffrey; Freeze, Hudson; Hart, Gerald; Marth, Jamey, editors (1999) Essentials of Glycobiology. 1st Ed. Plainview (NY): Cold Spring Harbor Laboratory Press
4. Robert, B.S.W., Sve-Rodwell, W. (1996). Nutrition Throughout the Life Cycle. 3rd Ed. Mosby, N.Y.
5. Potter, N. N. and Hotchkiss, J.H. (1995). Food Science. 5th Ed. Chapman and Hall, N.Y.
6. Stryer, L. (1995). Biochemistry. 4th Ed. W.H. Freeman and Co., N.Y.
7. Voet, D. and Voet, J. (1995). Biochemistry. 2nd Ed. John Wiley and Sons, Inc., N.Y.
8. Willians, S.R. (1995). Basic Nutrition and Diet Therapy. 10th Ed. Mosby year Book Inc. N.Y.
9. Lehninger, A. L., Nelson, D. L. and Cox, M. M. (1993). Principles of Biochemistry. 2nd Ed. Work Publ. Inc., N.Y.
10. Escott-Stump, S. (1992). Nutrition and Diagnosis-Related Care, 3rd Ed. Lea and Febiger, London.
11. Harrison, G.A. and Waterlow, J.C. (1990). Diet and Disease in Traditional and Developing Societies. Cambridge University Press, N.Y.
12. Stansfield, P. (1987). Basic Nutrition. Jones and Bartelett Publishers. Inc., Boston.

BCH-718	Plant Biochemistry	3(3-0)
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Pre-requisite: BCH-701

Theory

Chemical composition and biosynthesis: cell wall, tonoplast and vacuoles, Golgi apparatus, membrane origin and flow. Plant cell specific plastids: (origin, inter-conversion and division), microbodies and sphaerosomes. Photosynthesis: Brief discussion about C3, C4 and CAM. Importance of compartmentation, cyanide resistant respiration and respiration-like processes. Nitrogen metabolism: Nitrogen fixation, transport and storage, non-protein amino acids, cyanogenic glucosides and plant proteins. Plant products: Classification, nature, distribution and biological functions of terpenes & terpenoids, alkaloids and phenolics. Plant growth regulators: history, classification, biosynthesis and bioassays, in-vivo transport, role of natural and synthetic growth regulators in plant metabolism, importance in research/commercial applications.

Books Recommended

1. Walter,S.,P,Micheal,C and Jack.P.(2007) Biochemistry of Plants.Academic press U.K.
2. Berg, Jeremy M.; Tymoczko, John L.; and Stryer, Lubert. (2002) Biochemistry. New York: [W. H. Freeman and Co.](#)
3. Buchanan, B. B., Wilhelm, G. and Jones, R. L. (2000). Biochemistry and Molecualr Biology of Plants. American Society of Plant Physiologists.
4. Stryer, L. (1995). Principls of Biochemistry. 4th Ed. W. H. Freeman and Co. New York.
5. Goodwin, T. W. and Mercer, E. I. (1983). Introduction to Plant Biochemistry. 2nd Ed. Pergamon Press.

BCH-721	Environmental Biochemistry	3(2-2)
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Theory

Atmosphere: Toxic gases liberation and their effect on biological system. Noise pollution and its effect on human beings. Effect of smoke and dust pollution on human beings. Reasons for ozone depletion and their effect on biological system. Green house effect and global warming. Effect of heavy metals and radiation pollution on biological system.

Hydrosphere: Biological aspects of surface water pollution, industrial waste water, sewage and other solid wastes in water. Biochemical effect of acid rains. Thermal pollution, radioactive wastes in water and their effect on plants and animals.

Lithosphere: Effect of soil and deeper earth pollution. Effect of pesticides on life. Heavy metal and radioactive wastes in lithosphere.

Toxicological Biochemistry: Teratogenesis, Mutagenesis, Carcinogenesis and Immune system effects, Health Hazards, Toxic Elements and Elemental Forms, Toxic Inorganic Compounds, Toxicology of Organic Compounds.

Practical

Analysis of heavy metals from body fluids (blood and urine) and from environment (air, water & food) by atomic absorption. Analysis of pesticides residual for food/plants by chromatographic techniques. Water Microbiology, isolation and characterization of microorganisms from various environments (urban and rural), preparation of media to characterize for environmental safety, selective media for bacteria and fungi and staining of microorganisms, determination of level of environmentally applied chemicals on various eatable products like vegetables and fruits. Ames test, determination of carcinogenic material in vegetables and fruits particularly, Nitrates (NO₃), Nitrite (NO₂) and Nitrosamine.

Books Recommended

1. Botken, D.B. and E.A. Keller. 2007. Environmental Science, Earth As a Living Planet. 2nd ed., John Willey and Sons, New York.
2. Cunningham, W.P. and B.W. Saigo. 2008. Environmental Science, A Global Concern. WM. C. Brwon Publishers, London.
3. Colin, B. Environmental Chemistry, 2008, W. H. Freeman.
4. Fengxiang and X. Han, 2007. Biogeochemistry of Trace Elements in Arid Zone, Springer.
5. Goodman and Gillmans, 2008. The Pharmacological basis of Therapeutics.
6. Goudie, A., 1982. The human impact on the natural environment. 3rd ed. MIT press, Cambridge, MA.
7. Jaffar, G. H., 1989. Vogel’s Text book of quantitative analysis of industrial materials. Harlow, England
8. Manahan, S. E., 1993. Quantitative chemical analysis. Books, Cole Publisher Co, California.
9. Raven, H.P., L.R. Berg and G.B. Jhonson. 2006. Environment. Saunders College Publishing, New York.
10. Srivastava, R.P. and R.C. Saxena. 2008. Textbook of Insect Toxicology. Himanshu Publications, Udaipur, India.
11. Stanley, E. M., 2007. The environmental Chemistry. 8th ed. CRC.
12. Stantey, E. M., 1995. Environmental Chemistry, 4th ed. Lewis Publishing Inc. Michigan.
13. William, H.S., 2006. Biogeochemistry: an analysis of Global Change. 2nd ed. Acad. Press, California, USA.

BCH-722	Recent Topics in Molecular Biology	3(3-0)
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Theory

Addresses advanced topics in molecular biology, such as molecular biology of development, control of cell proliferation, genetic basis of cancer, evolution of the gene, origins of human cancer, DNA rearrangements and amplification, mutability and repair of DNA, the mitochondrial genome and genetic engineering.

Books/Literature Recommended

1. John, W.P and Edward, F.G (2006) Rapid review Biochemistry with student consult online access. 2nd Ed. Mosby. N.Y
2. Kensal E van Holde, Curtis Johnson, Pui Shing Ho. (April 6, 2005). Principles of Physical Biochemistry (2nd Edition). Publisher: Prentice Hall; 2 edition
3. Kensal E van Holde, Curtis Johnson, Pui Shing Ho. (April 6, 2005). Principles of Physical Biochemistry (2nd Edition). Publisher: Prentice Hall; 2 edition
4. David L. Nelson & Michael M. Cox. Lehninger Principles of Biochemistry. (April 23, 2004). Publisher: W. H. Freeman; 4th edition
5. Alberts, Bruce; Johnson, Alexander; Lewis, Julian; Raff, Martin; Roberts, Keith; Walter, Peter (2002) Molecular Biology of the Cell, New York and London: Garland Science
6. Berg, Jeremy M.; Tymoczko, John L.; and Stryer, Lubert. (2002) Biochemistry. New York: W. H. Freeman and Co.
7. Lodish, Harvey; Berk, Arnold; Zipursky, S. Lawrence; Matsudaira, Paul; Baltimore, David; Darnell, James E (2000). Molecular Cell Biology. 4th ed. New York: W. H. Freeman & Co.
8. Lewin, B. (1998). Gene, VI. Oxford Univ. Press, Oxford.
9. Lodish, H., Baltimore, D.A., Zipursky, S.L., Matsudaria, P and Darnell, J. (1995). Molecular Cell Biology. 3rd Ed., Scientific American Books, USA.
10. Nicoll, D.S. T. (1994). An Introduction to Genetic Engineering. Cambridge University Press, England
11. Ausubel, F.M., Brent, R., Kingston, R.E., Moore, D.D., Seidman, J.G., Smith, J.A. and Struhl, K. Current Protocols in Molecular Biology. John Wiley and Sons, N.Y.
12. Recent papers/review papers.

BCH-723	Current Topics in Microbiology	3(3-0)
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Theory

A study of modern molecular genetics as revealed by studies of microbial systems. This course covers current advancement in major groups of bacteria, fungi, protozoa and yeast and their use in gene manipulation to obtain a specific goal related to agriculture, health and medicine. Recent papers will be discussed and students would be asked to present seminar on topics mentioned above.

Books/Literature Recommended

1. Brogden, Kim A.; Guthmiller, Janet M., editors (2002) Polymicrobial Diseases, Washington (DC): [ASM Press](#)
2. Janeway, Charles A.; Travers, Paul; Walport, Mark; Shlomchik, Mark (2001) Immunobiology, New York and London: Garland Science
3. Prescott, L. M., Harley, J. P. and Klein, D. A. (1998). Microbiology. 4th Ed. Wm. C. Brown Publishes, N.Y.
4. Pleczar, M. J., Chan, E. C. S. and Kriegg, N. R. (1997). Microbiology: Concepts and Applications. McGraw Hill, Inc., N.Y.
5. Joklik, W. K., Willert, H. P., Amos, D. B. and Wilfert, C. M. (1996). Zinsser Microbiology. 21st Ed. Appelton and Lang, CT.
6. Cappuccino, J. G. and Sherman, N. (1996). Microbiology. A laboratory Manual. 4th Ed. Bahjamin/Cummings Publishing Co., Inc. CA.
7. Talaro, K. and Talaro, A. (1996). Foundations in Microbiology. 2nd Ed. Wm. C. Brown Publishers, USA.
8. Aleamo, I. E. (1994). Fundamentals of Microbiology. 4th Ed. The Benjamin/Cummings Publishing Co. Inc., CA.
9. Recent papers/review papers.

BCH-724	Fundamentals of Biotechnology	4(3-2)
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Theory

Introduction, Laying the groundwork: dynamic cell, chemical foundation, protein structure and function. Basic molecular biology: flow of genetic information, structure of nucleic acid, gene organization, gene expression, reproducing DNA. Genetic engineering: tools of trade, biology of genetic engineering. Cloning strategies. Selection, screening and analysis of recombinants. Down stream processing: large scale protein purification. Fermentation technology: microbial growth and fermentation processes. Plant tissue culture: virus elimination, micropropagation, somaclonal variation, anther, pollen and protoplast culture, somatic hybridization and cryopreservation. Application of biotechnology in health, agriculture, industries and medicine.

Practical

Preparation and estimation of proteins in various samples (plants/animal origin). SDS-polyacrylamide gel electrophoresis, gel filtration chromatography, enzyme essays, growth of bacteria on solid medium, preparation of bacterial culture, DNA and RNA extraction from animal and plant tissues and their estimation, preparation of plasmid DNA, restriction digestion of plasmid DNA.

Books Recommended

1. Brown, T.A (2002) Genomes, New York and London: Garland Science
2. Glick, B. R. and Pasternak, J. J. (1998). Molecular Biotechnology. 2nd Ed. ASM Press, Washington, D. C.
3. Burden, D. W. and Whitney, D. B. (1995). Biotechnology: Proteins to PCR. Birkhauser, Boston.
4. Zubay, G. L. Parson, W. W. and Vance, D. E. (1995). Principles of Biochemistry. 4th Ed. Wm.C. Brown Publ. England
5. Old, R. W. and Primrose, S. B. (1994). Principle of Gene Manipulations. Blackwell Science, Ltd., England.
6. Walker, J. M. and Gingold, E. B. (1993). Molecular Biology and Biotechnology. Royal Society of Chemistry, London.
7. Peters, P. (1993). Biotechnology: A guide to Genetic Engineering. Wm. C. Brown Publisher, USA.
8. Primrose, S. B. (1991). Molecular Biotechnology. Blackwell Scientific Publications, England.

BCH-725	Trends in Immunology	3(3-0)
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Theory

This course will cover models of the immunity system. Models will be used to stimulate various aspects of the immune system, such as its evolution, the structure of its receptor, B and T cell development, collaboration, the role of somatic mutation in diversification, V gene rearrangement, self/non-self discrimination. The models will be evaluated and modified according to the current literature.

Books/Literature Recommended

1. Warren E. Levinson. (March 10, 2006) Review of Medical Microbiology and Immunology (Medical Microbiology & Immunology). Publisher: McGraw-Hill Medical; 9th edition
2. Abul K. Abbas & Andrew Lichtman. (February 1, 2006) Basic Immunology. Publisher: Saunders; 2nd edition
3. Janis Kuby *et al.* Immunology. (October 9, 2006). Publisher: W.H.Freeman & Co Ltd; 6Rev Ed edition
4. John H. L. Playfair & Benjamin Chain. (September 1, 2005) Immunology at a Glance.. Publisher: Blackwell Publishing Limited; 8th edition
5. Abul K. Abbas & Andrew Lichtman. (February 25, 2005) Cellular and Molecular Immunology. Publisher: Saunders; 5th edition
6. Arthur G Johnson. (August 1, 2005) High-Yield™ Immunology (High-Yield™ Series).. Publisher: Lippincott Williams & Wilkins; 2nd edition
7. Fred Rosen. (April 9, 2004) Case Studies in Immunology. Publisher: Garland Science; 4th edition

8. William E Paul. Fundamental Immunology. (August 1, 2003). Publisher: Lippincott Williams & Wilkins; 5th Bk& Cdr edition Brogden, Kim A.; Guthmiller, Janet M., editors (2002) Polymicrobial Diseases, Washington (DC): ASM Press

9. Janeway, Charles A.; Travers, Paul; Walport, Mark; Shlomchik, Mark (2001) Immunobiology, New York and London: Garland Science

10. Joklik, W. K., Willert, H. P., Amos, B. D. and Wilfert, C. M. (1996). Zinsser Microbiology. 20th Ed. Appelton and Lange, CT.

11. Cappuccino, J. G. and Sherman, N. (1996). Microbiology. A Laboratory Manual. 4th Ed. Benjamin/Cummings Publishing Co., Inc. N.Y.

12. Fleisher, T.A. Schwartz, B.D., Shearer, W.T. and Strober, W. (1995). Clinical Immunology: Principles and Practice. Mosby, London.

13. Stites, D.P., Terr, A. I and Parslow, T.G. (1994). Basic and Clinical Immunology. 8th Ed. Appleton and Lange, CT.

14. Kurby, J. (1994). Immunology. 2nd Ed. W. H. Freeman and Co., N.Y.

15. Riott, I., Brostoff, J. and Male, D. (1993). Immunology. 3 Ed. Mosby-Year Book, Europe Ltd., London.

16. Roitt, I. (1988). Essential Immunology. 6th Ed. Balckwell Scientific Publications, MA

17. Johnstone, A. and Thorpe, R., (1988). Immunochemistry in Practice. Balckwell Scientific Publications, London

18. Recent papers/review papers.

BCH-726	Advanced Biochemistry	3(3-0)
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Theory
Advanced level discussion of the application of biochemical principles to complex biological problems. Topics include structural and conformational properties of macromolecules with emphasis on macromolecular function and recognition, mechanism of enzymatic reactions, sensory adaptation and the biochemistry of transcription.

Books/Literature Recommended

1. Zubay, G.L.L., Parson, W.W. and Vance, D.E. (1995). Biochemistry. 4th Ed. Wm.c. Brown Publishers, England.

2. Voet, D. and Voet, J. (1995). Biochemistry. 2nd Ed. John Wiley and Sons, Inc., N.Y.

3. Stryer, L. (1995). Biochemistry. 4th Ed. W. H. Freeman and Co., N.Y.

4. Moran, L. A., Scrimgeour, K.G., Horton, H.R. Ochs, R.S. and Rawn, J.D. (1994). Biochemistry. 2nd Ed. Neil Patterson Publishers/Prentice Hall Inc., N.J.

5. Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry. 2nd Ed. Worth Publishers, Inc., N.Y.

6. Recent papers/review papers.

BCH-727	General Microbiology	3(2-2)
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Theory
Overview, scope of microbiology, characterization of microorganism, prokaryotic and eukaryotic cell structures, nutritional requirements and microbiological media, cultivation and growth of microorganisms. Control of microorganisms: principles, physical and chemical agents. The major groups of prokaryotic (bacteria) and eukaryotic (fungi, algae and protozoa) organisms. Microbial metabolism: energy yielding and energy requiring biochemical processes. Inheritance and variability. Viruses: morphology, classification, replication, cultivation methods, pathogenicity. Normal flora of human body. Host parasite interactions: nonspecific host resistance. The immune response: specific host resistance, practical aspects of immunity, antibiotic and other chemotherapeutic agents. Nosocomial infections, sexually transmitted diseases, airborne diseases, foodborne and waterborne diseases, arthropod-borne diseases, wound and skin infections acquired by direct contact. Microbiology of soil and the atmosphere, natural water, drinking water and wastewater. Microbiology of food.

Practical

Microscope and prepared slides. Staining methods: preparation of smears, simple negative, gram, acid-fast, endospore, capsule, flagella staining and detection of mobility - hanging drop side. Cultivation of bacteria: transfer of bacteria-aseptic technique, isolation of bacteria by dilution technique, media preparation-special media for isolating bacteria. Microbial metabolism: carbohydrate catabolism, fermentation of carbohydrates, protein catabolism, respiration, rapid identification methods. Microbial growth: oxygen and growth of bacteria, determination of bacterial growth curve, factors effecting microbial growth; temperature, pH, osmotic pressure. Control of microbial growth: physical methods of control: heat, UV radiation, etc. Chemical methods of control: disinfectants, antiseptics, antibiotic and antimicrobial drugs sensitivity. The microbial world: unknown identification, fungi: yeast and molds, algae and protozoan. Viruses: isolation and titration of bacteriophages, plant viruses.

Books Recommended

1. Prescott, L.M., Harley, J.P. and Klein, D.A. (1998). Microbiology. 4th Ed. Wm.C. Brown Publishers, N.Y.

2. Pleczar, M. J., Chan, E. C.S. and Krieg, N. R. (1997). Microbiology: Concepts and Applications. McGraw Hill, Inc., N.Y.

3. Joklik, W.K., Willert, H.P., Amos, D.B. and Wilfert, C.M. (1996). Zinsser Microbiology. 21st Ed. Appleton and Lang, Connecticut.

4. Cappuccino, J.G. and Sherman, N. (1996). Microbiology. A Laboratory Manual. 4th Ed. Benjamin/Cummings Publishing Co., Inc, C.A.

5. Talaro, K. and Talaro, A. (1996). Foundations in Microbiology. 2nd Ed. Wm.C. Brown Publishers, U.S.

6. Aleamo, I.E. (1994). Fundamentals of Microbiology. 4th Ed. The Benjamin/Cummings Publishing Co. Inc., C.A.

BCH-728	Immunology and Immunochemistry	3(2-2)
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Theory

Introduction to the immune system. Elements of innate & acquired immunity, immunogens and antigens. Antibody structure and function, antigen-antibody interactions, genetic basis of antibody structure. Biology of the B lymphocyte, the role of MHC in the immune system, biology of the T lymphocyte, activation and function of T and B cells, Control mechanisms in immune response, cytokines, complement, hypersensitivity reactions; type I, II, III, IV. Autoimmunity, immunodeficiency and other disorders of the immune system, transplantation immunology, tumor immunology, resistance and immunization to infectious diseases. Practical application of immunological function.

Practical

Non-specific resistance, blood group determination. Agglutination reactions: microtiter agglutination. Immunodiffusion, immunoelectrophoresis, radioimmunoassay, enzyme immunoassays, fluorescent-immunoassays. Antibody production, antibody behavior.

Books Recommended

1. Eli Benjamini, Richard Coico, and Geoffery Sunshine. (2000). Immunology: A Short Course. 4th Ed. Wiley-Liss Inc, Canada.

2. Cappuccino, J.G. and Sherman, N. (1996). Microbiology. A Laboratory Manual. 4th Ed. Benjamin/Cummings Publishing Co., Inc. N.Y.

3. Joklik, W.K., Willert, H.P., Amos, D.B. and Wilfert, C.M. (1996). Zinsser Microbiology. 20th Ed. Appleton and Lange, Norwalk, Connecticut.

4. Fleisher, T. A., Schwartz, B. D., Shearer, W. T. and Strober, W. (1995). Clinical Immunology: Principles and Practice. Mosby, London.

5. Kurby, J. (1994). Immunology. 2nd Ed. W.H. Freeman and Co., N.Y.

6. Stites, D. P., Terr, A. I. and Parslow, T. G. (1994). Basic and Clinical Immunology. Appleton and Lange, Connecticut.

7. Riott, I., Brostoff, J. and Male, D. (1993). Immunology. 3rd Ed. Mosby-Year Book, Europe Ltd., London.

8. Johnstone, A. and Thorpe, R. (1988). Immunochemistry in Practice. Blackwell Scientific Publications, London.

9. Roitt, I. (1988). Essential Immunology. 6th Ed. Blackwell Scientific Publications, MA.

BCH -731	Advances in Biochemistry	3(3-0)
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Advanced level course will cover all recent advances in Biochemistry including genomes, proteomics etc.

Books Recommended

1. Prennington, S.R and Dunn, M.J. (2002). Proteomics from protein sequence to function Viva book private Ltd. New Delhi.

2. Berg J. M. Tymoczko, J. L. and Stryer, L. C. (2002) Biochemistry. W. H. Freeman and Co., New Delhi.

3. Mckee, T. Mckee, J.R. (2003), Biochemistry: The Molecular Basis of Life, Mac Graaw Hill.

4. Brown, T.A (2002). Genomics, Bios Scientific Publishing Ltd. UK.

5. Petsko, G. C. (2004). Protein Structure and Function. Humana Pres, USA.

6. Twyman, R.N. (2004). Principles of Proteomics.

7. Nelson D. L. and Cox. M.M (2005). Principles of Biochemistry, W.H. Freeman and Company New York.

8. Liebles, D.G. (2002). Introduction to proteomics.

9. Dunham, (2003) Genome mapping and sequencing. Gemome Mapping and Sequencing. Horizon Scientific Press.

BCH -732	Medical Nutrition Therapy	3(3-0)
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Theory

Medical nutrition therapy of diabetes mellitus and hypoglycemia of non diabetic origin. Cardiovascular disease, cancer and other risk factors, prevention treatment and recovery. Nutrition and clinical manifestation of macrominerals & microminerals Nutrition and immune function, viral disease like hepatitis, A, B, C, D and HIV/AIDS and their food therapy. Molecular mechanism of food allergy and food intolerance. Anemia and nutrition care process. Pulmonary disease, asthma and Tuberculosis, Nutrition during Kidney disease and renal failure. Digestion and absorption of nutrients. Detoxification in Colon and Liver. Transportation of organic molecules across the plasma membrane. Supplementary food like fruits, vegetables, coffee and tea for treatment and maintenance of human health on the basis of age weight habits and socio economic factors. Introduction of

Nutritional Genomics: Disease at the chromosomal level, Disease at the Molecular level, Disease at the Mitochondrial level, Genetic and nutrition therapy, influences of gene-nutrient, Interaction on metabolic process. Interactions on gene expression, complex genetic nutrition connections. Nutrition therapy for Acid-Base disorder. Nutrition therapy in Aging, Theories of Ageing, physiologic changes, Body composition changes, sensory losses, oralhealth status, Gastrointestinal function, Cardiovascular function, Renal function, neurologic function, immunocompetence, medications, Nutrition needs and nutrition issues.

Books Recommended:

1. Vasudevan, D.M and S.S. Kumari, 2007. Text book of Biochemistry 3rd ed. Jaypee brothers medical publishers Ltd. New Delhi.
2. Reginald, H.G and C. M. Gisham, 2006, Biochemistry 3rd ed. Brooks cole publishers.
3. Gerard J. T., B. R. Funke and C. L. Ember, 2004. Case. Microbiology of different foods, 8th ed. Pearson Education Inc. Singapore Pvt. Ltd.
4. Kathleen, L. M and S. E Stump.2000. Krause‘ Food &Diet Therapy, 11th ed. Elsevier, USA.
5. Rodney, B.2002. Concepts in Biochemistry, 2nd ed. Wadsworth group, Thomson learning & company Forest lodge Road Pacific Grove, USA.
6. Sylvia, E. S. 1992. Nutrition and Diagnosis related care. 3rd ed. Lea and Febiger. USA
7. Zemplen, J. and H. Domiel. 2004. Molecular Nutrition, CABI Publishing, Wallingford.UK.
8. Paul, I.R.E. Turner and D.Ross, 2004. Nutrition 2nd Jones and Bartlett Publishers, Canada.

BCH-733	Plant Molecular Physiology	3(3-0)
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Membrane Transport:Overview/organization of membrane transport, pumps, carriers, general properties of ion channels and water transport through aquaporins. The Cytoskeleton: Introduction, actin and tubulin characteristics, gene families, polymerization, characteristics of actin and tubulin, The cytoskeleton and signal transduction, mitosis and cytokinesis. Signal Transduction: Introduction, receptors, G-proteins and phospholipid signaling, cyclic nucleotides, calcium, protein kinases, signal transduction and plant growth regulators. Senescence and Programmed Cell Death (PCD): Introduction to cell death, PCD and senescence, nucleic acids, proteins, pigments, and oxidative metabolism during senescence, photosynthesis and senescence, PGRs and senescence, PCD as a plant response to stress. Responses to Abiotic Stresses: plant responses to abiotic stresses, osmotic adjustment and its role in tolerance to drought and salinity, impact on transport across plant membranes, additional genes induced by water stress , freezing stress, flooding, hypoxia, oxidative and heat stresses. Mineral Metabolism: Overview of essential mineral elements, mechanisms and regulation of plant K⁺ transport. Phosphorus nutrition and transport. The molecular physiology of micronutrient acquisition, plant responses to mineral toxicity

Books Recommended:

1. Walter,S.,P,Micheal,C and Jack.P.(2007) Biochemistry of Plants. Academic press U.K.
2. Buchanan, B, Gruissem, W. and Jones R.L. (2004). Biochemistry & Molecular Biology of Plants., John Wiley & Sons, Publishers.
3. Donald Voet. Biochemistry. (March 9, 2004). Publisher: Wiley; 3 Har/Com edition
4. Paul, I.R.E. Turner and D.Ross, 2004. Nutrition 2nd Jones and Bartlett Publishers, Canada.
5. Peggy, S.S 2003. Nutrition and Diet Thesdy, seel instructional modules. Jones and Bartlett Publishers, Canada.
6. Goodwin, T. W. and Mercer, E.I. Introduction to Plant Biochemistry (1983), 2nd Ed., Pergamon, Oxford, Lea P. and Leegood R.C. (1999). Plant Biochemistry and Molecular Biology, 2nd Edition. John Wiley & Sons publisher.
7. Mass, B. and Aducci, P. (1997). Signal Transduction in Plants (Molecular and Cell Biology Updates) Birkhauser Publisher.
8. Nath, P,A. Mattoo A.K., Ranade S.A. and Weil, J.H. (2003).Molecular Insight in Plant Biology. Science Publishers Inc.
9. Shaw, C.H. (1996). Plant Molecular Biology. IRL Publisher

BCH 734	Numerical Problems in Biochemistry	3(3-0)
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Numerical Problems and their solutions in the following areas will be studied. Acid-Base Chemistry: Aqueous Solutions, equilibrium constant, acids and bases, laboratory buffers, amino acids and peptides, blood buffers. Chemistry of Biological Molecules: Calculations related to peptide sequencing, nucleic acids, carbohydrates and fats, calculation of molecular weight. Bioenergetics: Exothermic and endothermic reactions, equilibrium concentrations, oxidation-reduction reactions, metabolism and ATP yield, oxidative and photo phosphorylation, active transport, enthalpy and entropy, activation energy. Isotopes in Biochemistry: Isotopes, radioactive and biological half life, solutions of radioactive compounds, assay using radioisotopes, double label analysis, dilution analysis, and stable isotopes

Books Recommended:

1. Adama, D. S. (2003). Lab Math: A Handbook of Measurements, Calculations, and Other Quantitative Skills for Use at the Bench Spiral edition. Cold Spring Harbor Laboratory Press
2. Barker, K. (2004). At the Bench: A Laboratory Navigator 2 Spi Rev edition. Cold Spring Harbor Laboratory Press

3. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry: 6th International Edition. W.H.Freeman & Co Ltd

4. Dawes, E. A. (1980). Quantitative Problems in Biochemistry 6th Sub edition. Longman Group United Kingdom

5. Moorthy, K. (2008). Fundamentals of Biochemical Calculations 2nd edition. CRC Press Inc

6. Murray, R. K., Granner, D. K., Mayes, P. A. and Rodwell, V. W (2006). Harper's Illustrated Biochemistry 27th edition. McGraw-Hill Medical

7. Segel, I.H. (1976). Biochemical Calculations. ©John Wiley & Sons Inc.

8. Stephenson, F. H. (2003). Calculations for Molecular Biology and Biotechnology: A Guide to Mathematics in the Laboratory 1st edition. Academic Press

9. Wilson, K., Walker, J. and Walker, M. J. (2000). Principles and Techniques of Practical Biochemistry 5th edition. Cambridge University Press

BCH-735	Principles of Advanced Biochemical Technique	3(3-0)
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GC-MS, LC-MS, their principles, theory, sampling techniques, instrumentation and recent developments. Capillary electrophoresis and its applications. FT-IR, principle, instrumentation, sampling techniques and applications. MALDI Toff (Matrix Assisted Laser Desorption Ionization Time of Flight), Quadrupole mass spectrometry (QMS), Tandem Mass Spectrometry (MS/MS). Flow cytometer principle, technique and applications. Real Time PCR, development, advantage, how it quantitate DNA or cDNA, Quantitation of mRNA levels, analysis and applications. Inductively coupled plasma emission spectroscopy (ICPMS)

Books Recommended:

1. Braithwaite, A and F.F. Smith, 1996 Chromatographic Methods, Chapman and Hall London.

2. Landers, J.P., 1994. Hand book of Capillary Electrophoresis, CRC Press, Boca Raton.

3. Robert E. Ardrey, 2003. Liquid Chromatography – Mass spectrometry: An Introduction, Publisher: Johan Wiley and Sons.

4. Rouessac F. & Rouessac A, 2000. Chemical Analysis: Modern Instrumentation Methods and Techniques, John Wiley and Sons.

5. J. Michael, Hollas, 1998. High Resolution Spectroscopy, John Wiley and Sons. England.

6. Singh M, 2002. Analytical Chemistry, Instrumental Techniques, Delhi, Dominant Publishers and Distributors.

7. Ferrer I. (Editor), E.M. Thurman (Editor), 2003 Liquid Chrometography/Mass spectrometry MS/MS and Time of Flight MS: Analysis of Emerging Contaminants (Acs Symposium Series, 850), American Chemical Society.

8. Jose A.,C. Broekaert 2001. Analytical Atomic Spectrometry with Flames and Plasmas, Johan Wiley and Sons.

BCH -736	Proteomics	3(3-0)
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Theory

Introduction to proteomics. Types of proteomics. From genomics to proteomics. Strategies for protein separation. Methods for the measurement of gene expression. Protein identification: Mass spectrometry, Peptide mass finger printing, De novo sequencing, Antibody based assays. Quantitative proteomics: Standard 2 D gels, Multiplexed proteomics, Quantitative proteomics with mass spectrometry. Protein Sequence Analysis: Protein families and evolutionary relationships, Principles for protein sequence comparison (finding distant relationships), Prediction of function from sequence, MALDI, (SELDI – TOF). Structural Proteomics: Techniques for solving protein structures, Modeling protein structure, Structural Classification of proteins. Interaction Proteomics: Principles of protein – protein interaction analysis, Library based methods, Yeast two – hybrid system, Protein localization, Protein Interaction Maps. Automation of Proteomics: Protein chips and functional proteomics. Application of Proteomics: Medical proteomics, Pharmaceutical Proteomics, Proteomics and Plant Biotechnology

Books Recommended:

1. Daniel C. Liebler. (2007). Introduction to Proteomics: Tools for the New Biology 2nd edition. Publisher: Humana Press

2. Hubert Rehm. (2006). Protein Biochemistry and Proteomics (The Experimenter Series). Publisher: Academic Press

3. Nedelkov, D. and Nelson, R. W. (2006). New and Emerging Proteomic Techniques (Methods in Molecular Biology) 1st edition. Humana Press

4. O'conner, C. D. (2007). Proteomics (Methods Express). Scion Publishing Ltd

5. Rehm, H. (2006). Protein Biochemistry and Proteomics (The Experimenter Series) 1st edition. Academic Press

6. Twyman, R. M. (2004). Principles of Proteomics. BIOS Scientific Publishers, UK

7. Van Eyk, J. E. and Dunn, M. J. (2008). Clinical Proteomics: From Diagnosis to Therapy 1st edition. Wiley-VCH

8. Veenstra, T. D. and Yates, J. R. (2006). Proteomics for Biological Discovery 1st edition. Wiley-Liss

BCH-737	Nanobiotechnology	3 (3-0)
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Theory

Introduction of nanotechnology: History, nano-definitions, size relationships.. Nanobiotechnology: Merging nanotechnology with biotechnology, Basic molecular biology and self organization of macromolecules into functional units, Biological motors and pumps. Nanoparticles: Physical, chemical and biological properties, Nanoparticles and their association with macromolecules, Synthesis of nanoparticles *in vivo* and *in vitro*, Techniques required for synthesis and analysis of nanoparticles. Applications: Nanotechnology in cancer diagnosis and treatment, Labeling and image analysis, Passive and active drug targeting, Drug encapsulation strategies, Multifunctional nanotherapeutics, Nano-sensors, Nano-medicines. Protein mechanics at nano scale and future of the nanotechnology.

Books Recommended

1. Christof M. Niemeyer, Chad A. Mirkin, 2004. Nanobiotechnology: Concepts, Applications and Perspectives. 1st Ed. Wiley VCH. Germany.

2. Claudio Nicolini, 2008. Nanobiotechnology and Nanobiosciences. 1st Ed. Pan Stanford Publishing Pvt Ltd. Singapore.

3. Jain. K.K., 2006. Nanobiotechnology in Molecular Diagnostics: Current Techniques and Applications. Horizon Bioscience. UK.

4. Prasad S. K., 2008. Advanced Nanotechnology. Discovery Publishing House Pvt Ltd. New Delhi, India.

5. Prasad S. K., 2008. Progress in Nanotechnology. Discovery Publishing House Pvt Ltd. New Delhi, India.

6. Storrs Hall .J., 2006. Nanofuture: What`s Next for Nanotechnology. Manas Publications. New Delhi, India.

7. Suri Shalini, 2006. Nanotechnology: Basic Science to Emerging Technology. APH Publishing Corporation. New Delhi, India.

8. Viroj Wiwanitkit, 2008. Advanced Nanomedicine and Nanobiotechnology. 1st Ed. Nova Science Publishers Inc. New York, USA.

BCH-751	Advances in Biotechnology	3(3-0)
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THEORY

Address advanced topics in microbial, animal and plant biotechnology such as biosensors, gene chip, gene silencing, immobilised biocatalysts. Gene therapy. Plants as bioreactors, tissue culture and transgenic plants. Bioremediations and biomass utilizations. Computer based modeling and drug designing.

BOOKS RECOMMENDED

1. The Biotechnology Directory (1999). Ed. Sara Hachwood. Macmillan Reference Ltd, USA.

2. Glick, B. R. and Pasternak, J. J. (1998). Molecular Biotechnology. 2nd Ed. ASM Press, Washington, D. C.

3. Bunders, J., Haverkort, B. and Hiemstra, W. (1997). Biotechnology: Building on farmers’ knowledge.

4. Recent papers/review papers.

Summary

This Self Assessment Report (SAR) contains eight sections. The first section outlines the program mission and objectives. Section-2 provides information about the curriculum development. Section-3 enlists the laboratories and other relevant information. The last four sections provide information about student support, process control, faculty characteristics and institutional facilities and support provided by the university.

The program mission, objectives and outcomes are assessed and strategic plans are presented to achieve the goal, which are again measurable through definite standards. Programme outcomes appeared to be highly relevant. The results of proforma no. 10 of 2009 show the scores of evaluation by students; five teachers of the Department of Biochemistry which ranged from 3.1 to 3.65 on a scale of 3.70%. The results of proforma no. 1 of 2009 show the score evaluation by the students, of five courses offered by the Department of Biochemistry which ranged from 2.60 to 3.40 on a scale of 3.50%.

The results of proforma no. 10 of 2010 show the scores of evaluation by students; five teachers of the Department of Biochemistry which ranged from 2.5 to 3.65 on a scale of 3.70%. The results of proforma no. 1 of 2010 show the score evaluation by the students, of five courses offered by the Department of Biochemistry which ranged from 2.60 to 3.49 on a scale of 3.50%.

The curriculum satisfies the core requirements for the programmes as specified by HEC and Information technology components of the curriculum has been applied by offering non-conventional course like Experimental Design and Computer Applications, Bioinformatics and Proteomics.

Curriculum design and update is initiated by the faculty members of the Department after the approval of Board of Studies which is comprised of senior faculty members and a subject specialist who is taken from other faculties or from other Universities or research institutions. The Board is headed by the Chairman of the Department. The approved curriculum is then sent to Board of Faculty, headed by the Dean Faculty of Sciences. This Board consists of senior faculty members from all the Departments of the faculty and subject specialists. Finally the curriculum is presented to the University Syndicate for formal approval after the approval of the Academic Council which is comprised of the Professors, Associate Professors, Faculty Representatives of whole the university and very senior subject specialists from other academic/research institution.

Laboratories are reasonably equipped but not spacious and adequate. However these problems will be circumvented in the near future when the Department will shift to its new building.

The process of admission is well established and followed as per rules and criteria set by HEC and the University. For this purpose an advertisement is published in the National News Papers by the Registrar Office. As regards the process control covering admission, registration, recruiting policy, courses and delivery of material, academic requirements, performance and grading, university as well as Higher Education Commission have set forth appropriate rules, which are properly followed.

Institutional facilities were measured through Criterion 3; infrastructure and facilities, class rooms, faculty offices, computing facility support, shortcomings in computing infrastructure and safety arrangements are highlighted. Institutional facilities need to be strengthened.

CONCLUSION

The performance of the Department may be improved considering the following points.

- 1 Developing of human resource for the highly advanced fields of biochemistry, biotechnology, enzymology and bioinformatics to play a crucial role in national development.
- 2 Strengthening graduate, post graduate and postdoctoral programmes in Biochemistry, Biotechnology and Bioinformatics.
- 3 Up-gradation of research by integrating biochemistry, biotechnology and bioinformatics into existing traditional systems.
- 4 To emphasize biochemical and molecular approaches in vitro techniques in plant propagation, crop improvement and plant disease management as well as animal disease management.
- 5 Strengthening capabilities in cloning animal, plant, viral and bacterial genes to be utilized in various ways.
- 6 Introduction of genetic engineering of crops as a regular feature for crop improvement.
- 7 Production of recombinant proteins, enzymes, hormones, antibiotics or vaccines etc for therapeutic use/diagnostic purposes for human, plants, animals and different industries
- 8 Development of efficient microbes for treatment of waste and other hazardous materials and to take care of environmental pollution
- 9 The faculty survey revealed that some faculty members are in need of professional foreign training which will enable them to carry out research on the latest issues
- 10 At present there are no arrangements for professional and behavioral training of the supporting staff. Such trainings will improve their abilities for assisting in enhancing the quality of research and teaching.
- 11 The survey has also pointed out that computer with internet facilities should be available to all faculty members and post graduate students to boost the level of research and teaching.
- 12 Faculty members have pointed out that the weakest aspect is the amount of time available to teachers to interact with their families

Proforma 2

Faculty Course Review Report (To be filled by each teacher at the time of Course Completion)						
For completion by the course instructor and transmission to Head of Department of his/her nominee (Dept. Quality Officer) together with copies of the Course Syllabus outline						
Department:				Faculty:		
Course Code:		Title:				
Session:		Semester:	Autumn ☐	Spring ☐	Summer ☐	
Credit Value:		Level:		Prerequisites:		
Name of Course Instructor:		No. of Students Contact Hours	Lectures	Other (Please State)		
			Seminars			
Assessment Methods: give precise details (no & length of assignments, exams, weightings etc)						

Distribution of Grade/Marks and other Outcomes: (adopt the grading system as required)

Undergraduate	Originally Registered	%Grade A	%Grade B	%Grade C	D	E	F	No Grade	Withdrawal	Total
No. of Students										
Post-Graduate	Originally Registered	%Grade A	%Grade B	%Grade C	D	E	No Grade		Withdrawal	Total
No. of Students										

Overview/Evaluation (Course Co-coordinator’s Comments)

Feedback: first summarize, then comment on feedback received from:
(These boxes will expand as you type in your answer.)

1) Student (Course Evaluation) Questionnaires
2) External Examiners or Moderators (if any)
3) Student /staff Consultative Committee (SSCC) or equivalent, (if any)
4) Curriculum: comment on the continuing appropriateness of the Course curriculum in relation to the intended learning outcomes (course objectives) and its compliance with the HEC Approved / Revised National Curriculum Guidelines

5) Assessment: comment on the continuing effectiveness of method(s) of assessment in relation to the intended learning outcomes (Course objectives)

6) Enhancement: comment on the implementation of changes proposed in earlier Faculty Course Review Reports

7) Outline any changes in the future delivery or structure of the Course that this semester/term’s experience may prompt

Name: _____ Date: _____
(Course Instructor)

Name: _____ Date: _____
(Head of Department)

Proforma 3



Survey of Graduating Students

(To be filled out by graduating students in last semester/year before the award of degree)

The survey seeks graduating students’ input on the quality of education they received in their program and the level of preparation they had at university. The purpose of this survey is to assess the quality of the academic programs. We seek your help in completing this survey.

A: Very satisfied B: Satisfied C: Uncertain D: Dissatisfied E: Very dissatisfied

1. The work in the program is too heavy and induces a lot of pressure

A B C D E

2. The program is effective in enhancing team-working abilities.

A B C D E

3. The program administration is effective in supporting learning.

A B C D E

4. The program is effective in developing analytical and problem solving skills.

A B C D E

5. The program is effective in developing independent thinking.

A B C D E

6. The program is effective in developing written communication skills.

A B C D E

7. The program is effective in developing planning abilities.

A B C D E

8. The objectives of the program have been fully achieved

A B C D E

9. Whether the contents of curriculum are advanced and meet program objectives

A B C D E

10. Faculty was able to meet the program objectives

- | | A | B | C | D | E |
|-----|--|---|---|---|---|
| 11. | Environment was conducive for learning | | | | |
| | A | B | C | D | E |
| 12. | Whether the Infrastructure of the department was good. | | | | |
| | A | B | C | D | E |
| 13. | Whether the program was comprised of Co-curricular and extra-curricular activities | | | | |
| | A | B | C | D | E |
| 14. | Whether scholarships/ grants were available to students in case of hardship | | | | |
| | A | B | C | D | E |

Answer question 9 if applicable.

9.

The internship experience is effective in enhancing

a.

Ability to work in teams

(A)

(B)

(C)

(D)

(E)

b.

Independent thinking

(A)

(B)

(C)

(D)

(E)

c.

Appreciation of ethical Values

(A)

(B)

(C)

(D)

(E)

d.

Professional development

(A)

(B)

(C)

(D)

(E)

e.

Time management skills

(A)

(B)

(C)

(D)

(E)

f.

Judgment

(A)

(B)

(C)

(D)

(E)

g.

Discipline

(A)

(B)

(C)

(D)

(E)

h.

The link between theory and practice

(A)

(B)

(C)

(D)

(E)
10.

What are the best aspects of your program?
11.

What aspects of your program could be improved?

You may use additional sheets for questions 10 & 11 if needed.

Proforma 4

RESEARCH STUDENT PROGRESS REVIEW FORM (To be filled out by Master/ M.Phil / Ph.D Research Students on six monthly basis)	
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To be submitted by the HoD / Dept. Quality Officer to the QEC

For Research Student to Complete:

1. Date of admission to the department
2. Date of initiation of research
3. Date of completion of Course work
4. Number of credit hours completed
5. Date of Synopsis Defense
6. Cumulative Grade Point Average (CGPA) secured
7. Please outline details of progress in your research since your last review (including any research publications):
8. Do you have any comments on the level of supervision received?
9. What do you plan to achieve over the next 6 months?
10. Do you have any comments on generic or subject-specialist training you may have received or would like to receive internally and / or externally?
11. Do you have easy access to sophisticated scientific equipment?
12. Do you have sufficient research material / commodities available?

Student _____ Date: _____

Supervisory Committee Comments

(Please comment on and benchmark the student’s progress against your University’s internal and external HEC Quality Criteria for Master/PhD/MPhil Studies)

Principal Supervisor: _____	Date: _____
Co-Supervisor: _____	Date: _____
Co-Supervisor: _____	Date: _____

Head of Department Comments:

Signature: _____ Date: _____

Director, Board of Research Studies (or equivalent) Comments:

Signature: _____ Date: _____

Dean/Director, QEC Action: (including monitoring of Follow-up action) Date: _____



Proforma 5

Faculty Survey

(To be submitted on annual basis by each faculty member)

The Purpose of this survey is to assess faculty members’ satisfaction level and the effectiveness of programs in place to help them progress and excel in their profession. We seek your help in completing this survey and the information provided will be kept in confidence. **Indicate how satisfied are you with each of the following aspects of you situation at your department?**

A: Very satisfied B: Satisfied C: Uncertain D: Dissatisfied E: Very dissatisfied.

1.

Your mix of research, teaching and community service.

A B C D E
2.

The intellectual stimulation of your work.

A B C D E
3.

Type of teaching / research you currently do.

A B C D E
4.

Your interaction with students.

A B C D E
5.

Cooperation you receive from colleagues.

A B C D E
6.

The mentoring available to you.

A B C D E
7.

Administrative support from the department.

A B C D E
8.

Providing clarity about the faculty promotion process.

A B C D E
9.

Your prospects for advancement and progress through ranks.

A B C D E
10.

Salary and compensation package.

A B C D E

11.

Job security and stability at the department.

A

B

C

D

E
12.

Amount of time you have for yourself and family.

A

B

C

D

E
13.

The overall climate at the department.

A

B

C

D

E
14.

Whether the department is utilizing your experience and knowledge

A

B

C

D

E
15.

What are the best programs / factors currently available in your department that enhance your motivation and job satisfaction:
16.

Suggest programs / factors that could improve your motivation and job satisfaction?

Information about faculty member

- i.

Academic rank:

A: Professor

B: Associate Professor

C: Assistant Professor

D: Lecturer

E: Other
- ii.

Years of service:

A: 1-5

B: 6-10

C: 11-15

D: 16-20

E: >20

Name: _____ Signature: _____ Date: _____



Proforma 6

SURVEY OF DEPARTMENT OFFERING Ph.D. PROGRAMS

The following information is required for EACH Department in which a Ph.D. program is offered.

1	General Information:	
1.1	Name of Department	
1.2	Name of Faculty	
1.3	Date of initiation of Ph.D. program	
1.4	Total number of academic journals subscribed in area relevant to Ph.D. program.	
1.5	Number of Computers available per Ph.D. student	
1.6	Total Internet Bandwidth available to all the students in the Department.	
2	Faculty Resources:	
2.1	Number of faculty members holding Ph.D. degree in the department.	
2.2	Number of HEC approved Ph.D. Advisors in the department.	
3	Research Output:	
3.1	Total number of articles published last year in International Academic Journals that are authored by faculty members and students in the department.	
3.2	Total number of articles published last year in Asian Academic Journals that are authored by faculty members and students in the department.	
3.3	Total number of ongoing research projects in the department funded by different organizations	
3.4	Number of post-graduate students in the department holding scholarships/fellowships.	
3.5	Total Research Funds available to the Department from all sources.	
3.6	Number of active international linkages involving exchange of researchers/students/faculty etc. (Attach Details).	

4	Student Information:	
4.1	Number of Ph.D. degrees conferred to date to students from the Department during the past three academic years.	
4.2	Number of Ph.D. students currently enrolled in the department.	
4.3	Ratio of number of students accepted to total number of applicants for Ph.D. Program.	
5	Program Information	
5.1	Entrance requirements into Ph.D. Program (M.Sc. / M.Phil.) Indicate subjects or M.Sc. / M.Phil.	
5.2	Is your Ph.D. program based on research only? (Y/N)	
5.3	Maximum number of years in which a Ph.D. degree has to be completed after initial date of enrollment in Ph.D. program.	
5.4	Total number of post M.Sc. (16 year equivalent) courses required for Ph.D.	
5.5	Total number of M.Phil. level courses taught on average in a Term / Semester.	
5.6	Total number of Ph.D. level courses taught on average in a Term / Semester.	
5.7	Do your students have to take/write:	
	e. Ph.D. Qualifying examination (Y/N)	
	f. Comprehensive examination (Y/N)	
	g. Research paper in HEC approved Journal	
	h. Any other examination (Y/N)	
5.8	Total number of International examiners to which the Ph.D. dissertation is sent.	
5.9	How is the selection of an examiner from technologically advanced countries carried out?	
5.10	Is there a minimum residency requirement (on campus) for award of Ph.D. degree?	
6	Additional Information	
6.1	Any other information that you would like to provide.	



Alumni Survey

(To be filled by Alumni - after the completion of each academic year)

The purpose of this survey is to obtain alumni input on the quality of education they received and the level of preparation they had at University. The purpose of this survey is to assess the quality of the academic program. We seek your help in completing this survey.

A: Excellent B: Very good C: Good D: Fair E: Poor

1. Knowledge

1. Math, Science, Humanities and professional discipline, (if applicable) (A)
- (B) (C) (D) (E)
2. Problem formulation and solving skills (A) (B) (C) (D) (E)
3. Collecting and analyzing appropriate data (A) (B) (C) (D) (E)
4. Ability to link theory to practice. (A) (B) (C) (D) (E)
5. Ability to design a system component or process (A) (B) (C) (D) (E)
6. IT knowledge (A) (B) (C) (D) (E)

II Communications Skills

1. Oral communication (A) (B) (C) (D) (E)
2. Report writing (A) (B) (C) (D) (E)
3. Presentation skills (A) (B) (C) (D) (E)

III Interpersonal Skills

1. Ability to work in teams. (A) (B) (C) (D) (E)
2. Ability to work in arduous /Challenging situation (A) (B) (C) (D) (E)
3. Independent thinking (A) (B) (C) (D) (E)
4. Appreciation of ethical Values (A) (B) (C) (D) (E)

IV Management /leadership Skills

1. Resource and Time management skills (A) (B) (C) (D) (E)
2. Judgment (A) (B) (C) (D) (E)
3. Discipline (A) (B) (C) (D) (E)

V General Comments

Please make any additional comments or suggestions, which you think would help strengthen our programs. (New courses that you would recommend and courses that you did not gain much from)

VI. Career Opportunities

VII. Department Status

1. Infrastructure (A) (B) (C) (D) (E)
2. Faculty (A) (B) (C) (D) (E)
3. Repute at National level (A) (B) (C) (D) (E)
4. Repute at international level (A) (B) (C) (D) (E)

VIII Alumni Information

- 1. Name (Optional)_____
- 2. Name of organization_____
- 3. Position in organization_____
- 4. Year of graduation_____

Proforma 8



Employer Survey

(To be filled in by Employer - after the completion of each academic year)

The purpose of this survey is to obtain employers' input on the quality of education **University of Arid Agriculture, Rawalpindi** is providing and to assess the quality of the academic program. The survey is with regard to University of _____ graduates employed at your organization. We seek your help in completing this survey.

A: Excellent

B: Very good

C: Good

D: Fair

E: Poor

I. Knowledge.

1. Math, Science, Humanities and professional discipline, (if applicable)

(A) (B) (C) (D) (E)

2. Problem formulation and solving skills (A) (B) (C) (D) (E)

3. Collecting and analyzing appropriate data (A) (B) (C) (D) (E)

4. Ability to link theory to Practice (A) (B) (C) (D) (E)

5. Ability to design a system component or process (A) (B) (C) (D) (E)

6. Computer knowledge. (A) (B) (C) (D) (E)

II. Communication Skills

1. Oral communication (A) (B) (C) (D) (E)

2. Report writing (A) (B) (C) (D) (E)

3. Presentation skills (A) (B) (C) (D) (E)

III. Interpersonal Skills

1. Ability to work in teams (A) (B) (C) (D) (E)

2. Leadership (A) (B) (C) (D) (E)

3. Independent thinking (A) (B) (C) (D) (E)

- #### 4. Motivation (A) (B) (C) (D) (E)

5. Reliability (A) (B) (C) (D) (E)

6. Appreciation of ethical values (A) (B) (C) (D) (E)

IV. Work skills

1. Time management skills (A) (B) (C) (D) (E)

2. Judgment (A) (B) (C) (D) (E)

3. Discipline (A) (B) (C) (D) (E)

V. General Comments

Please make any additional comments or suggestions, which you think would help strengthen our programs for the preparation of graduates who will enter your field. Did you know as to what to expect from graduates?

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on its right side, suggesting it is resting on a surface.

VI. Information About Organization

1. Organization Name_____
2. Type of Business_____
3. Number of Graduates (specify the program) in your Organization:



Proforma 9

Faculty Resume

Name				
Personal	May include address(s) and phone number(s) and other personal information that the candidate feels is pertinent.			
Experience	List current appointment first, each entry as follows: Date, Title, Institution.			
Honor and Awards	List honors or awards for scholarship or professional activity.			
Memberships	List memberships in professional and learned Societies, indicating offices held, committees, or other specific assignments.			
Graduate Students Postdocs Undergraduate Students Honour Students	List supervision of graduate students, postdocs and undergraduate honors theses showing: <table><tr><td>Years</td><td>Degree</td><td>Name</td></tr></table> Show other information as appropriate and list membership on graduate degree committees.	Years	Degree	Name
Years	Degree	Name		
Service Activity	List University and public service activities.			
Brief Statement of Research Interest	May be as brief as a sentence or contain additional details up to one page in length.			

<i>Publications</i>	<i>List publications in standard bibliographic format with earliest date first.</i> ○ Manuscripts accepted for publication should be included under appropriate category as “in press;” ○ Segment the list under the following standard headings: • Articles published by refereed journals. • Books. • Scholarly and / or creative activity published through a refereed electronic venue. • Contribution to edited volumes. • Papers published in refereed conference proceedings. • Paper or extended abstracts published in conference proceedings. (refereed on the basis of abstract) • Articles published in popular press. • Articles appearing in in-house organs. • Research reports submitted to sponsors. • Articles published in non-refereed journals. • Manuscripts submitted for publication. (include where and when submitted).						
<i>Research Grants and Contracts.</i>	<i>Entries should include:</i> <table><tr><th>Date</th><th>Title</th><th>Agency / Organization</th></tr><tr><th colspan="3">Total Award Amount</th></tr></table> Segment the list under following headings: • Completed • Funded and in progress • In review	Date	Title	Agency / Organization	Total Award Amount		
Date	Title	Agency / Organization					
Total Award Amount							
<i>Other Research or Creative Accomplishments</i>	<i>List patents, software, new products developed, etc.</i>						
<i>Selected Professional Presentations</i>							