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RAWALPINDI



Self Assessment Report
DEPARTMENT OF PLANT PATHOLOGY
July, 2008

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Introduction

The Department of Plant Pathology started functioning with the establishment of the Barani Agricultural College in 1979. Initially, the department offered two supporting courses for the students of B.Sc. (Hons) Agriculture and the subject gained the status of major discipline for undergraduate students in 1986. The college was upgraded to University of Arid Agriculture in 1994 and M.Sc. (Hons) degree programme in Plant Pathology commenced in 1997. The department initiated Ph.D. Program in 1999. Since then its growth and progress both in terms of faculty, students and upgradation have been remarkable. It has produced eminent Plant Pathologists, who have been serving the country in different capacities.

The program of Plant Pathology is designed to provide necessary skills in understanding pathological problems. Its curriculum highlights the emerging issues of new and economically important plant diseases in the area. Moreover, disease management has been given substantial importance in the curriculum. Additionally, new and modern tools have been introduced to conduct advanced research and the department is committed to quality teaching, research and development of trained manpower in the discipline of Plant Pathology.

With the latest developments in the field of Plant Pathology, the department regularly revises and updates its curriculum. More recently, emerging tools of molecular approaches have been incorporated in the curriculum. The department provides a variety of study programs such as Mycology, Bacteriology, Virology and Nematology to enhance students' professional training and career opportunities. It holds national and international seminars to exchange knowledge and information. The faculty is actively engaged in a number of research projects; some of which are internationally collaborated and funded.

This Self Assessment Report (SAR) is based on eight criteria. The first criterion outlines the program mission and objectives. Criterion 2 provides information about the curriculum development. Criterion 3 enlists the laboratories and other relevant information. The fourth

criterion is pertinent to the information about students' support and advising. The last four criteria provide information about process control, faculty characteristics and institutional facilities and support.

CRITERION 1: PROGRAM MISSION, OBJECTIVES AND OUTCOMES

Criterion 1: Program Mission, Objectives and Outcomes

The self assessment is based on a number of criteria. To meet each criterion several standards must be satisfied. This section describes how the standards of the Criterion 1 are met.

Standard 1-1: The program must have documented measurable objectives that support institution mission statements.

Mission Statement

The mission of Department of Plant Pathology is to deliver quality education, conduct superior research and extend knowledge for the amelioration of agriculture, environment, human health to ensure self-sufficiency in quality food by reducing quantitative as well as qualitative losses in crop yields due to diseases. The emphasis is to develop a sustainable and substantially profitable production system so as to make the future of Pakistan effulgent.

Documented measurable objectives

Strategic objectives of the department of Plant Pathology are:

1. To develop the discipline on modern and innovative lines for teaching and research for the graduate and post-graduate students.
2. To impart basic and applied education through high quality knowledge and skills in the field of Plant Pathology, advanced analytical techniques for disease diagnosis, pathogen detection and characterization, disease epidemiology and management.
3. To guide the students and conduct research on diseases of economic and national importance in the area.
4. To strengthen the discipline with incorporation and integration of advanced knowledge and approach of related subjects such as Molecular Biology, Genetic Engineering, Biotechnology, Host Parasite Interactions and Vector Involvement.
5. To anticipate new and emerging problems in the field.

6. To inculcate culture of research in teaching faculty and students.

Main elements of strategic plan to achieve mission and objectives

- Development of a sound and dynamic teaching system based on the experience and vision gathered from world reviews, literature, innovations, proceedings, symposia etc for the award of degrees
- Designing and constantly updating the curricula involving core subjects, elective subjects, specialized areas, internship programs and study tours
- Setting up of well equipped specialized research laboratories depending on the available resources
- Post-graduate research and presentation of reports and thesis
- Publication of scientific papers, books, manuals and bulletins etc
- Implementation of research projects funded by the universities and other agencies
- Development of linkages with national and international research organizations to foster research

The assessment of program objectives through different criteria is presented in Table 1

Table 1. Program Objectives Assessment

S. #	Objective	How Measured	When Measured	Improvement Identified	Improvement made
1	Development & strengthening of Plant Pathology discipline at AAUR	On the basis of recognition, importance & impact of plant diseases in the area	It is a continuous & dynamic process	Teaching methods need to be improved	Teaching methods have been revised and developed on modern lines
2	To impart basic & applied education to the graduate and Post-graduate students	Back ground information and status of knowledge of students through entry tests and students feed back	At the time of admission or semester	Some basic courses need to be included in the curriculum	Revision of curriculum as per requirement
3	Guidance to students in research/ internship	Assessing interest of students, students feed back	Before start of projects	Students to make presentations and reports	Presentations, seminars, communication skills development
4	Integration of related fields	Through entry tests, interviews research interests	Subject/ courses attachment before start	Related subjects to be recommended for studies	Enhancement of knowledge and vision
5	Anticipation of new teaching/ researchable areas	Through surveys, monitoring of diseases and identity of priority problems	Continuous activity	New courses to be included in curriculum, research on new problems	Approval of new curriculum integrated approaches
6	Inculcation of interest and spirit in academics and research in Plant Pathology	No. of research publications, techniques introduced; research projects submitted & completed; evaluation by students and efficiency in disease diagnosis	During the whole academic year	Use of advanced techniques in disease monitoring and evaluation; interaction between farmers and scientists; maintenance of pathogen cultures and provision to students	Research papers published in reputed journals; approval of projects; strengthening of Plant Pathology; application of new immunological & DNA-based techniques

Programme Learning Outcomes

All the students in Plant Pathology should possess the ability of:

1. Development of communication skills through presentations, oral discussions, review articles etc
2. Preparation of research projects based upon identification of problems and use of new analytical techniques; such as immunological and DNA-based techniques
3. Identification of priority problems and their solution
4. Enhancement of knowledge and vision
5. Approval of new curriculum integrated approaches
6. Research papers published in reputed journals; strengthening of plant pathology.

A number of surveys based on the QAA questionnaires were conducted to assess the program outcomes/graduates of the Department.

Standard 1-2: The program must have documented outcomes for graduating students. It must be documented that the outcomes support the program objectives and that graduating students are capable of performing these outcomes.

Table 2 shows that outcomes of the programme are aligned with each objective

Table 2: Programme outcomes and their relationship with objectives

		Objectives					
Outcomes		1	2	3	4	5	6
	1	+++	+++	+++	+	++	++
	2	++	++	+++	++	++	+++
	3	++	+++	++	+	++	+++
	4	+++	+++	+++	+++	++	+
	5	+++	+++	++	+++	++	+++
	6	+	++	+++	+	+++	++

+ = Moderately satisfactory

++ = Satisfactory

+++ = Highly satisfactory

Program Assessment Results

Teachers' Evaluation

There are 8 teachers in the department that are numbered 1-8 without mentioning their names. The teachers were evaluated by the students at the end of the semester in accordance with Proforma-10 (Annexure-X). The results are graphically presented in Fig-1. The overall compiled results showed that Teacher-1 is on the top scoring 4.66 points out of 5 while teacher 8 is on the bottom securing 3.47 scores. The grading of other teachers can be seen from the graph.

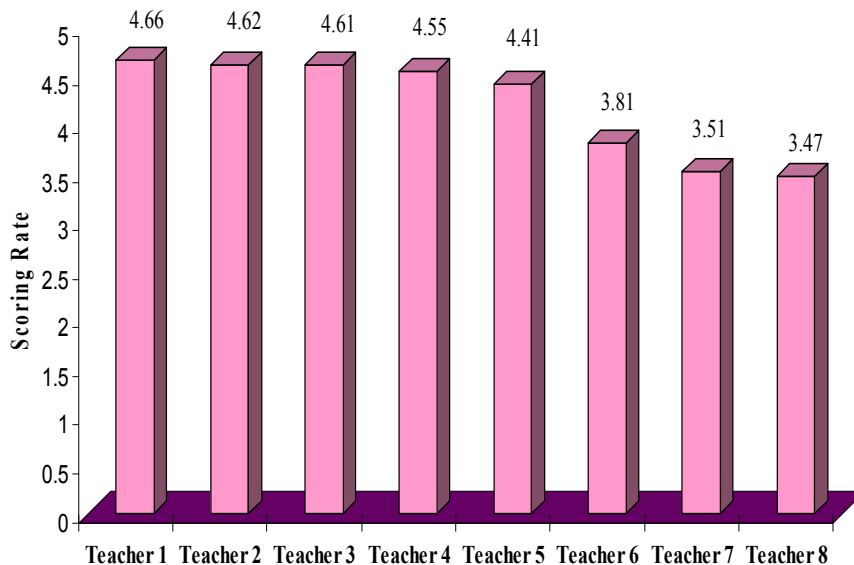


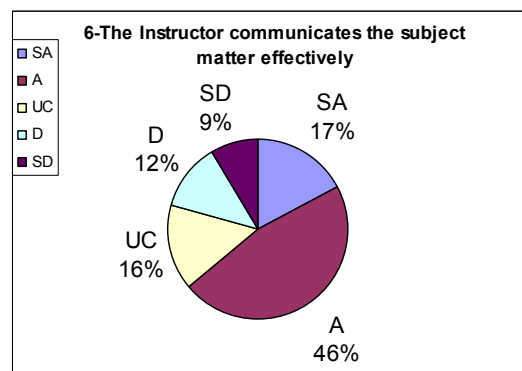
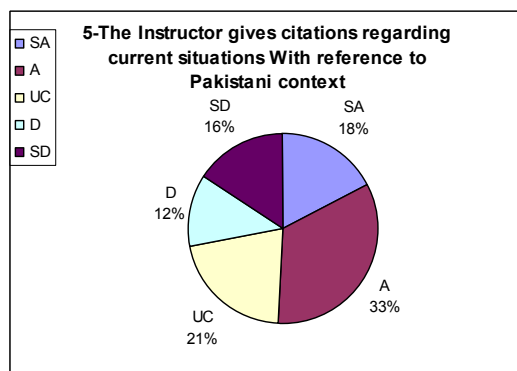
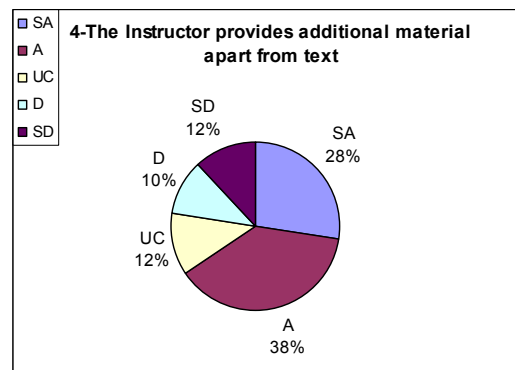
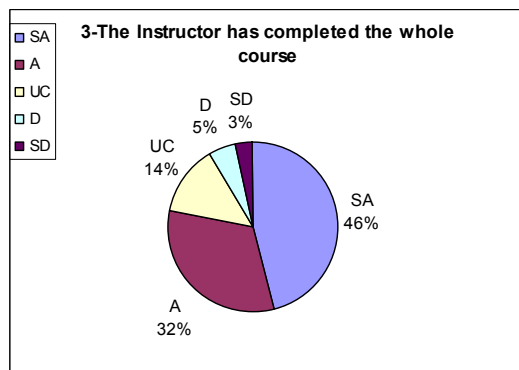
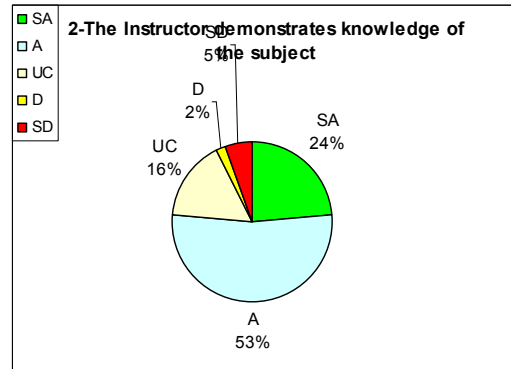
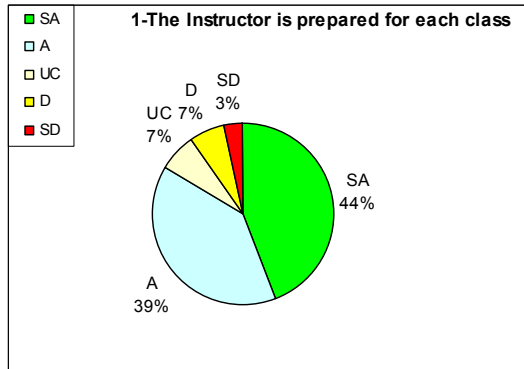
Fig.1 Teacher Evaluation

Detail of individual performance of each teacher is obvious from the Pie-charts given below.

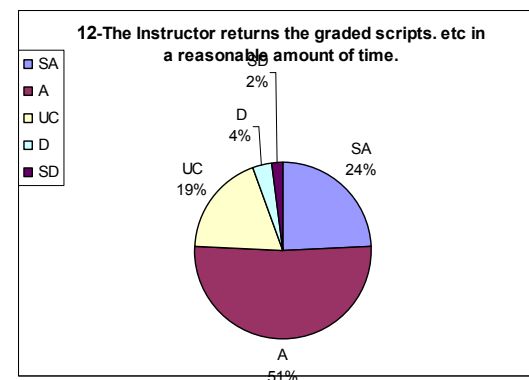
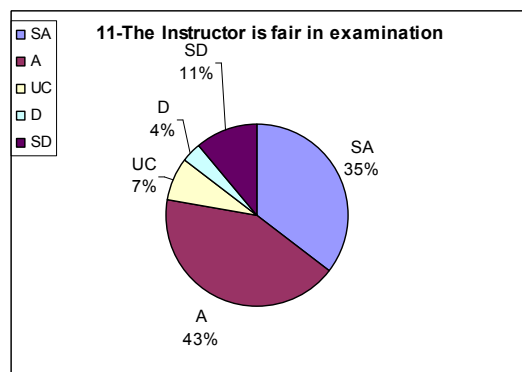
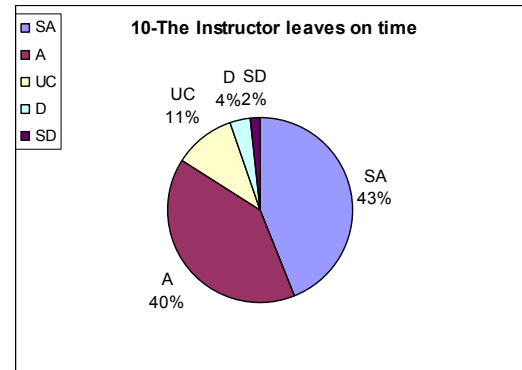
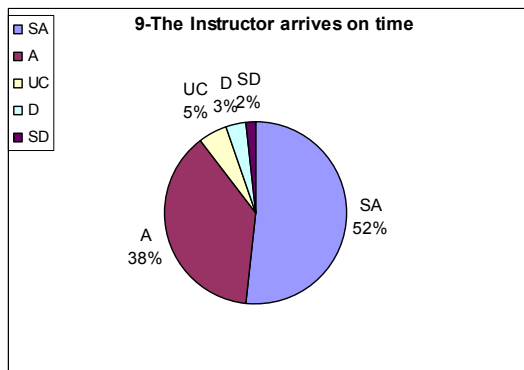
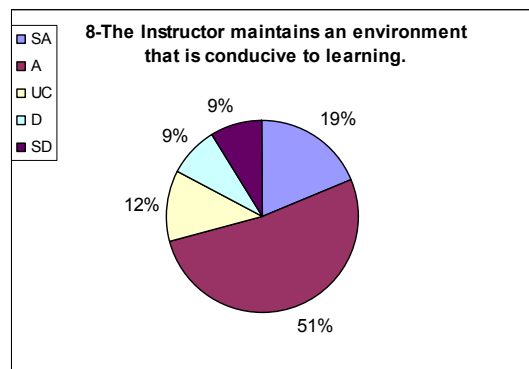
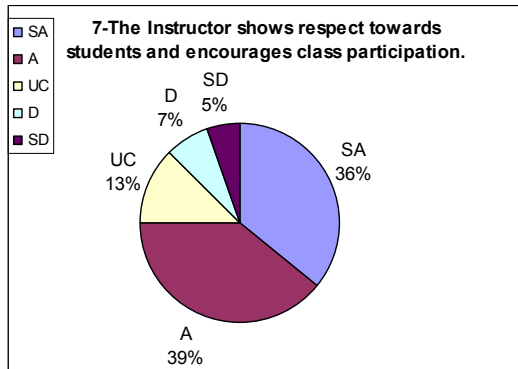
Teacher 6 (PP 402)

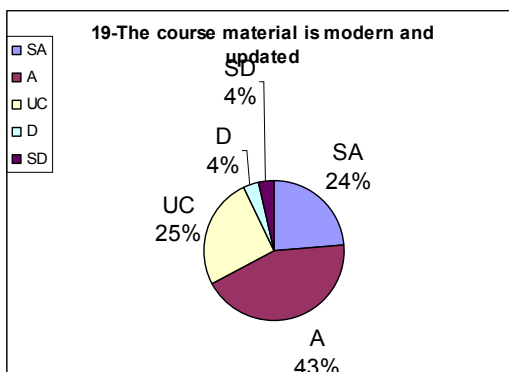
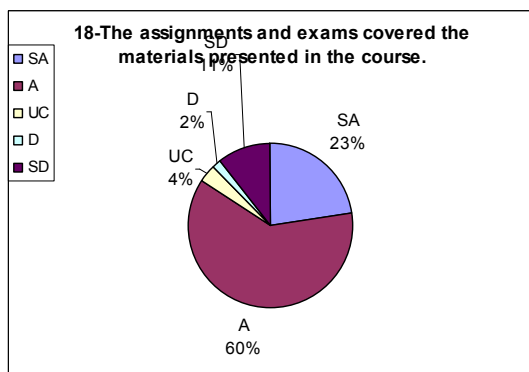
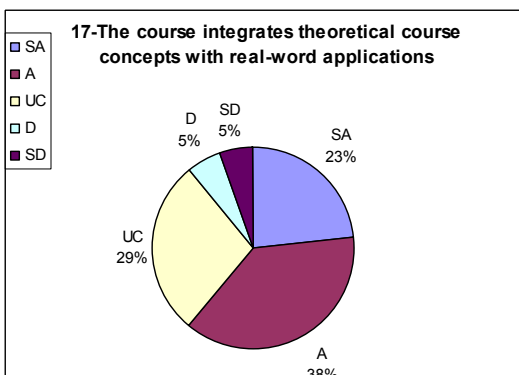
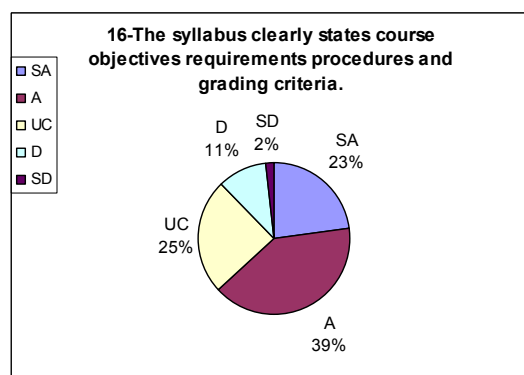
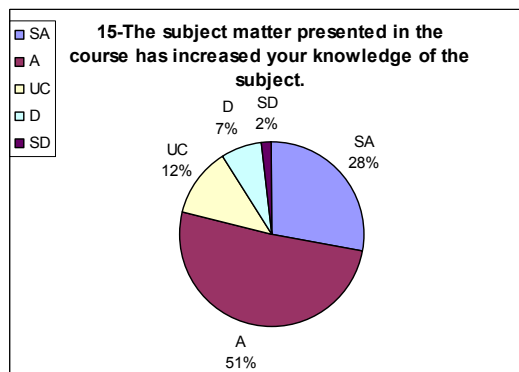
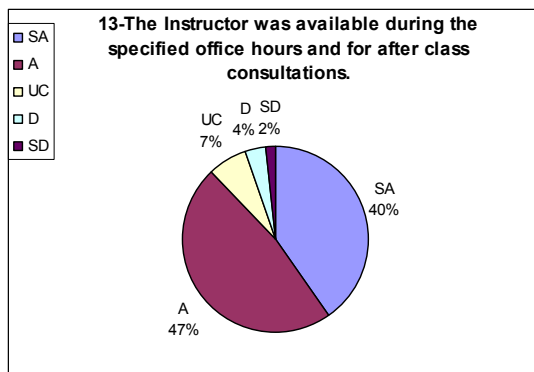
Pie charts show that the students were satisfied with the performance of the teacher. However more than 28 % students revealed that the teacher did not give citation regarding current situations with reference to Pakistani context. Similarly more than 21 % students were not satisfied with teacher's communication. However the 70 %

students were of the view that the teacher maintained conducive environment for learning. Similarly 78 % students stated that the teacher was fair in the examination. However only 62 percent students depicted that the syllabus clearly stated course objectives.



SA= Strongly Agree; A= Agree; UC= Uncertain; D= Disagree; SD=Strongly Disagree





General Comments of the Students about this Teacher

Weaknesses:

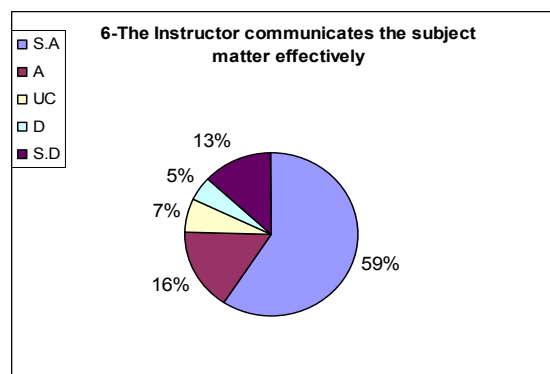
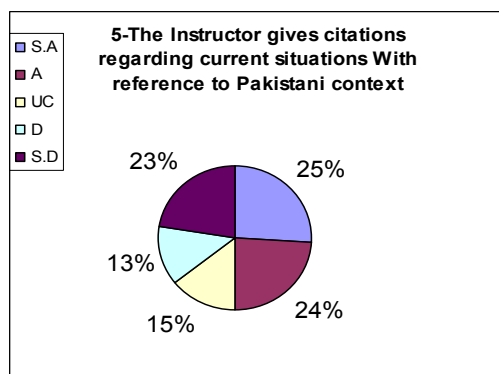
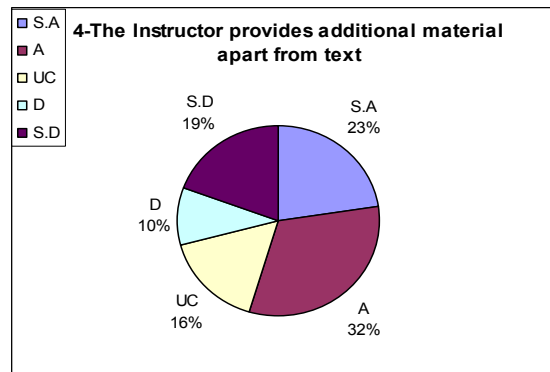
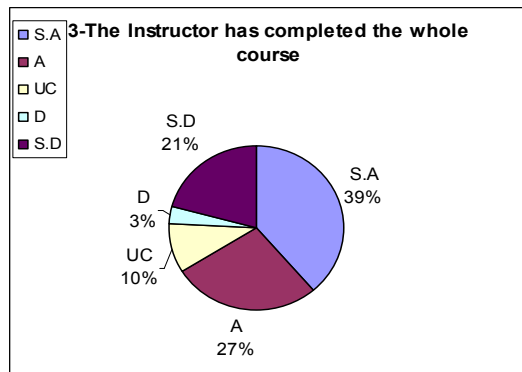
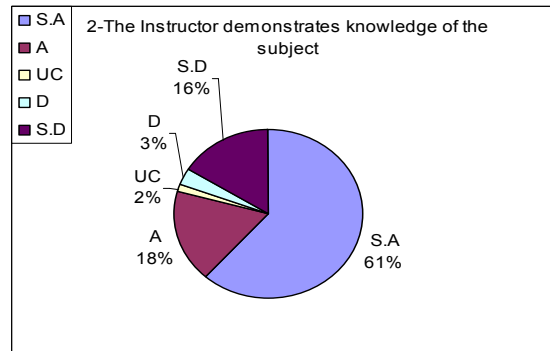
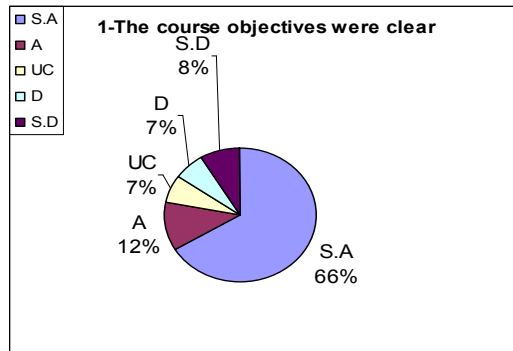
- Teacher did not encourage students' participation.
- Teacher was not able to teach this course.
- Teacher should improve his teaching skills.
- Teacher should include modern concepts in his lectures.

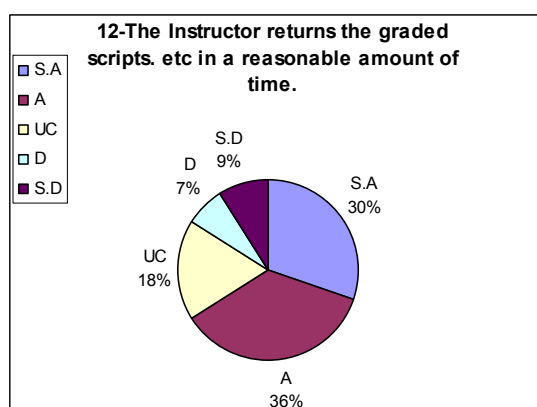
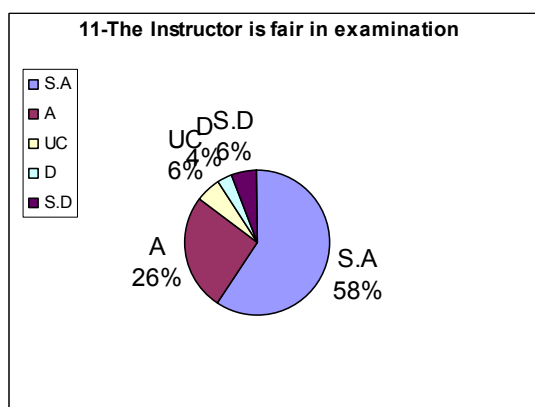
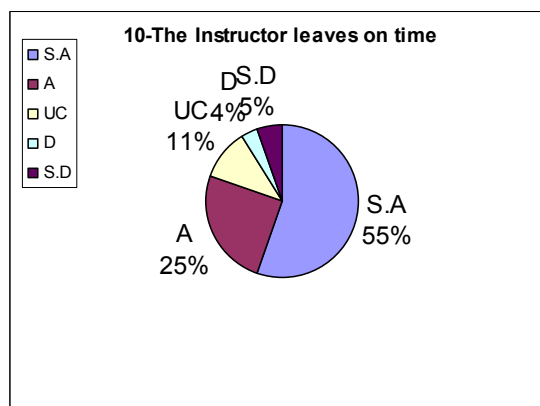
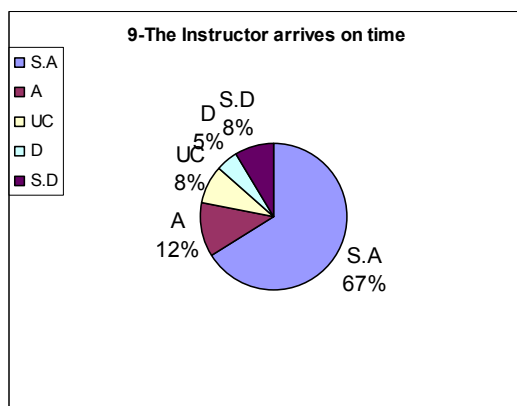
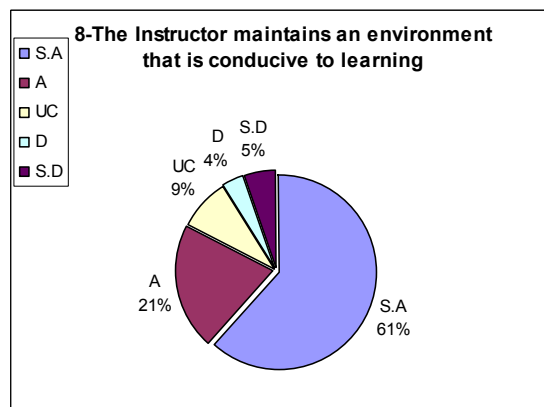
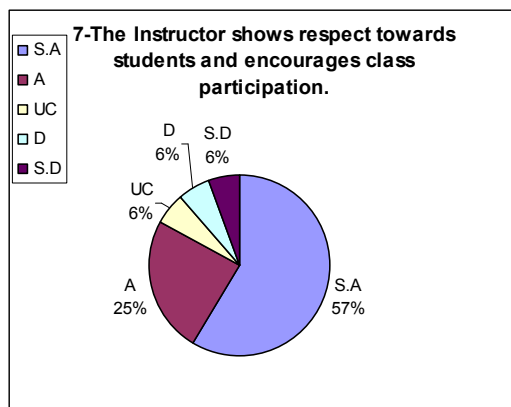
Strengths:

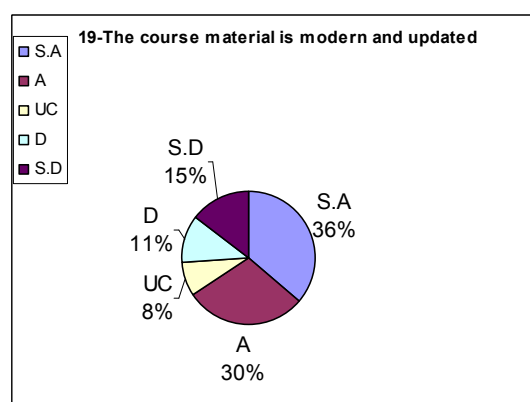
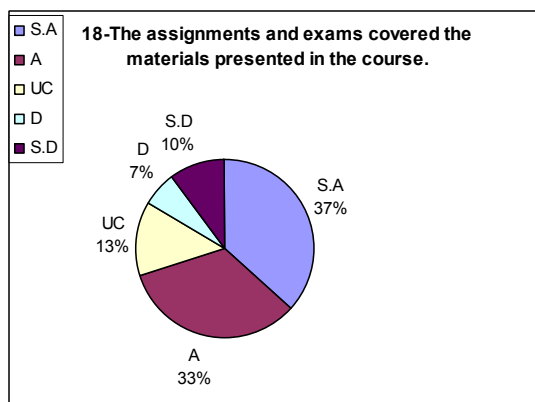
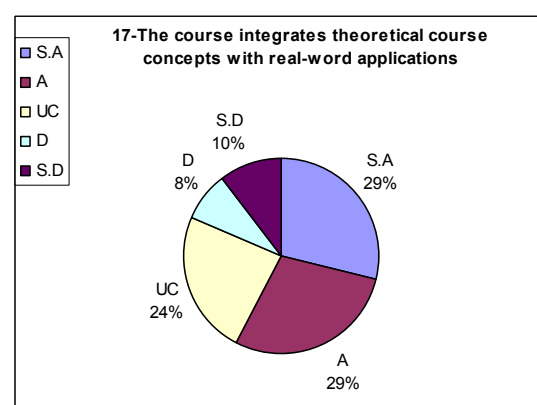
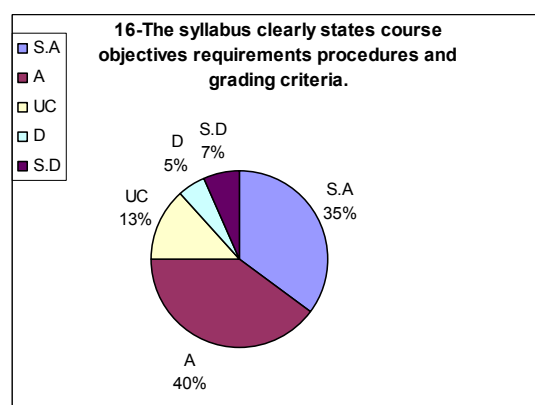
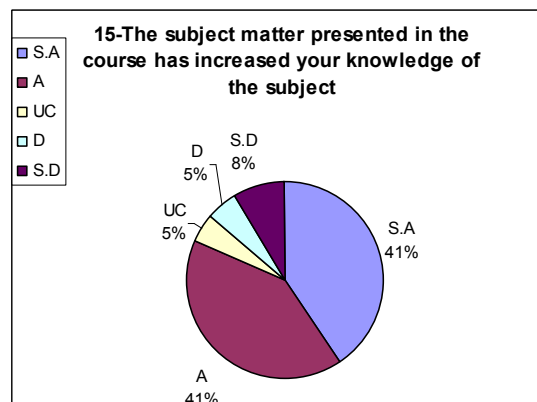
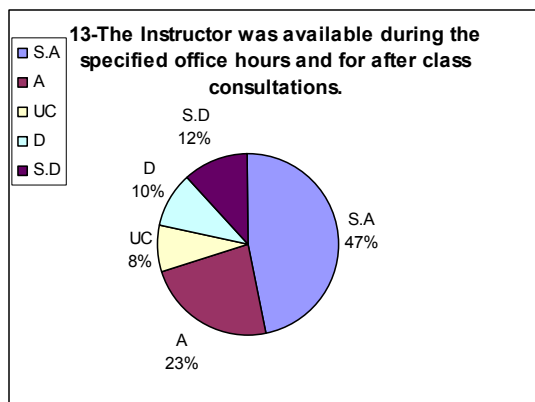
- Teacher was good in behavior.

Teacher 8 (PP 402)

The survey results presented below show that only 66 % students agreed that course objectives were clear. Similarly 55 % of the students agreed that the teacher used to give them additional material apart from text. Whereas 49% students agreed that the teacher gave citations regarding current situation with reference to Pakistani context. Likewise 58 % students agreed that the course was intergraded with real world applications. However 80% students agreed that the teacher was punctual and showed respect toward students.







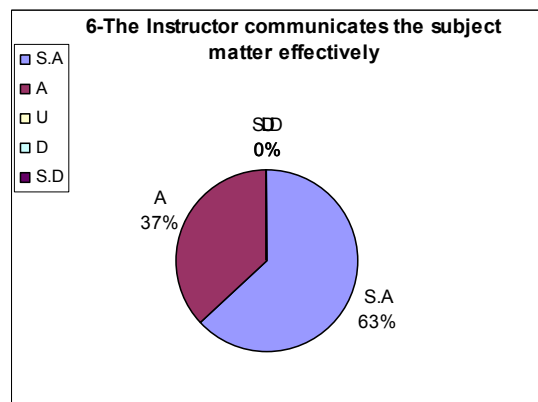
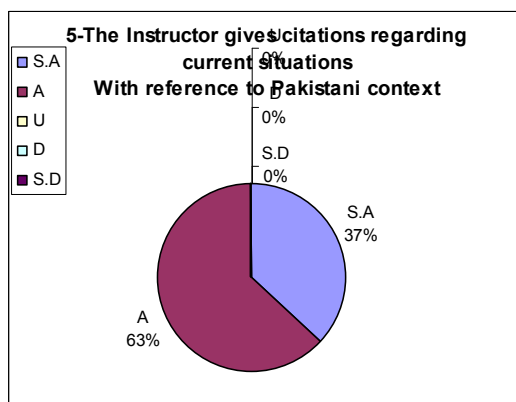
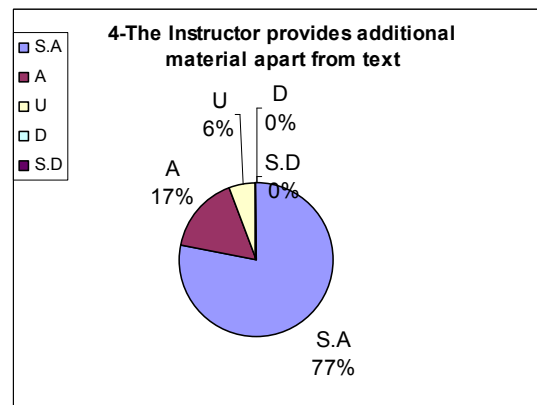
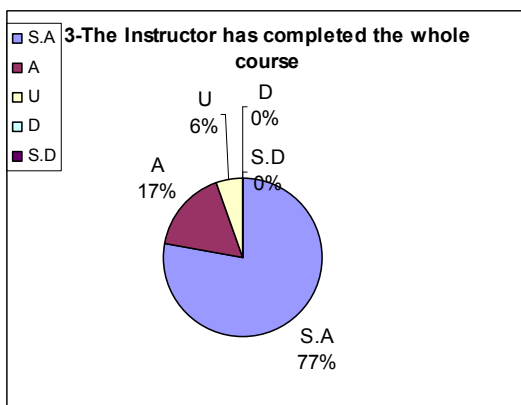
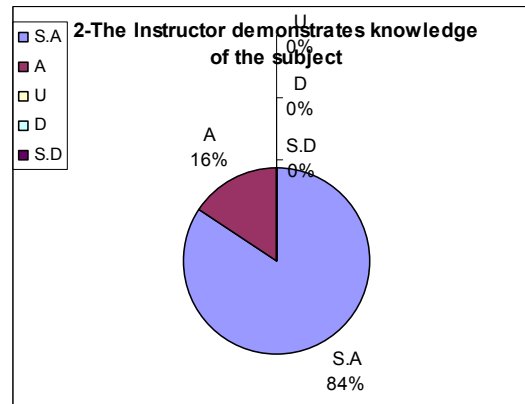
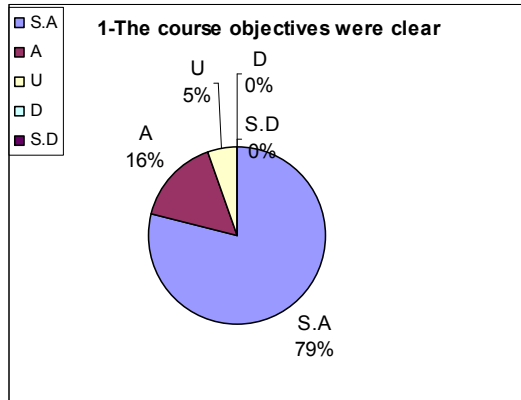
General Comments of the Students about the Teacher

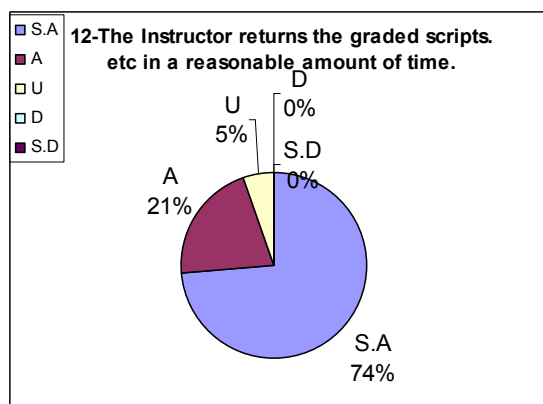
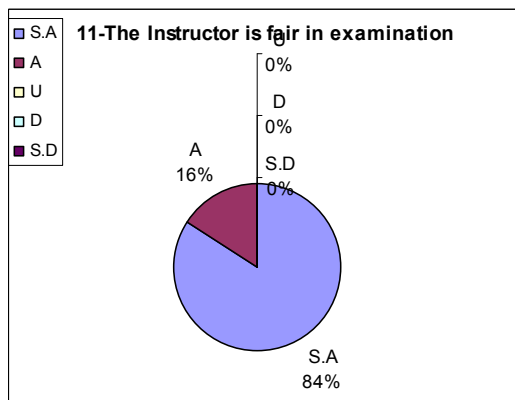
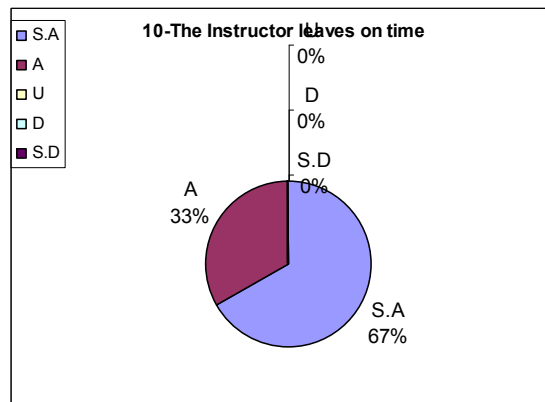
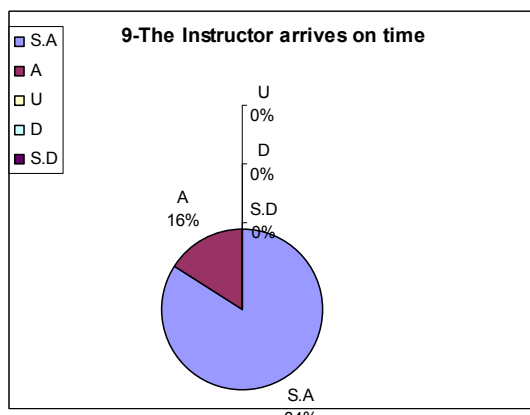
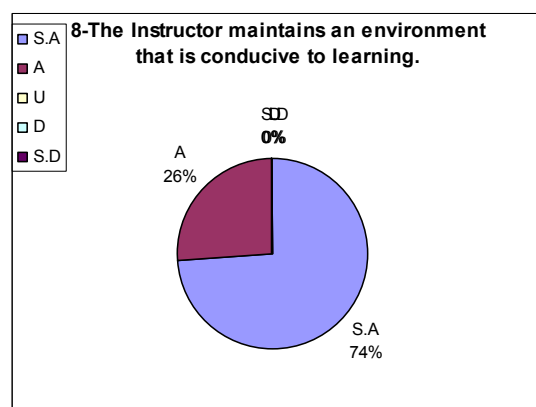
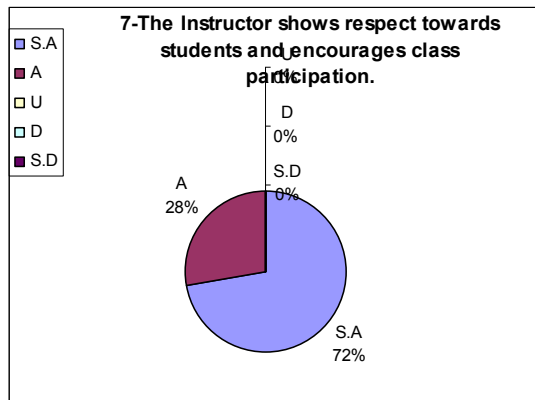
Weaknesses:

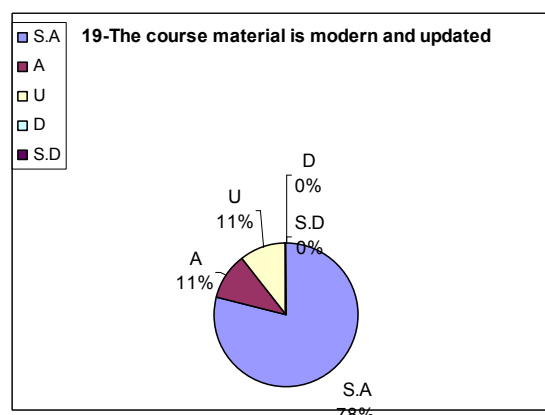
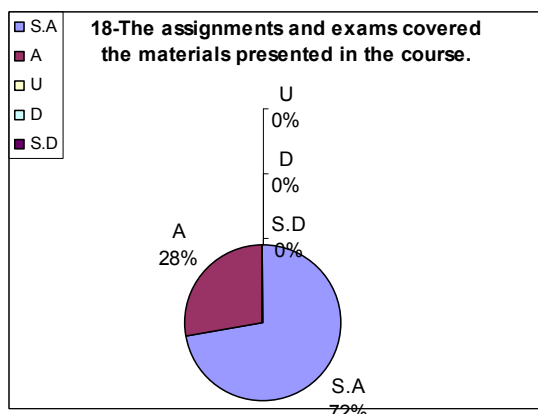
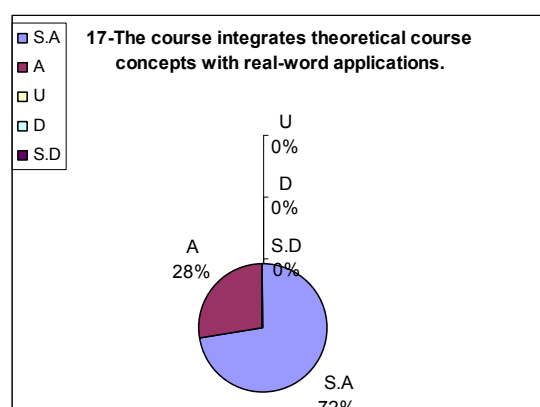
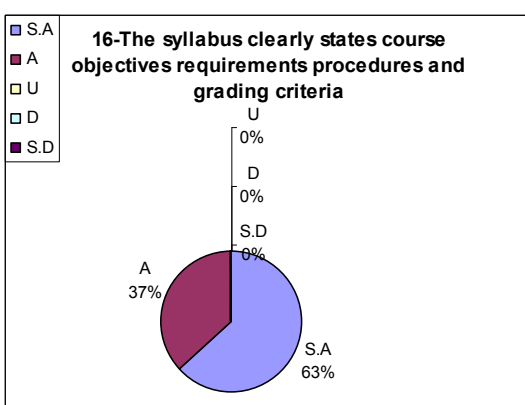
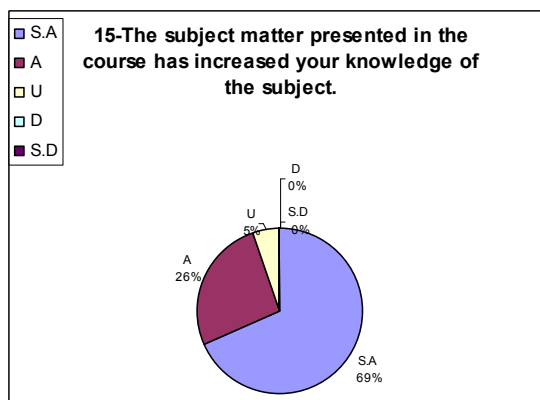
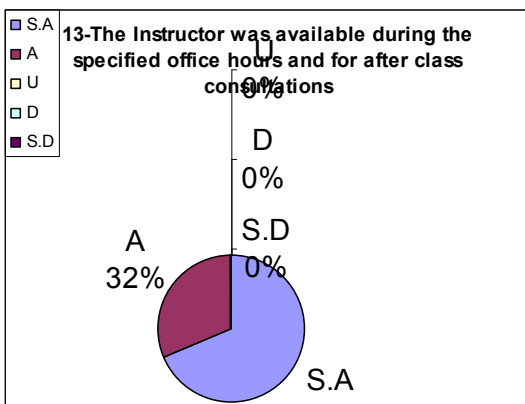
- Teacher confused us with syllabus.
- Teacher should encourage class participation.
- Teacher should improve his teaching skills.
- Pattern of lectures changes-dictates lectures.
- Sometimes he was not available for lectures and other teachers took our classes for him, which confused us.

Teacher 2 (PP 510)

As is evident from the following graphs, overall performance of the teacher rated by the student is excellent.







General Comments of the Students about the Teacher

Weaknesses:

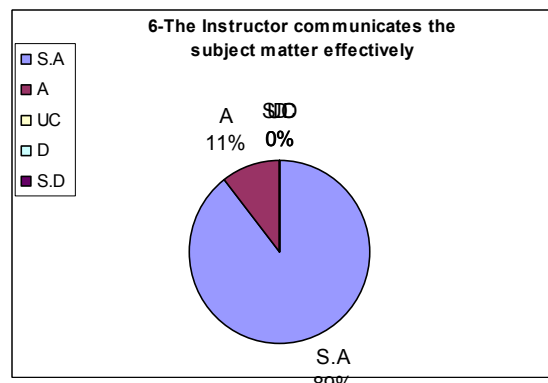
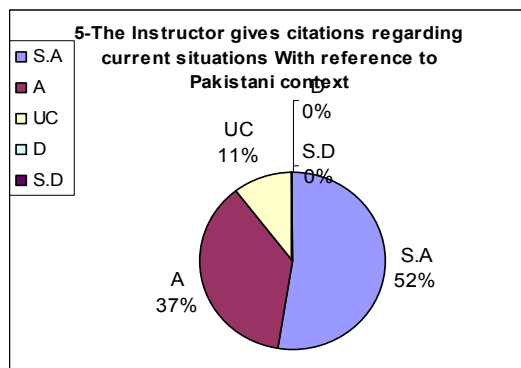
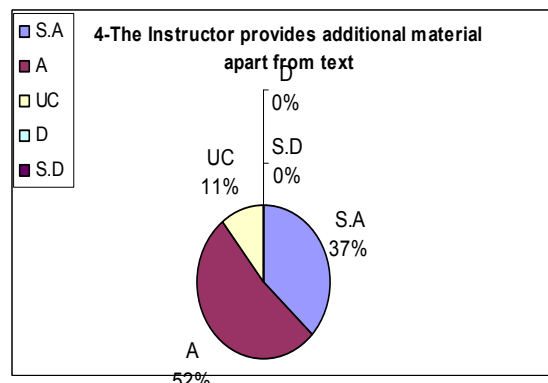
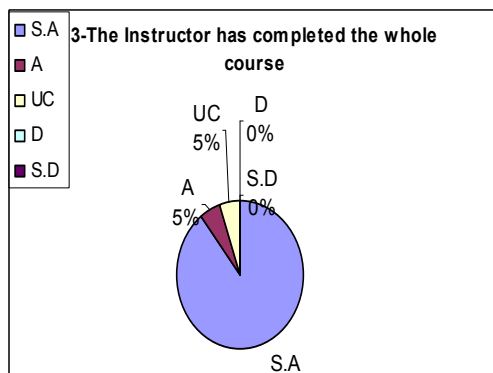
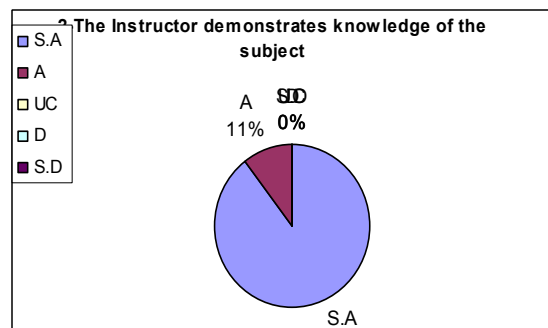
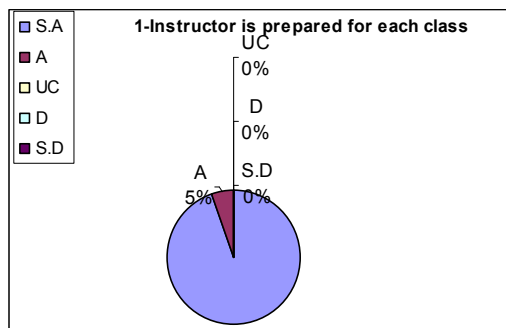
- Teacher should teach the course regularly throughout the semester.
- Teacher should improve her teaching skills.
- Teacher did not hold proper practicals.
- Teacher should arrange field visits and study tours to learn more practically.

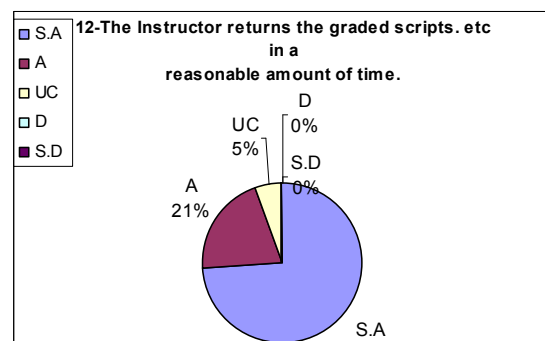
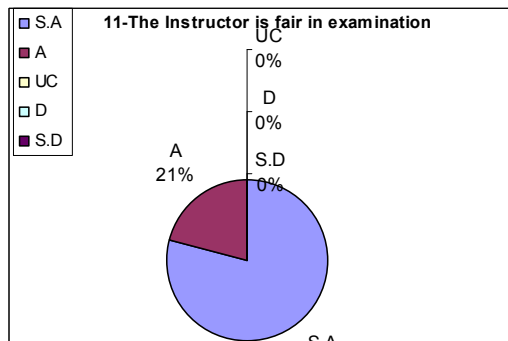
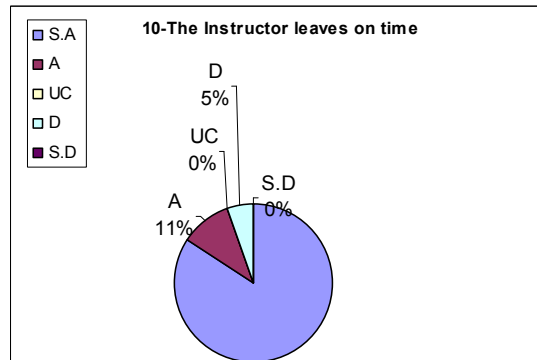
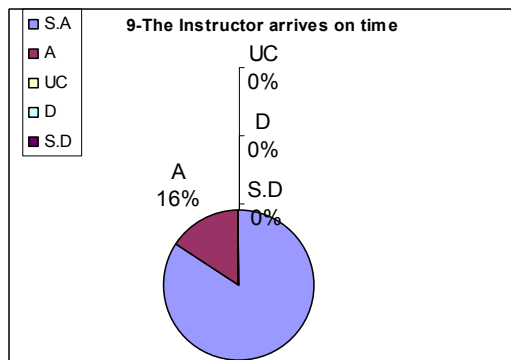
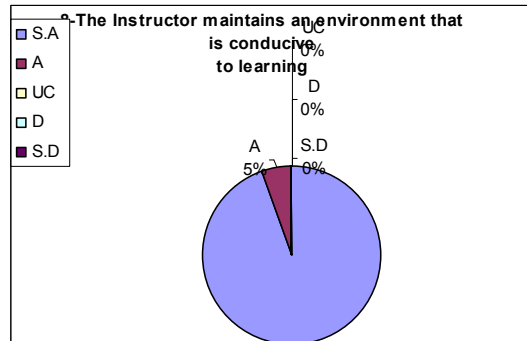
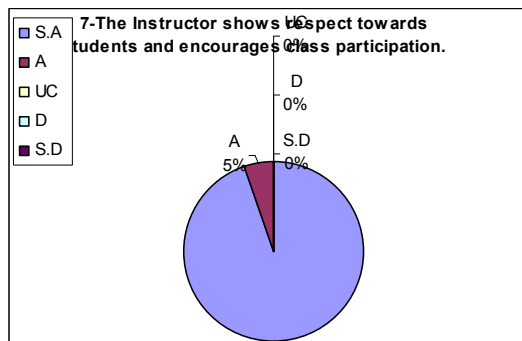
Strengths:

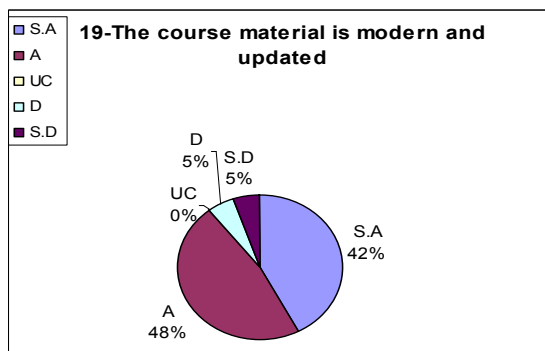
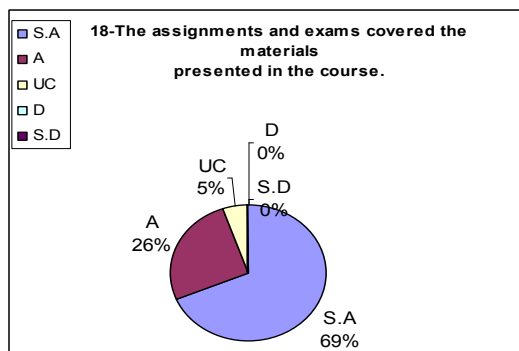
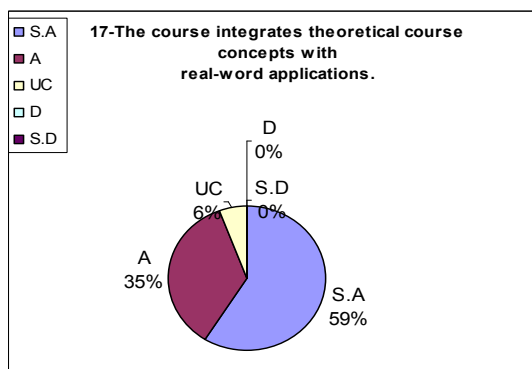
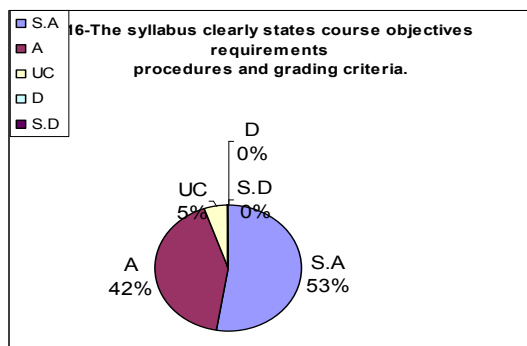
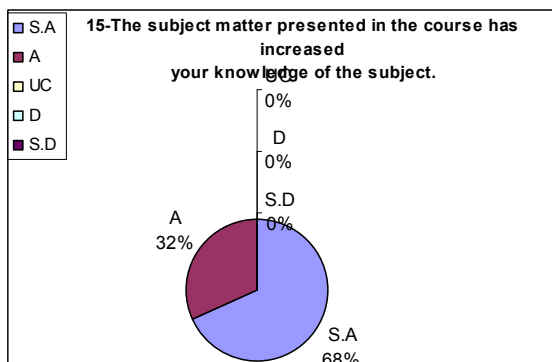
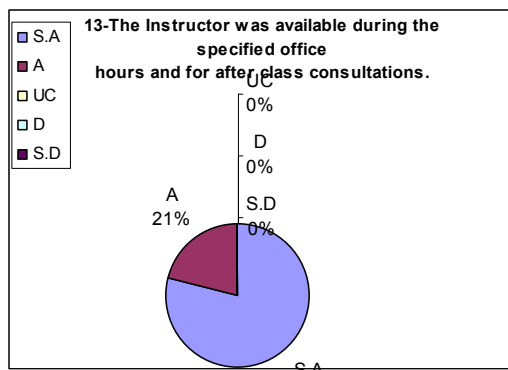
- Teacher encouraged class participation.
- Teacher was guiding.

Teacher 1 (PP 508)

The following graphs show that overall the performance of the teacher rated by the students is excellent. The teacher was punctual, showed respect to the students and gave additional material for learning.







General Comments about the Teacher

Weaknesses:

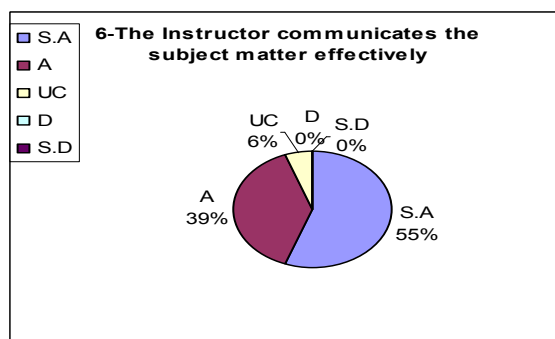
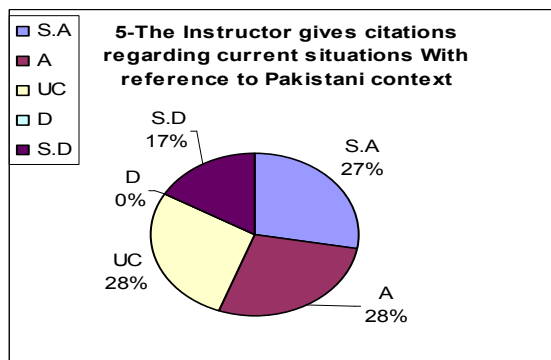
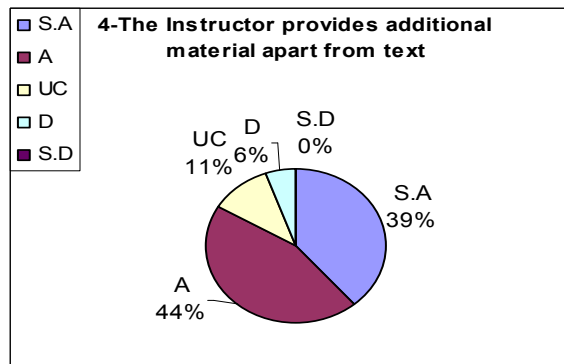
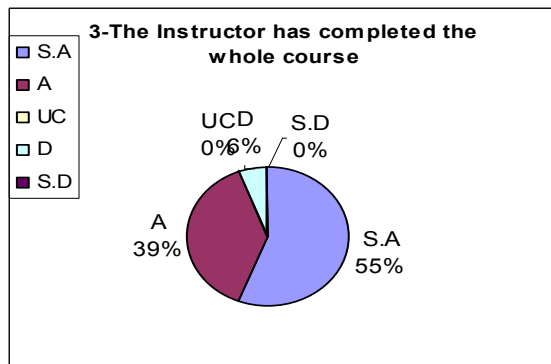
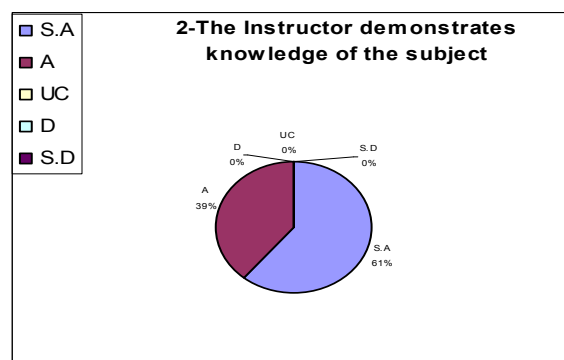
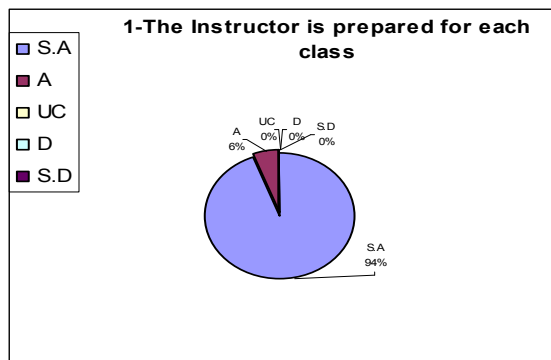
- Teacher should take Quizzes from students.
- Teacher should improve his concepts with modern knowledge.

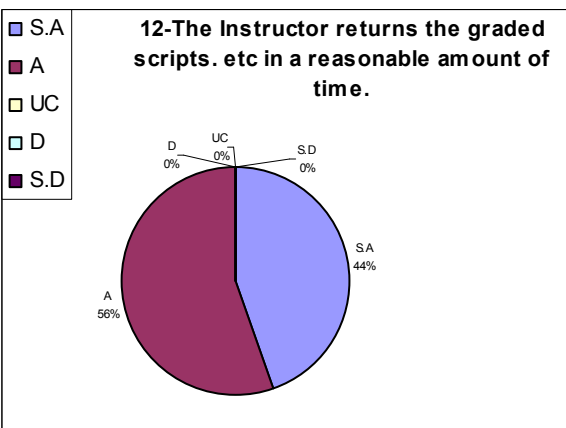
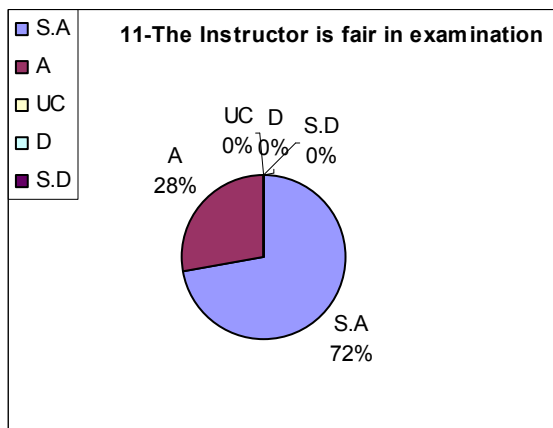
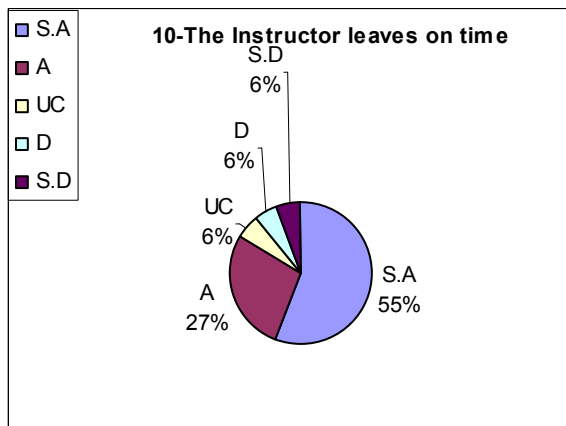
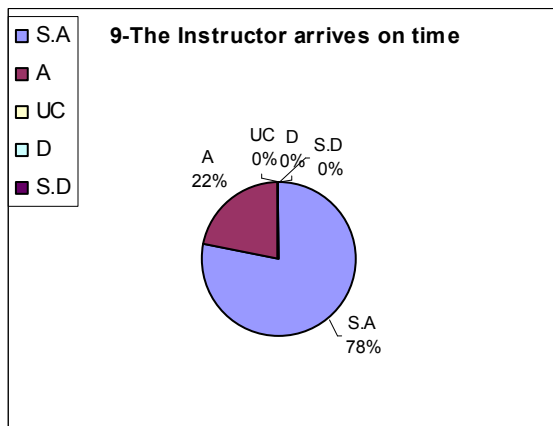
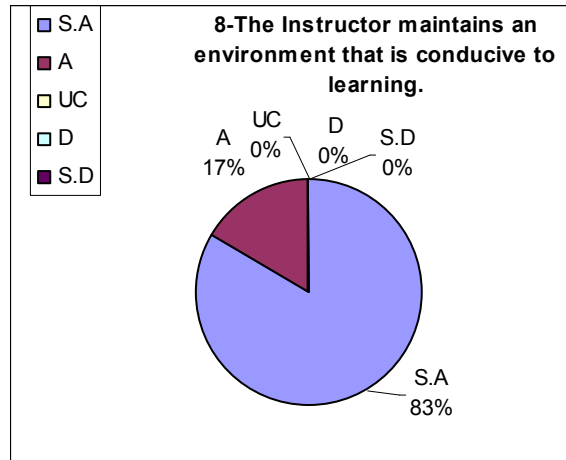
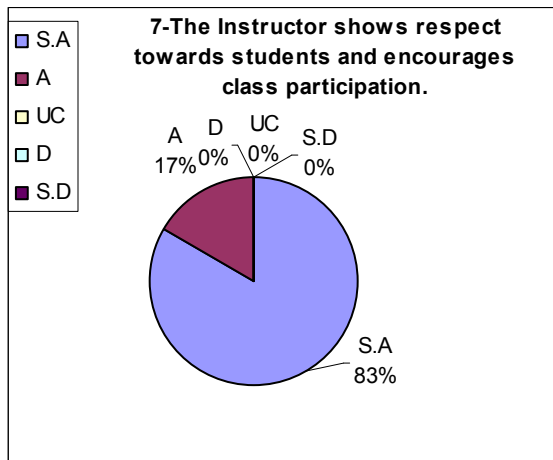
Strengths:

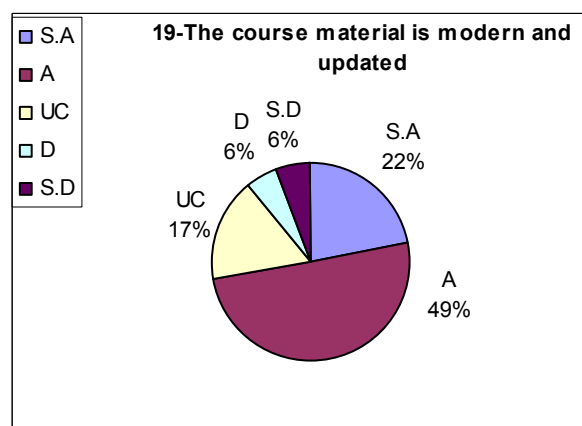
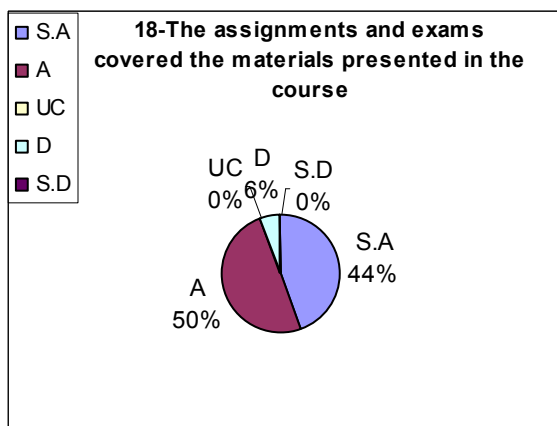
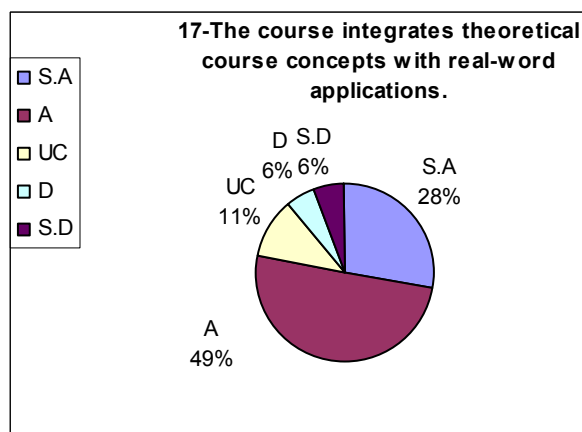
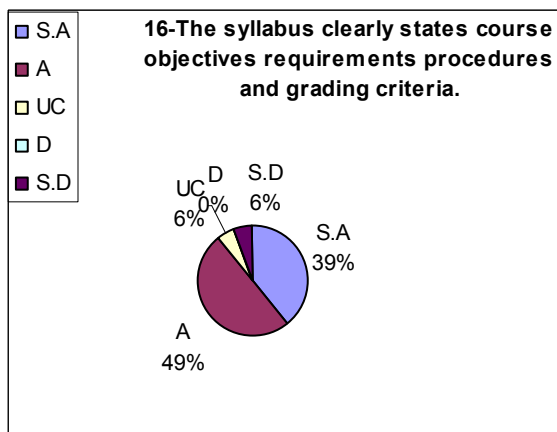
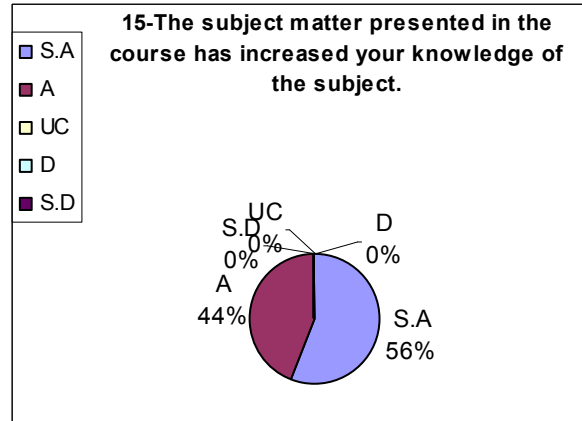
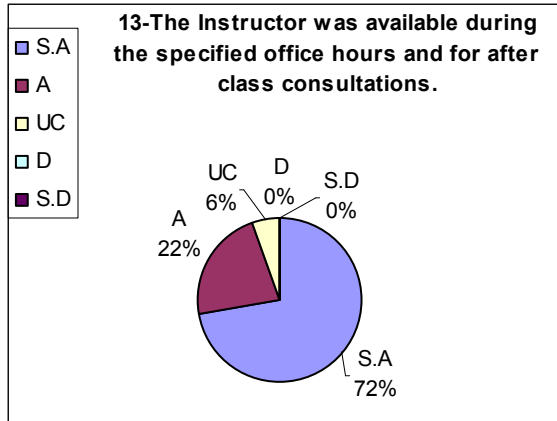
- Teacher was encouraging and helpful.
- Teacher was hardworking and friendly.

Teacher 5 (PP 506)

It is evident from the following graphs that overall performance of the teacher remained satisfactory. Only 6% students revealed that the teacher did not give them additional material other than text. However 45 % did not agree that the teacher used to give them citations regarding current situations with reference to Pakistani context. Regarding punctuality, 82 % students agreed that the teachers leave on time. Twenty three percent of the respondents did not agree that the course integrates with the real world problems.







General Comments about the Teacher

Weaknesses:

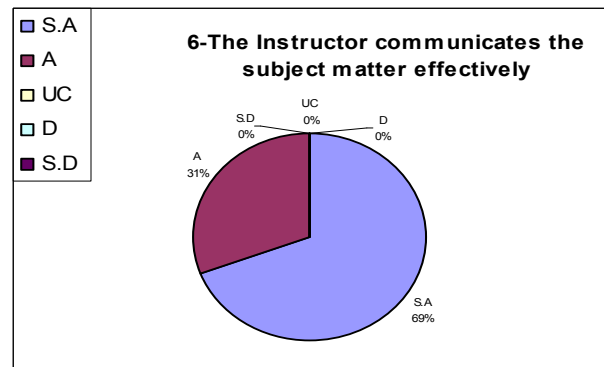
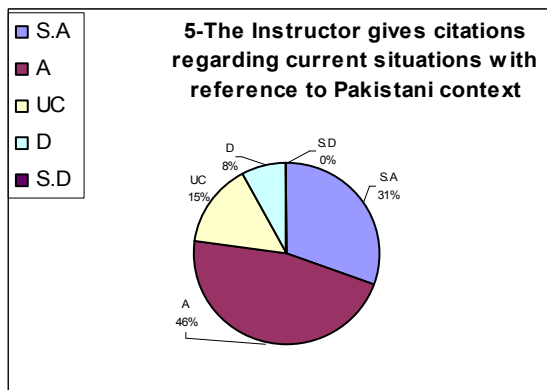
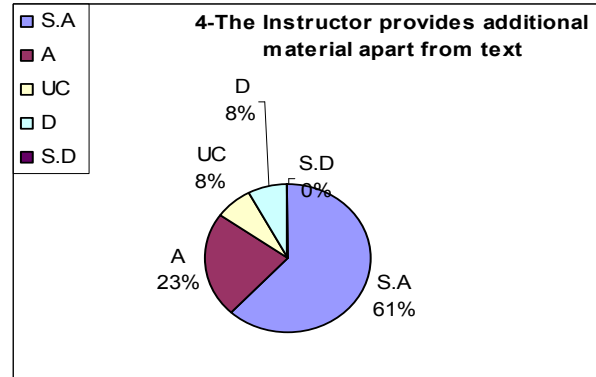
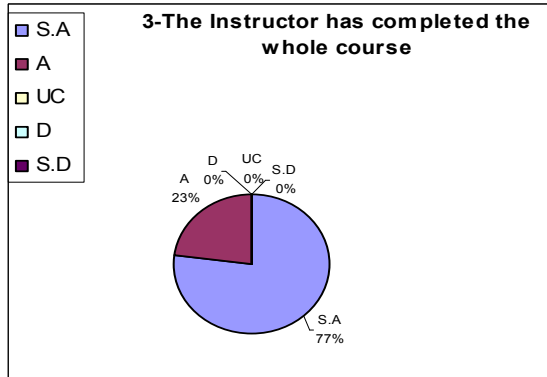
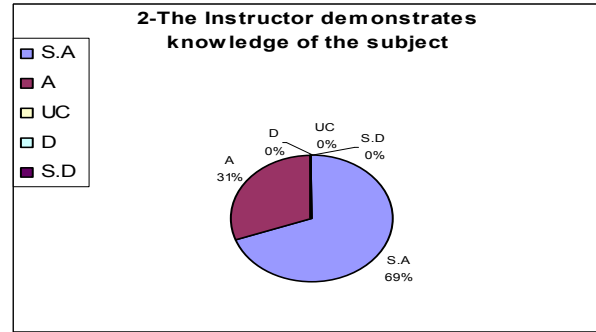
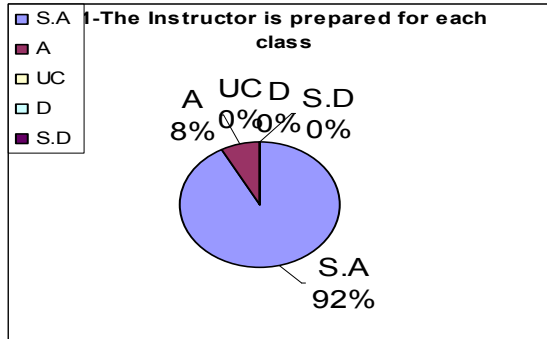
- Teacher should teach the course regularly throughout the semester.
- Teacher should improve her teaching skills.
- Teacher did not hold proper practicals.
- Teacher should arrange field visits and study tours to learn more practically.

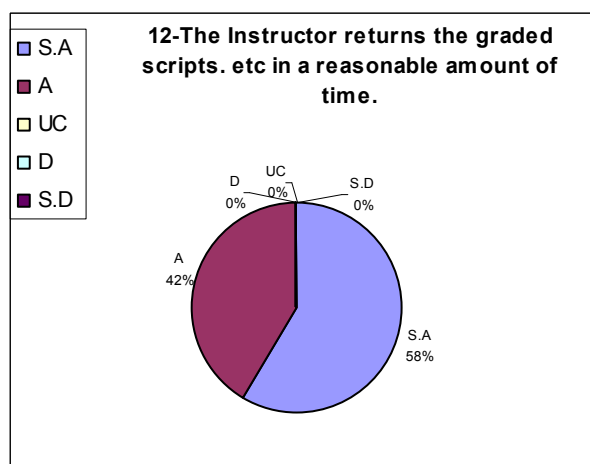
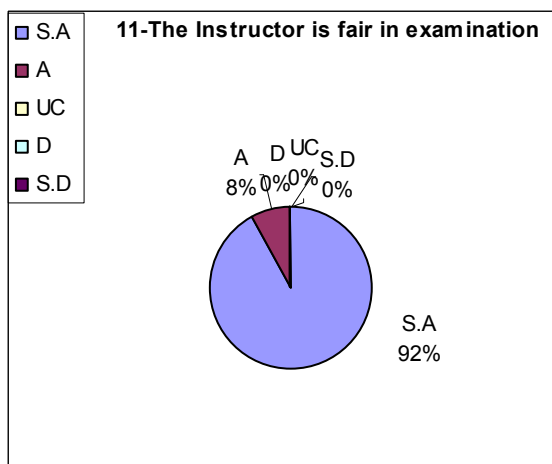
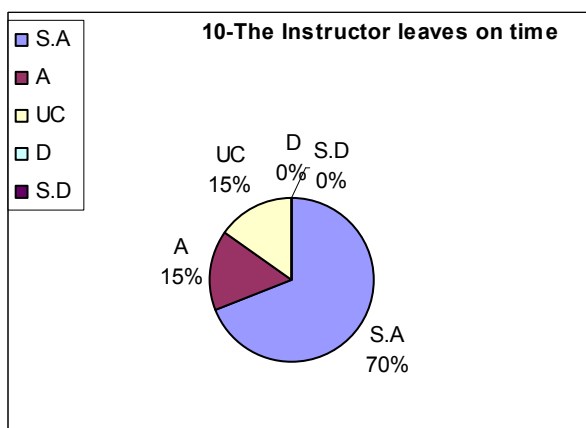
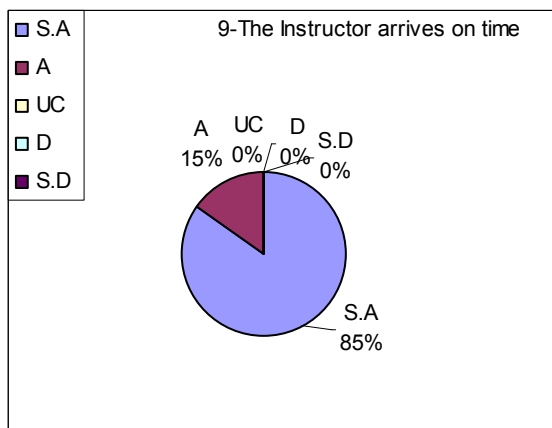
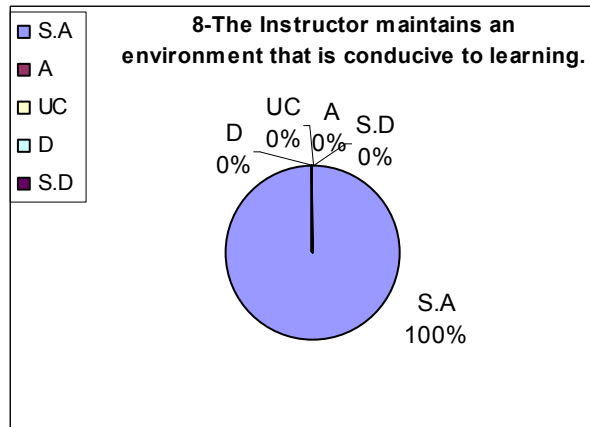
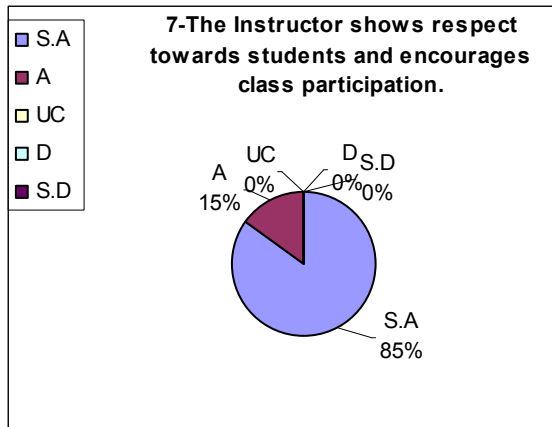
Strengths:

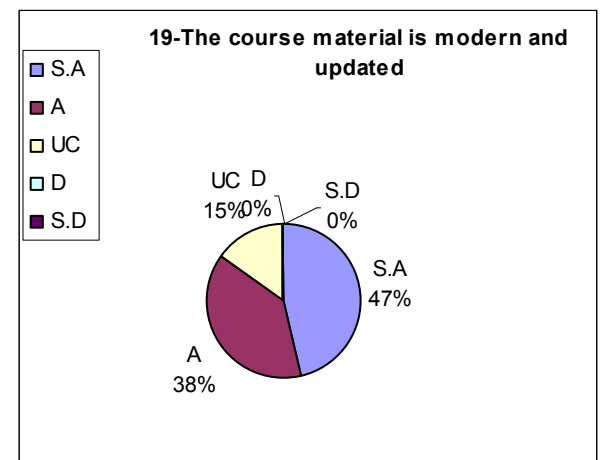
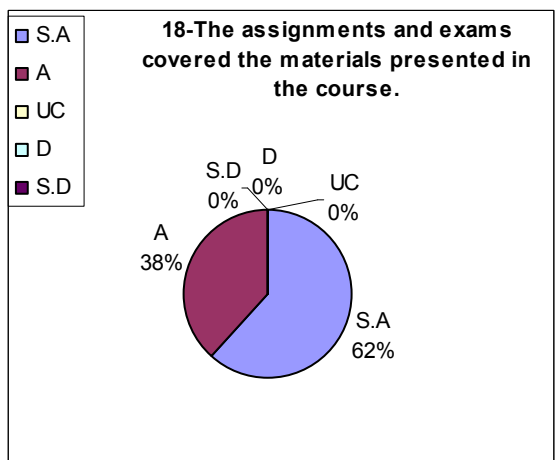
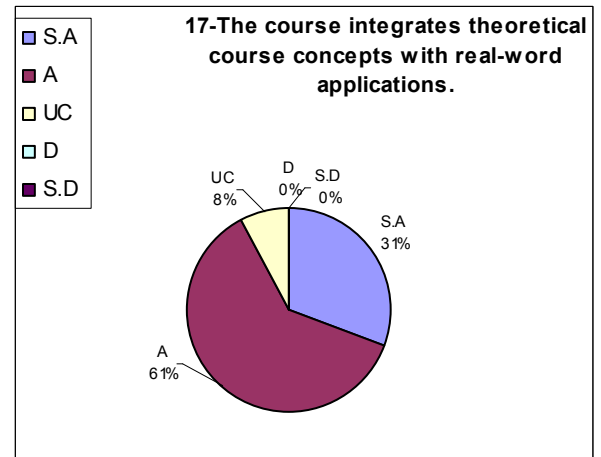
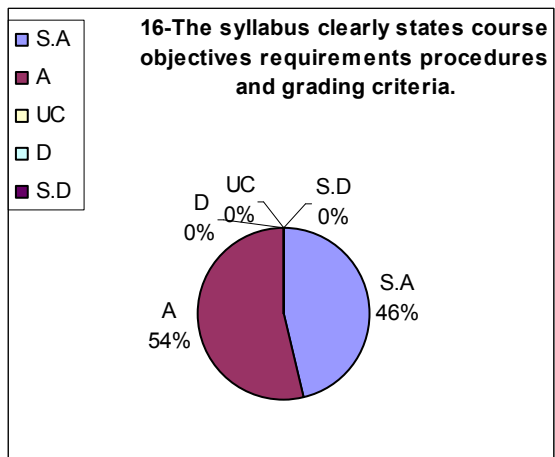
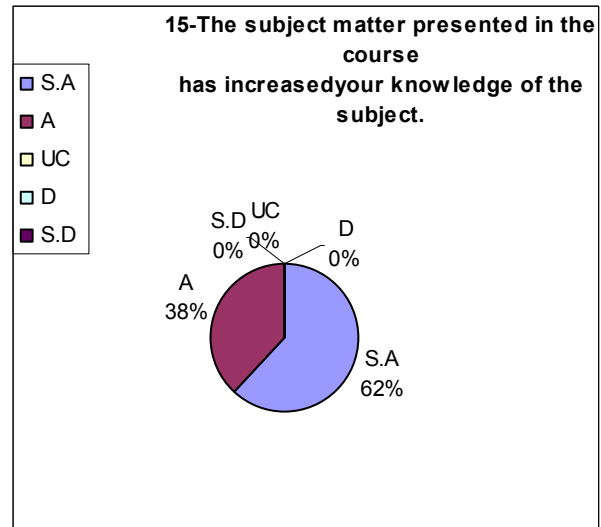
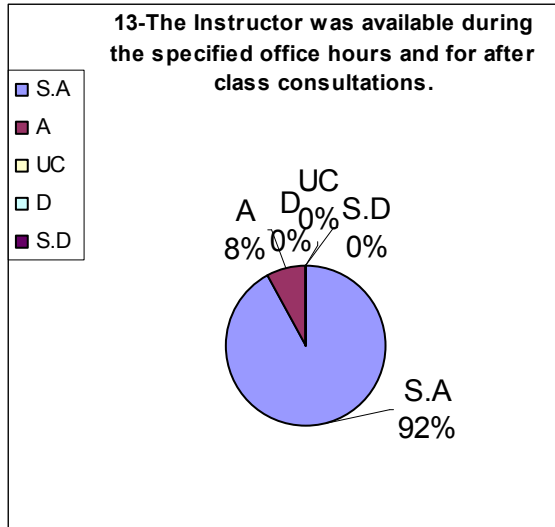
- Teacher encouraged class participation.
- Teacher was guiding.

Teacher 3 (PP 708)

The survey results exhibited satisfactory performance of the teacher. However 16 % respondents did not agree that the teacher used to give them additional material. Likewise 23 % did not agree that the teacher used to give them citations regarding current situations with reference to Pakistani context. Likewise only 15 % students showed uncertain response that the teacher leaves on time. A similar percentage of respondents were uncertain that the course material was updated.







General Comment of Students about the Teacher

Weaknesses:

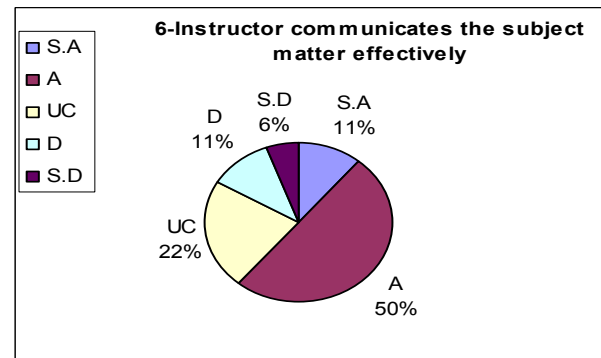
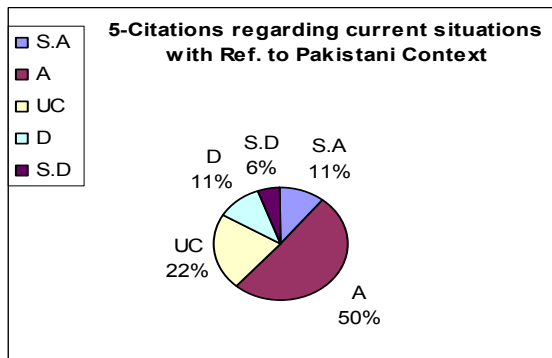
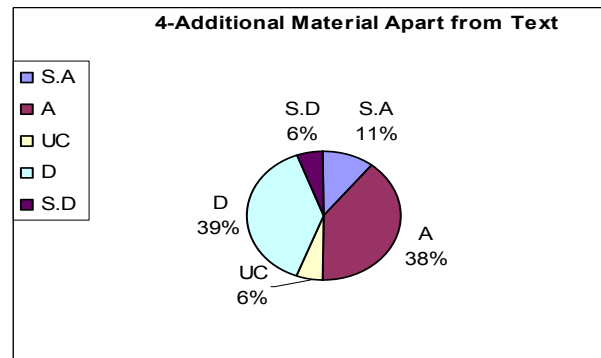
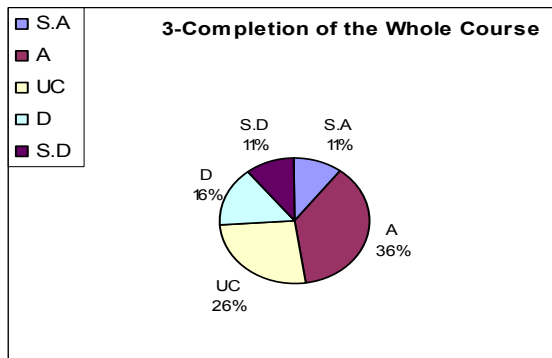
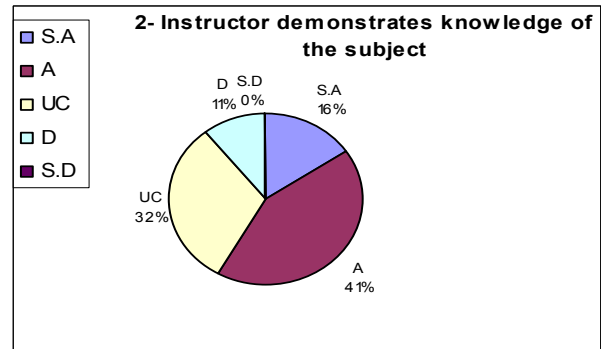
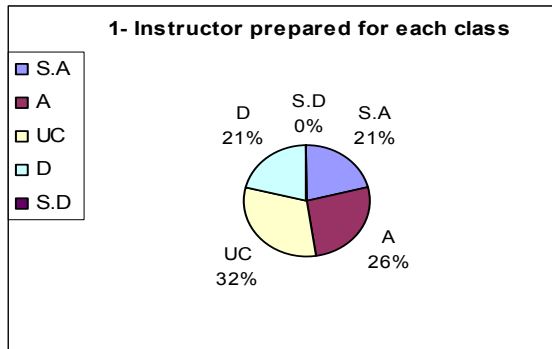
- Teacher should take regular attendance of students.

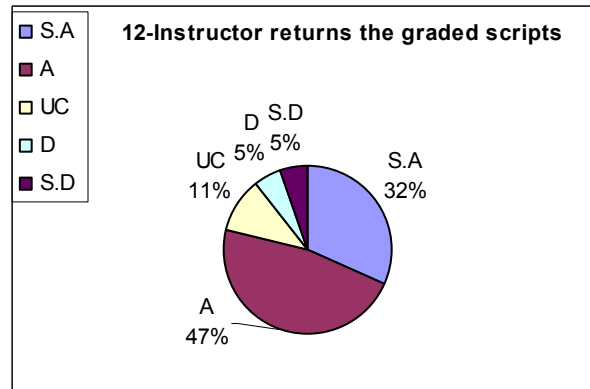
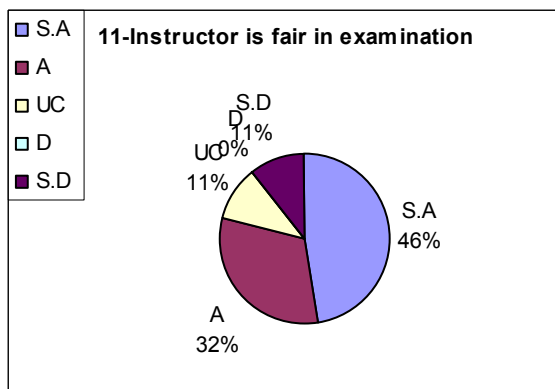
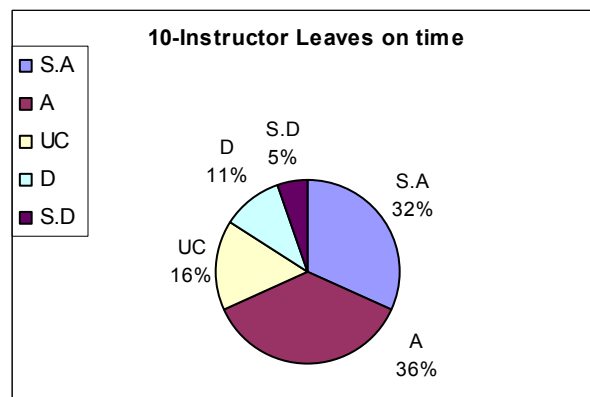
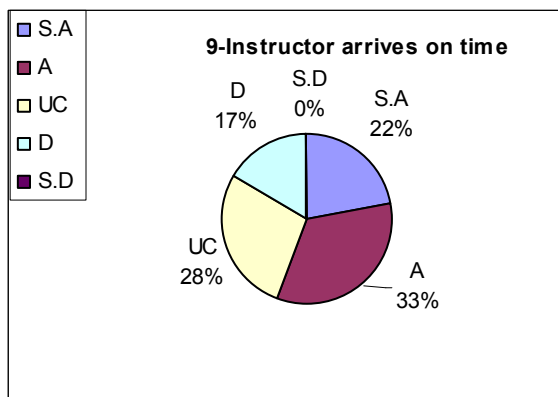
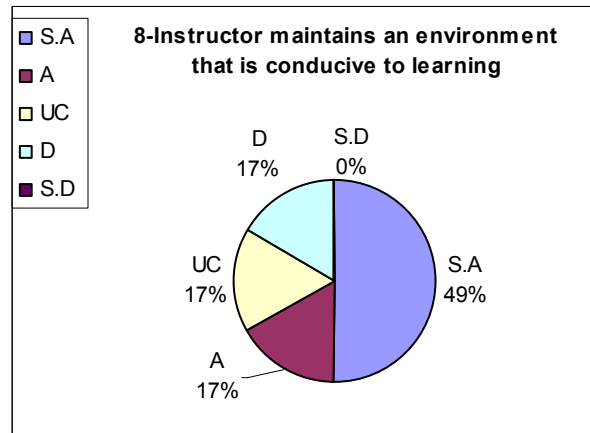
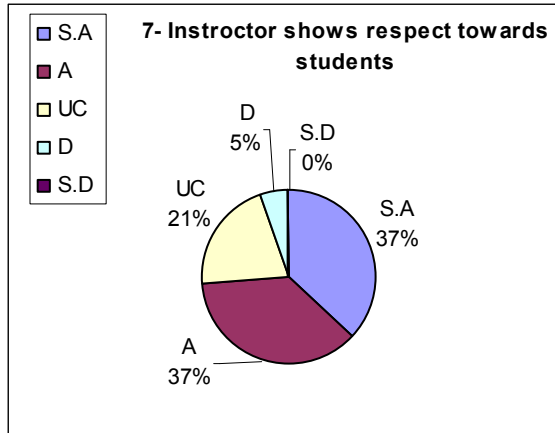
Strengths:

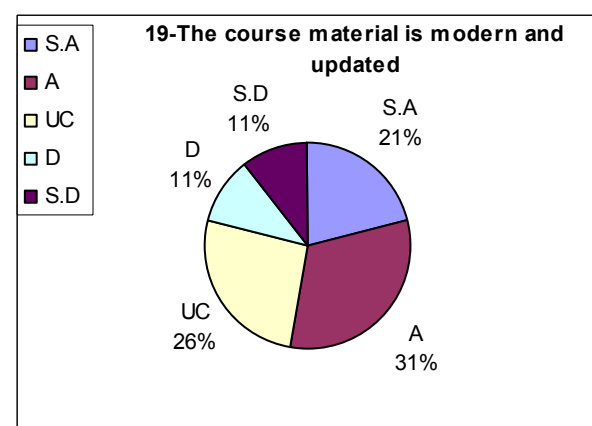
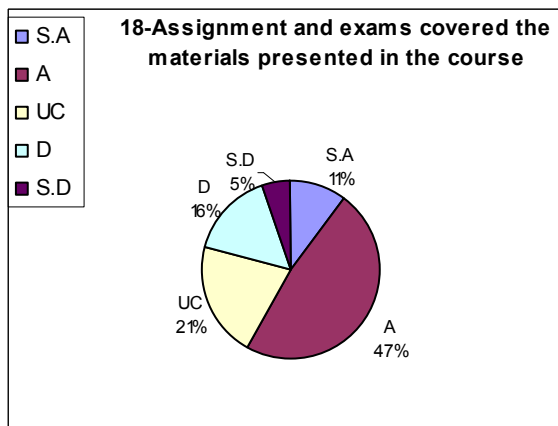
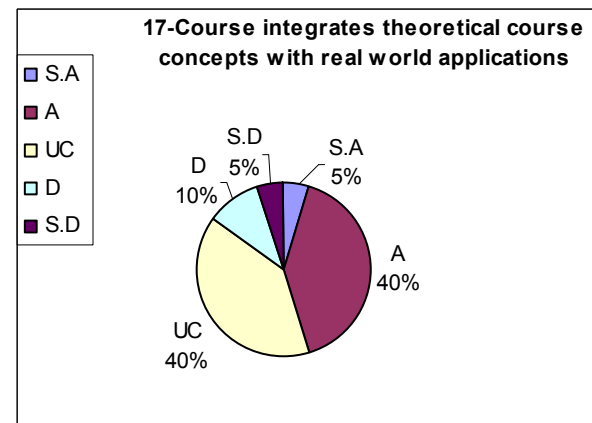
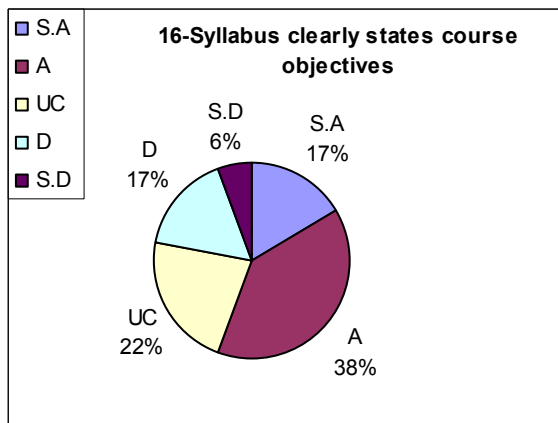
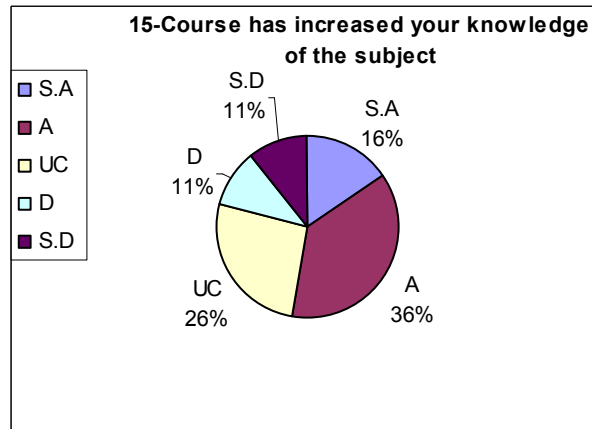
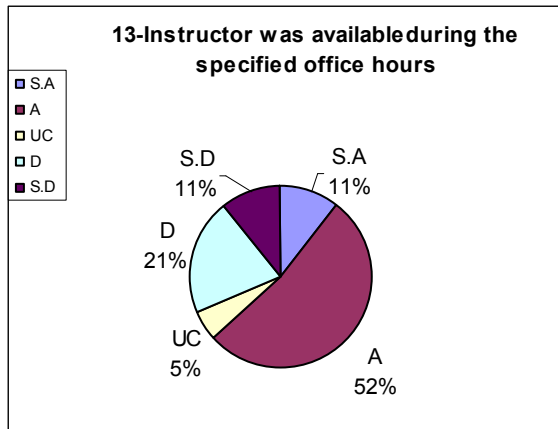
- Teacher was well disciplined.
- Teacher was nice and humble.
- His lectures were informative and full of knowledge.
- Teacher had good command on his subject.

Teacher 7 (PP 502)

Survey results indicated that only 47 % respondents agreed that the teacher was prepared for the class. Likewise 57 % students agreed that the teacher demonstrates knowledge of the subject. Whereas 47 % students agreed that the teacher completed the whole course. However 61 % respondents were of the view that the teacher used to communicate the subject matter effectively. The responses of the remaining questions are also similar.







General Comments of Students about this Teacher

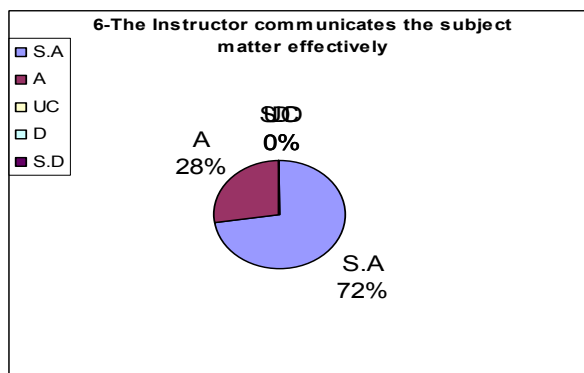
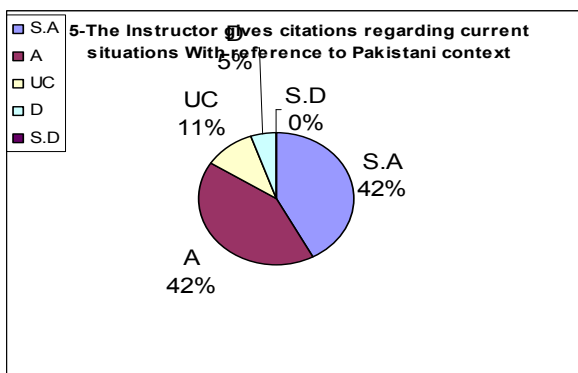
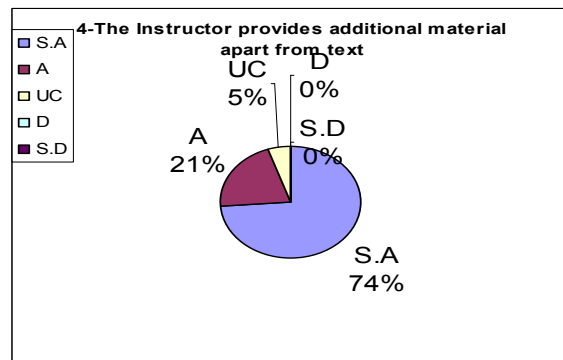
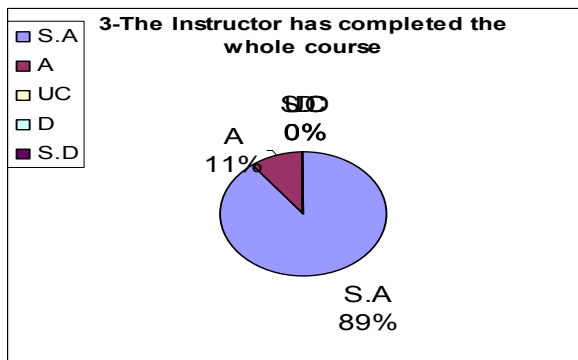
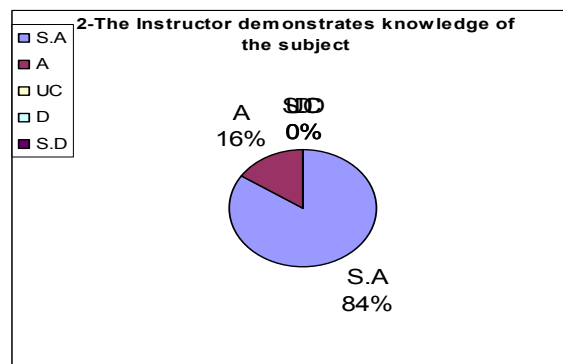
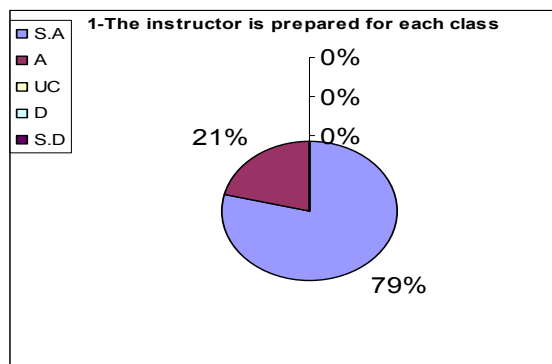
Weaknesses:

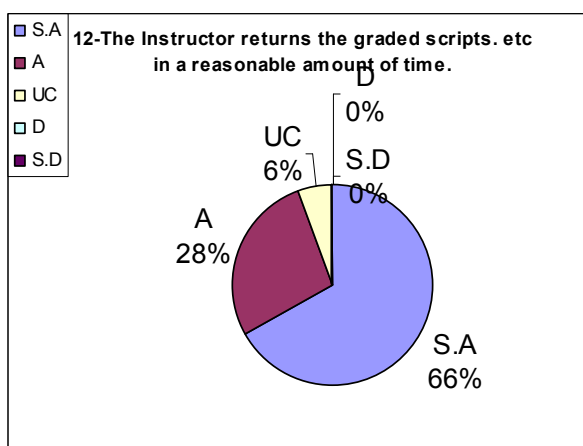
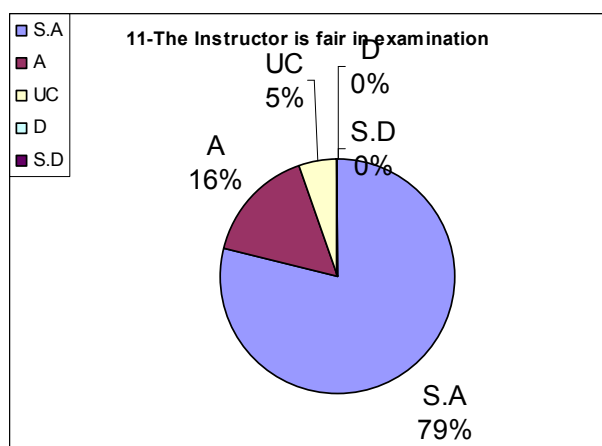
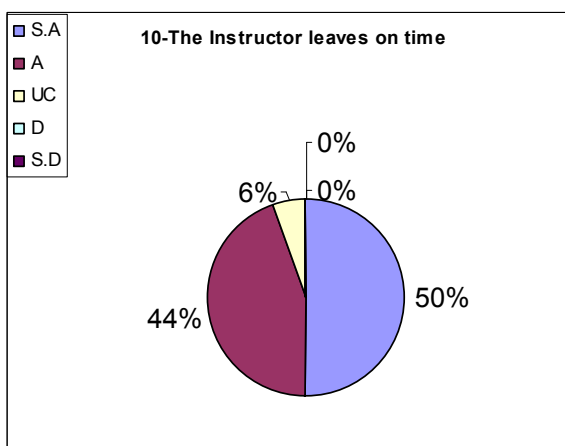
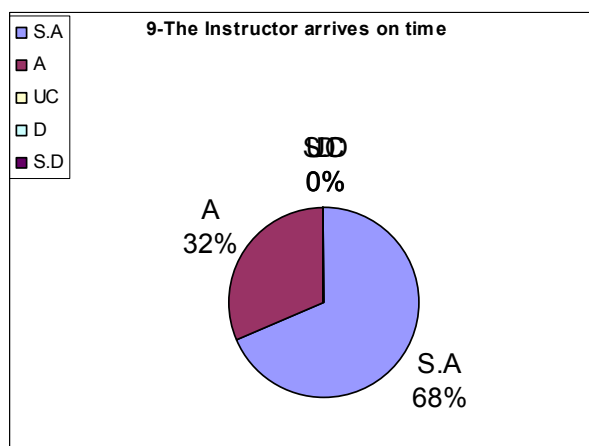
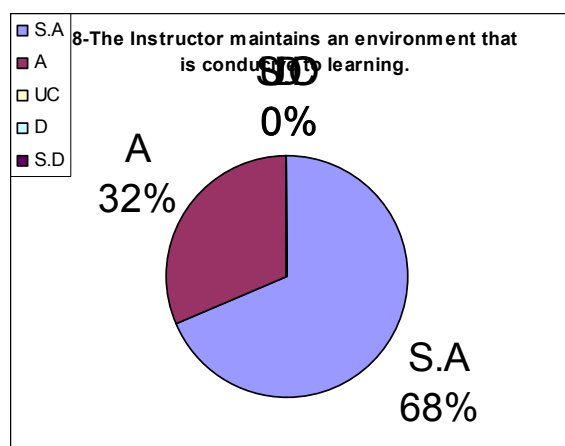
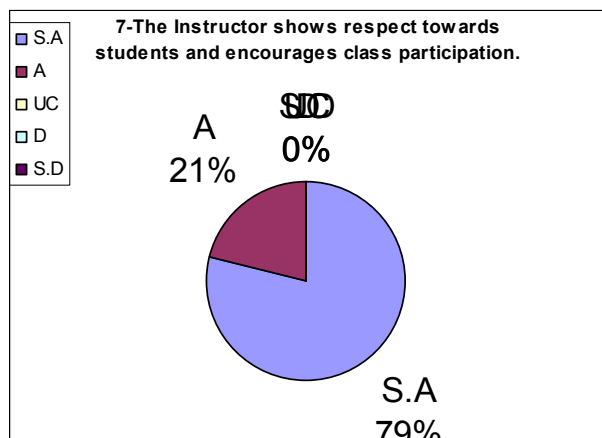
- Teacher was irregular taking classes.
- Teacher did not prepare her lecture daily.
- Speaks very fast.

- Teacher should provide notes on time.
- Teacher should give feedback to students.

Teacher 4 (PP 710)

Overall performance of the teacher was found satisfactory. However just 5 % of the class students were of the view that the teacher provided additional material apart from the text. On the other hand 84 % respondents stated that the teacher used to give them citation regarding current situations with reference to Pakistani context.





General Comments of the Students about this Teacher

Weaknesses:

- Teacher should encourage class participation.

Strengths:

- Teacher completed the course within time.
- Teacher was kind.
- Teacher was punctual.

Student Course Evaluation

The courses of the respective teachers were also evaluated as per Proforma 1 (Annexure-1) and the results are shown in Fig-2. It is clear from the figure that the course taught by the teacher 4 is on the top securing 4.28 points out of 5 and the course of Teacher 1 is in second number securing 4.21 points. The course taught by teacher 8 was ranked at the bottom securing 3.06 points. The scores of other courses of respective teachers can be seen from the graph.

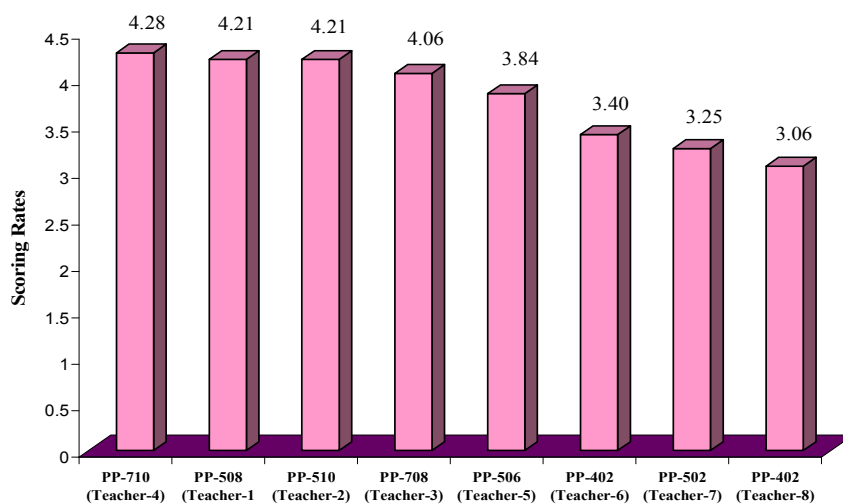
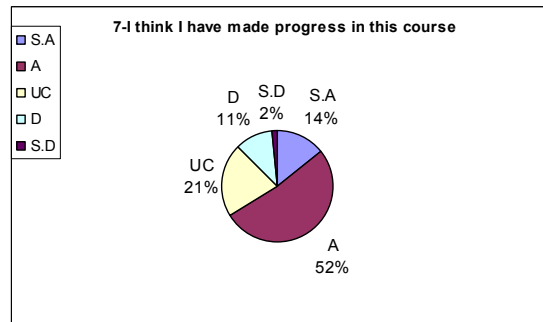
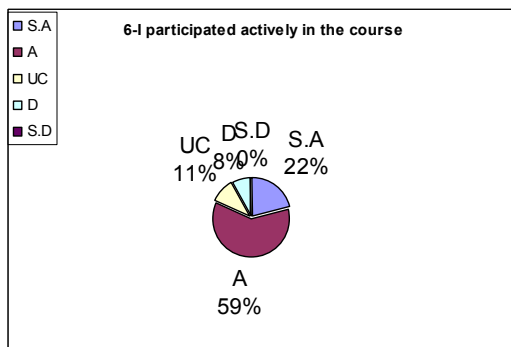
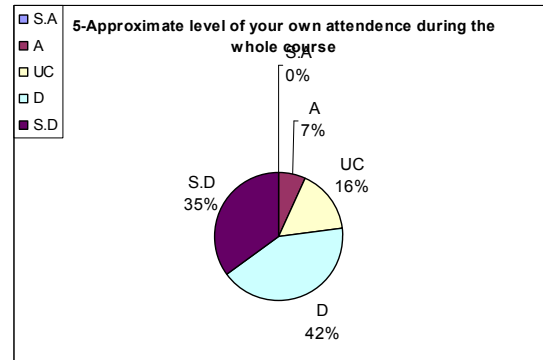
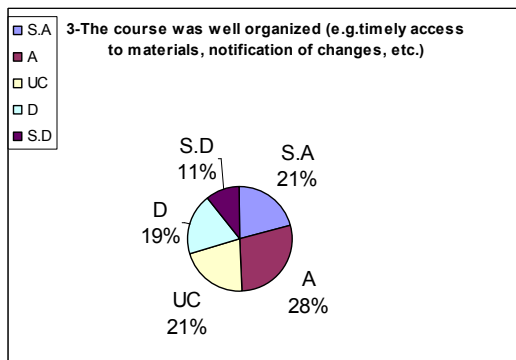
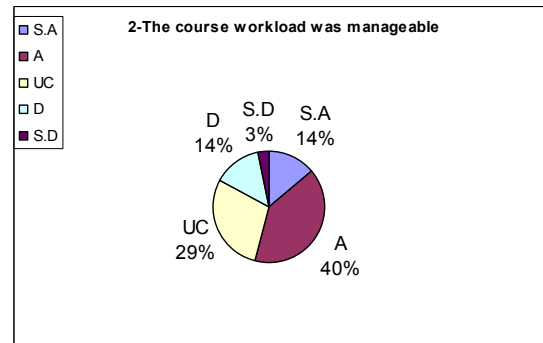
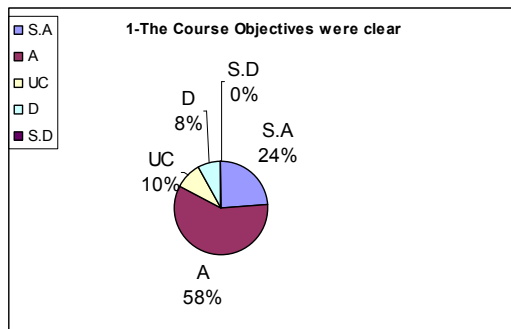


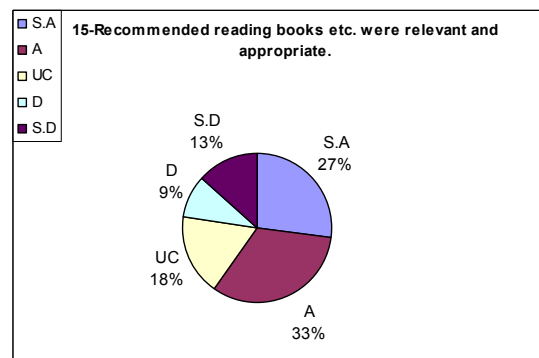
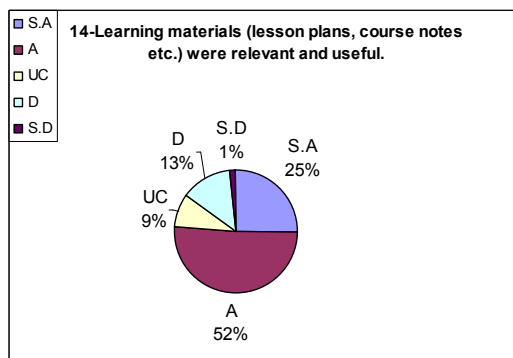
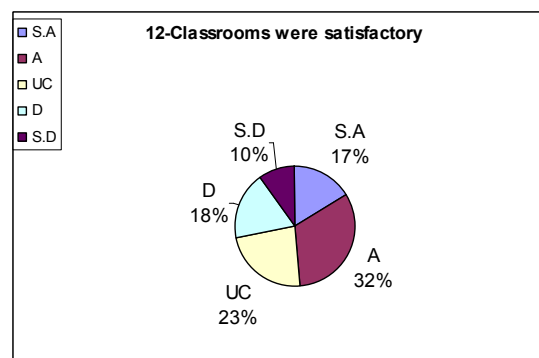
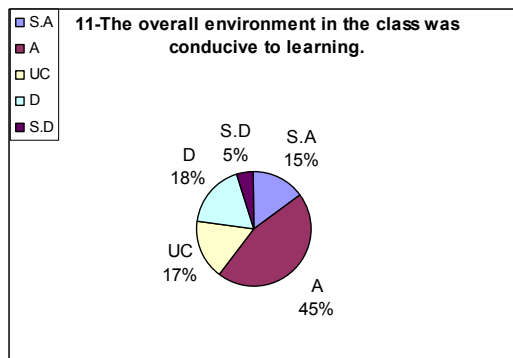
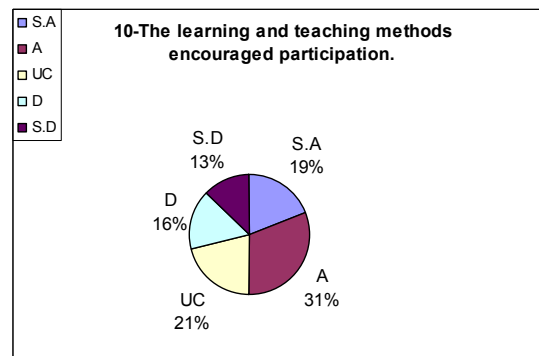
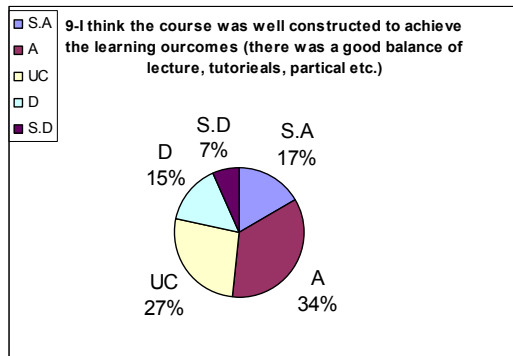
Fig.2 Student Course Evaluation

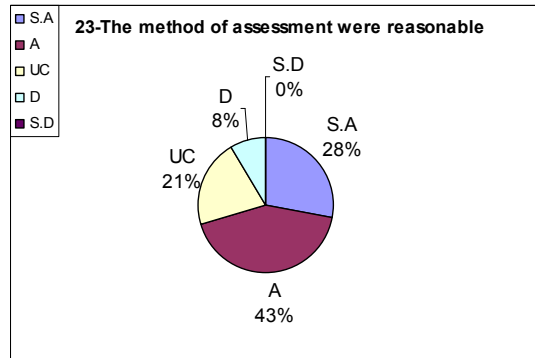
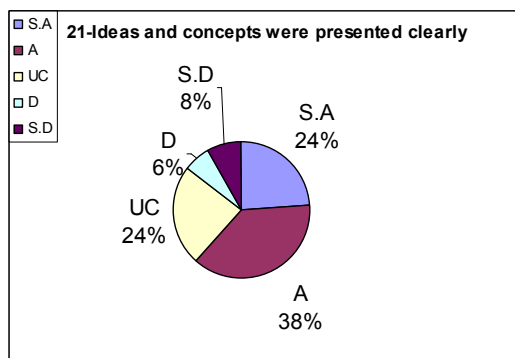
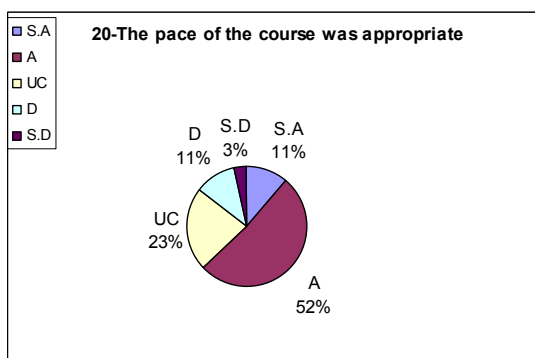
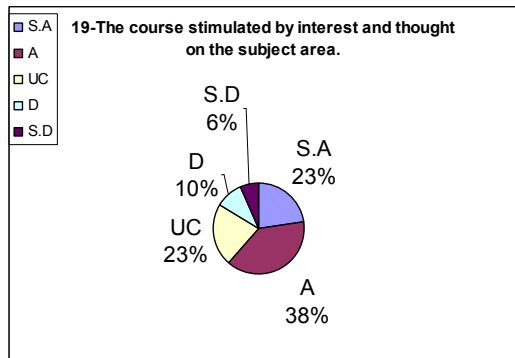
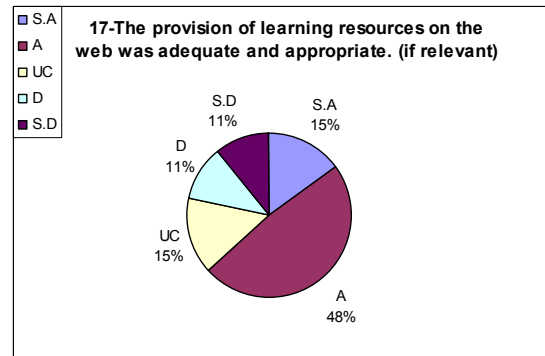
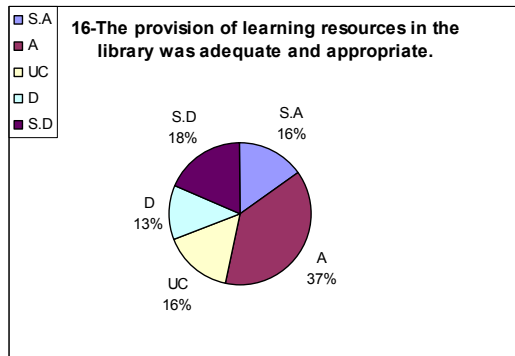
Desalted evaluation of individual course is given below.

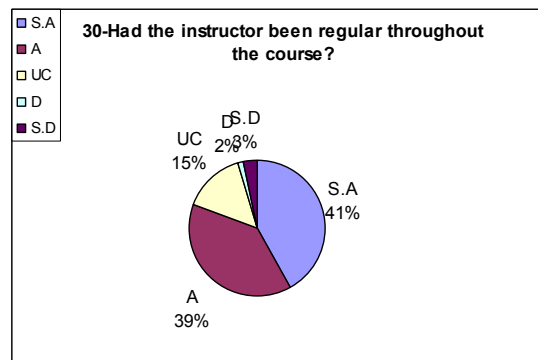
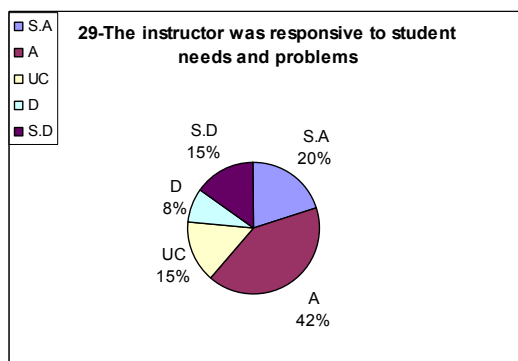
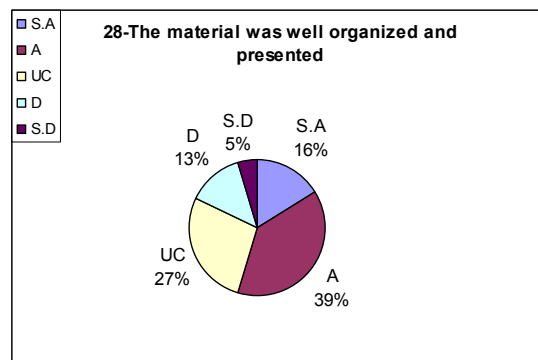
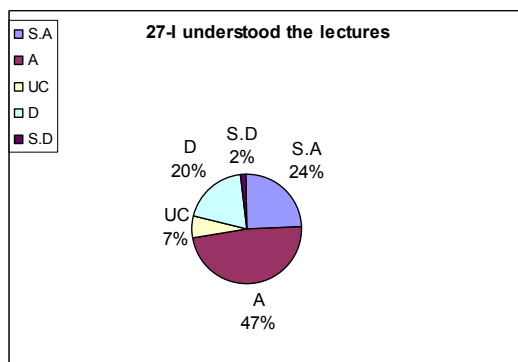
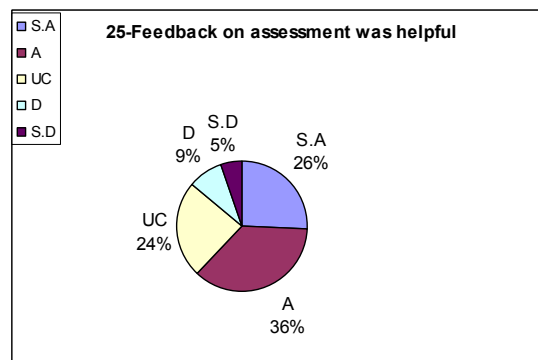
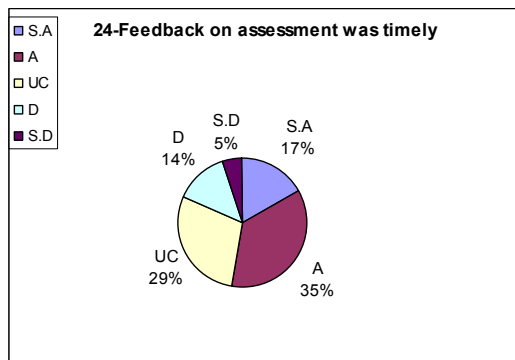
PP 402 (Teacher 6)

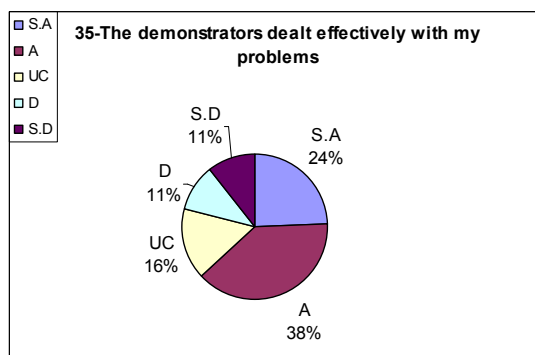
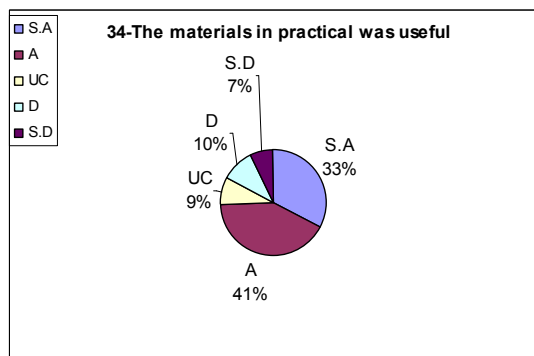
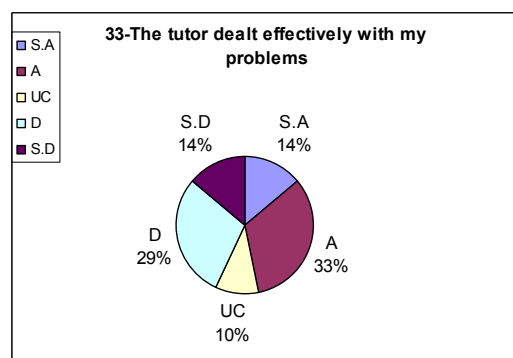
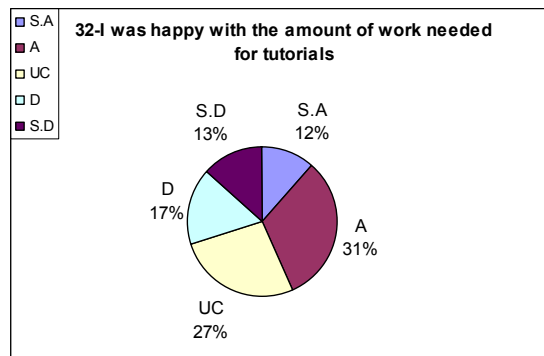
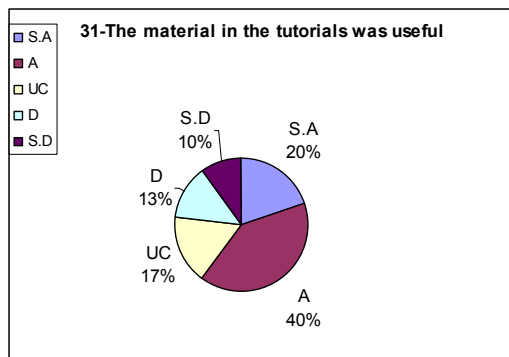
Although 82 % students agreed that course objectives were clear, 17 % disagreed and 29 % students were uncertain that the workload was manageable. Thirty nine percent students agreed that the course was well organized. Likewise 50 % students agreed that teaching method adopted by the instructor encouraged level of participation. Further detail is depicted in the following graphs.











General Comments of the Students about this Course

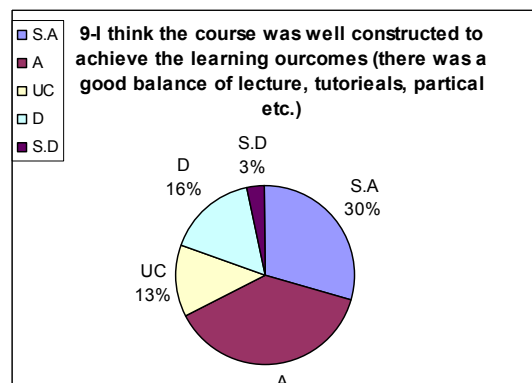
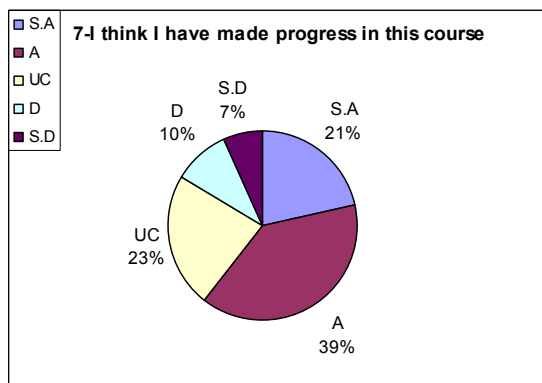
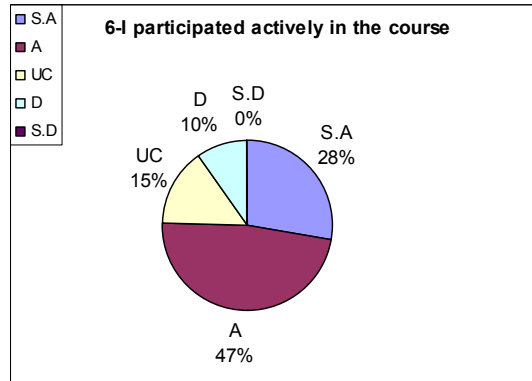
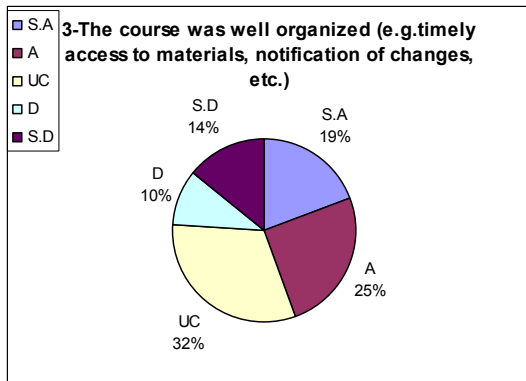
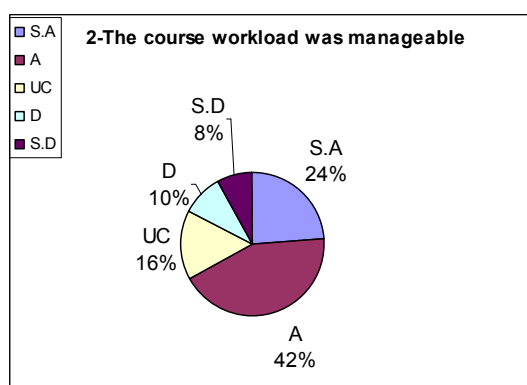
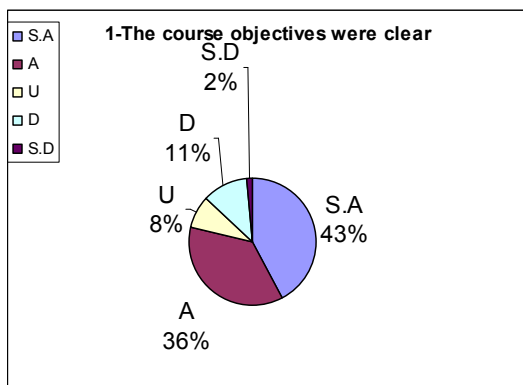
Weaknesses:

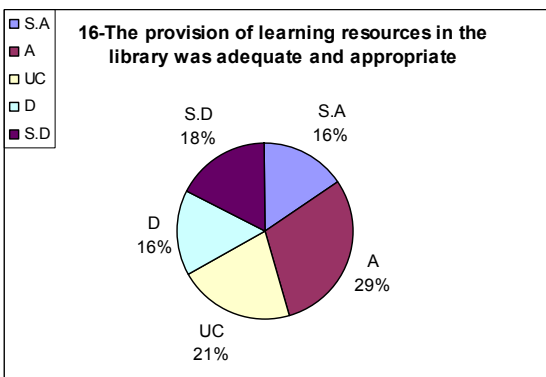
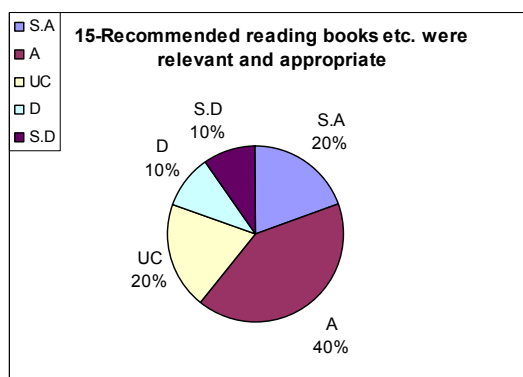
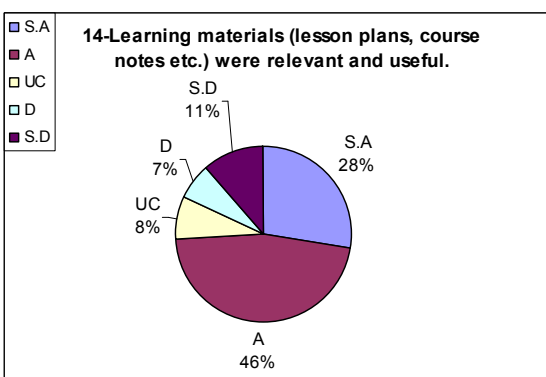
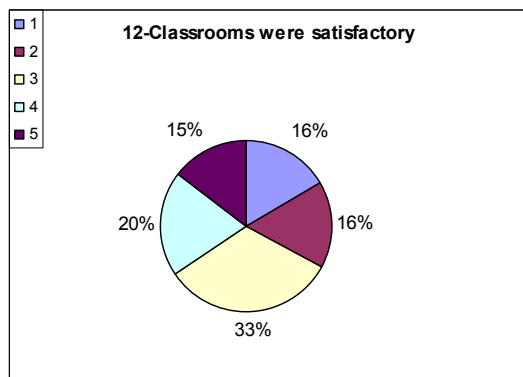
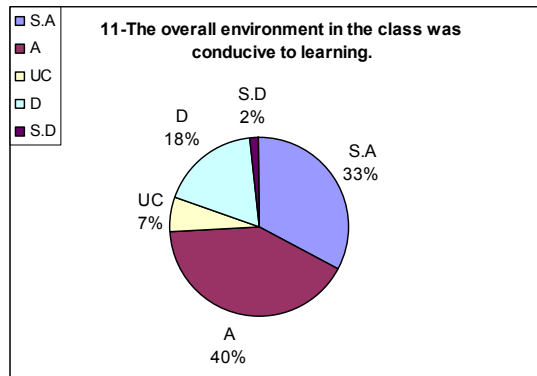
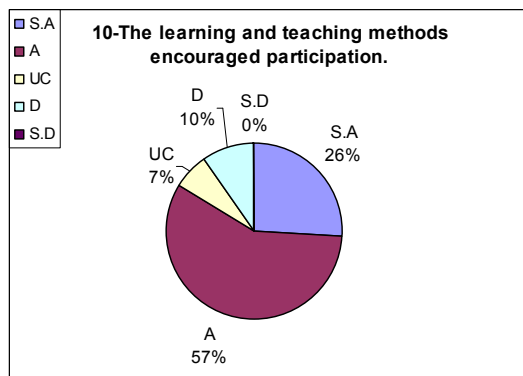
- More practicals must be arranged in labs.
- Course should be up graded and up dated.
- Learning environment and resources were not satisfactory.
- Usage of visuals, practical demonstrations and multimedia can make the course interesting and effective.
- Course objectives must be clearly defined.
- Course should include modern knowledge and techniques.

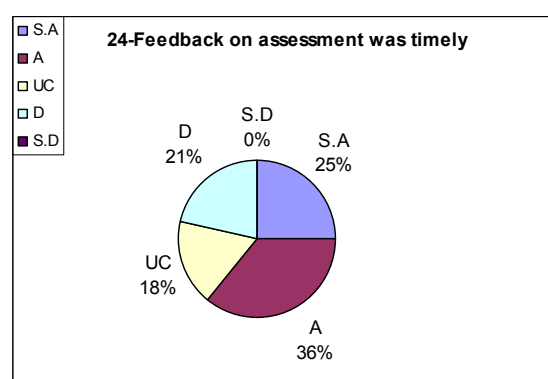
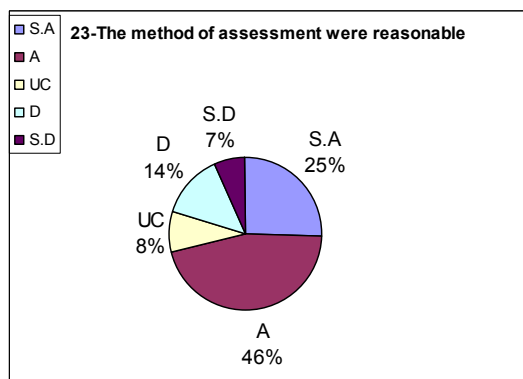
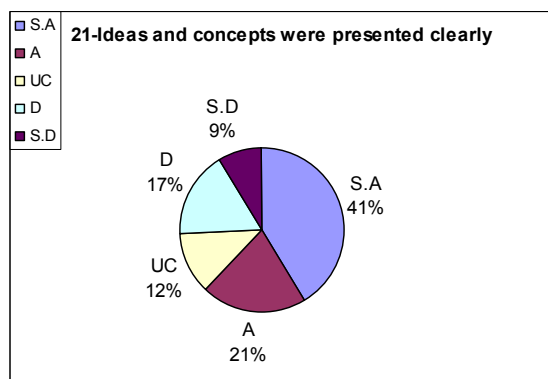
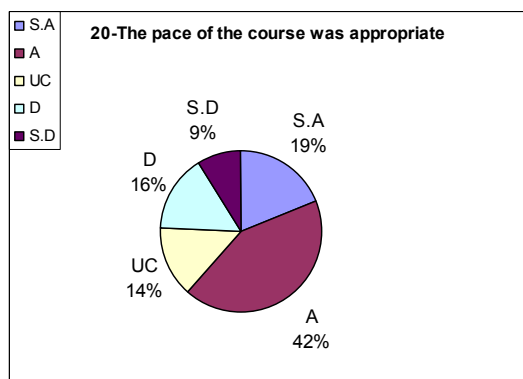
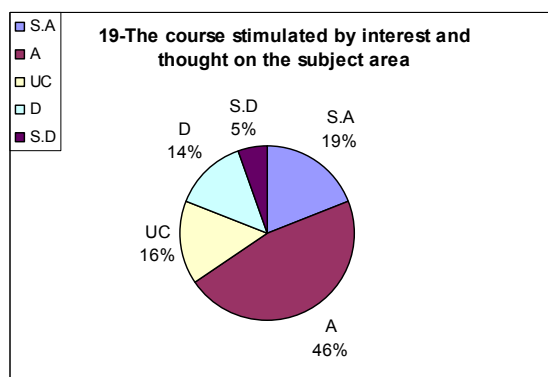
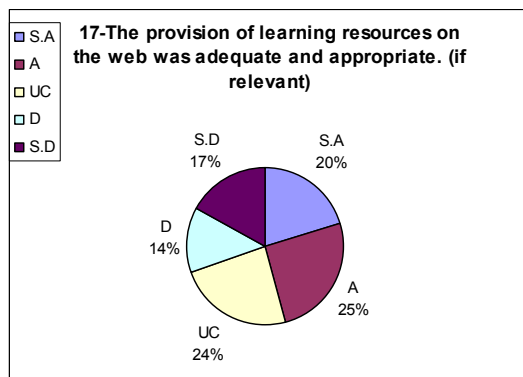
- Objective part of the paper must be separate from subjective paper.

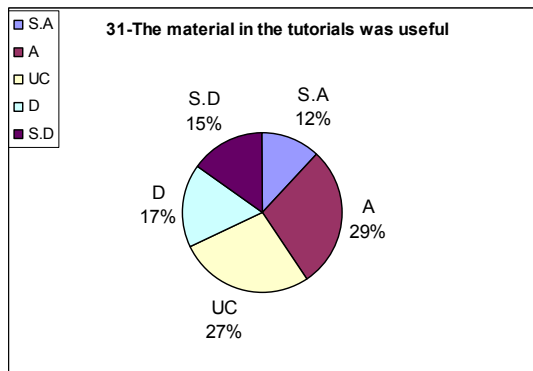
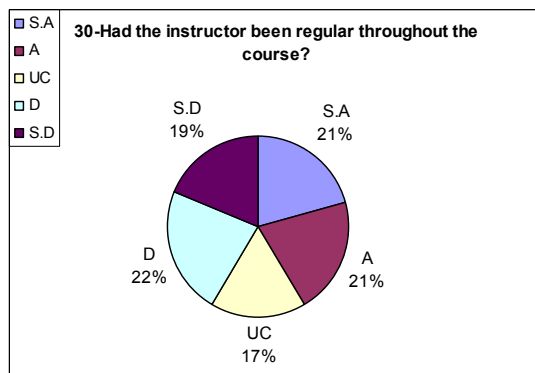
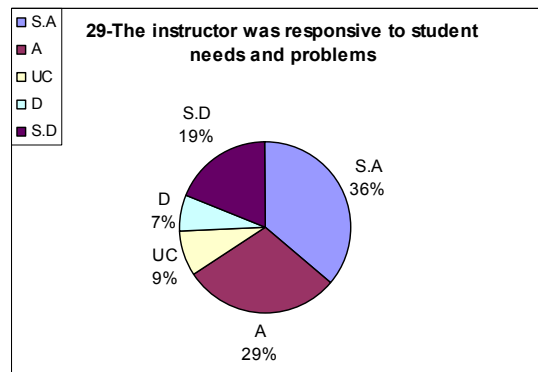
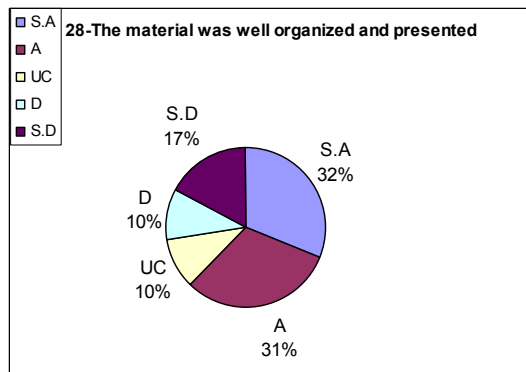
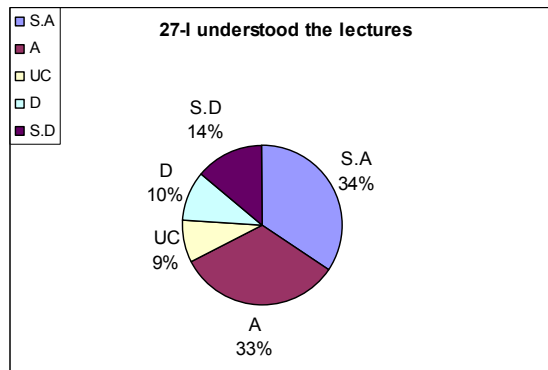
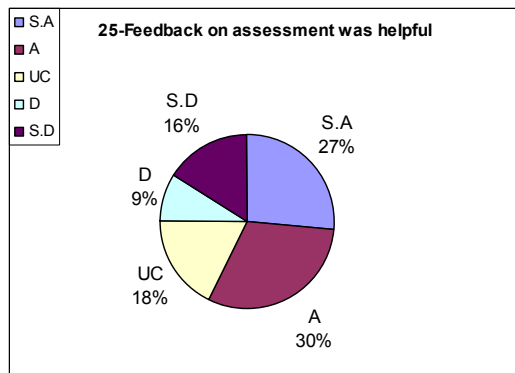
PP 402 (Teacher 8)

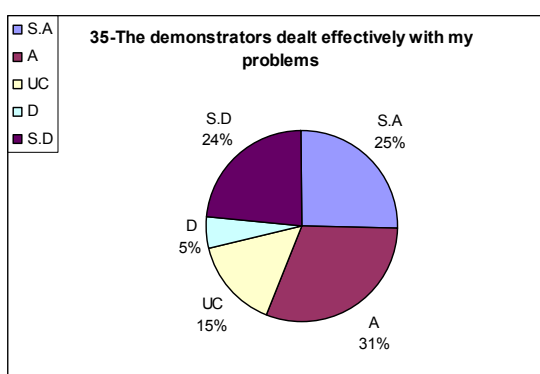
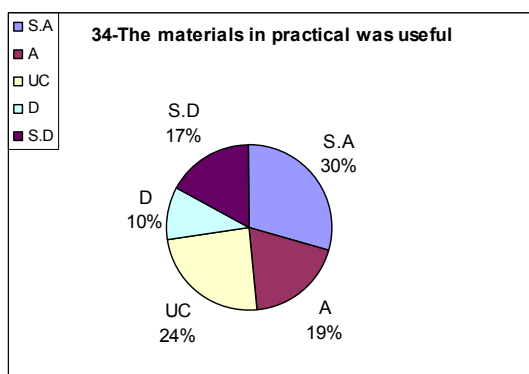
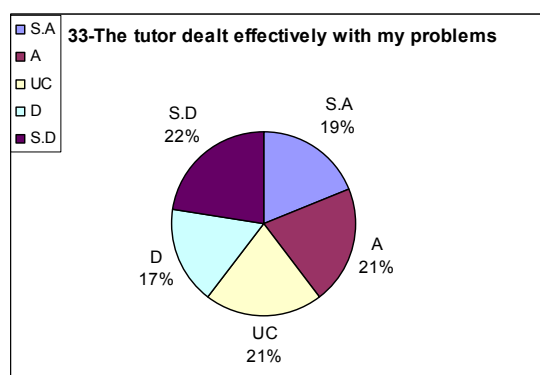
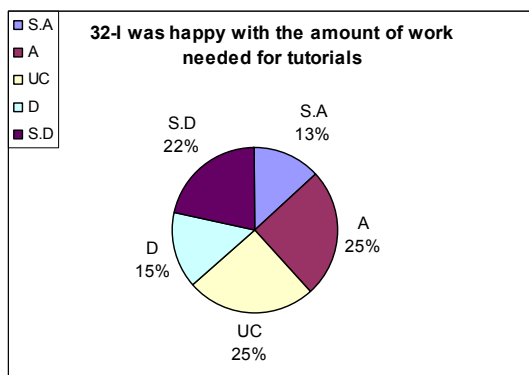
It is evident from the following pie charts that 66 % students were of the view that workload was manageable. However 44 % students agreed that the course was well organized. Likewise 50 % students thought that they had made progress in the course. Fifty one percent of the students (including 33 % uncertain) showed reservation over class room environment. Similarly 34 % students disagreed that learning resources in the library were adequate. Further detail is given as under.











General Comments of the Students about the Course

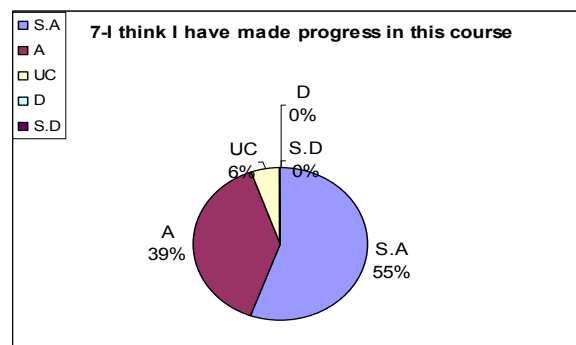
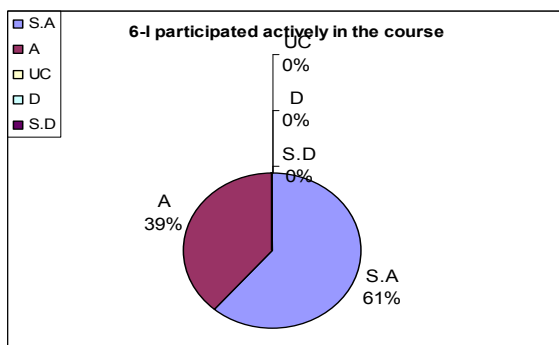
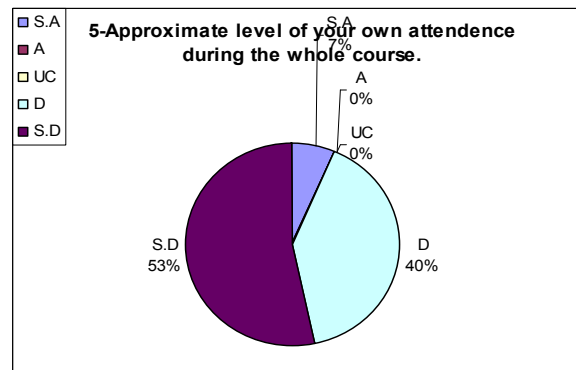
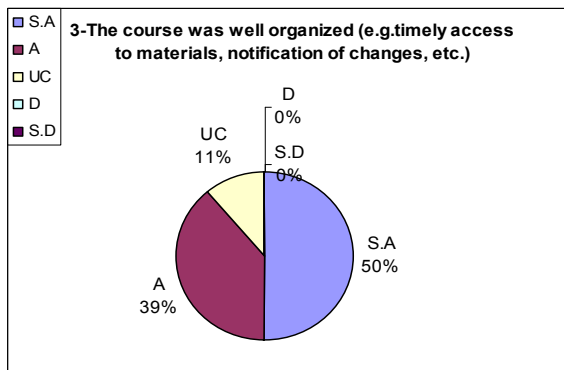
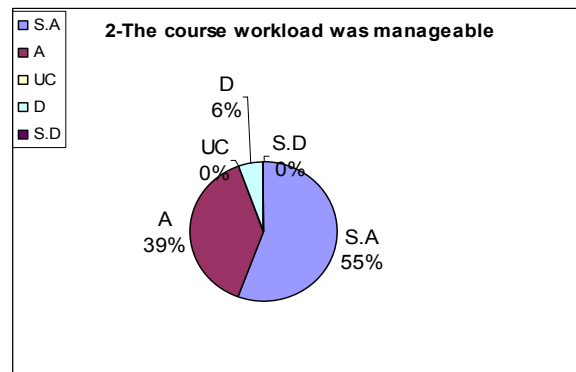
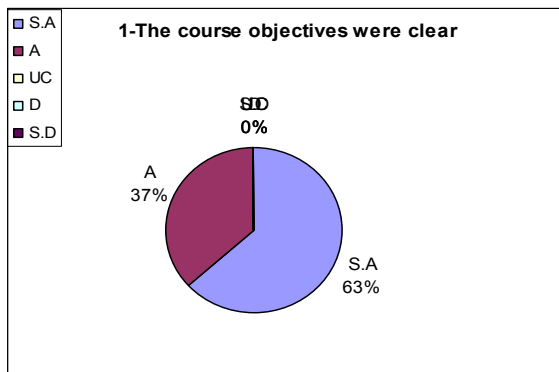
Weaknesses:

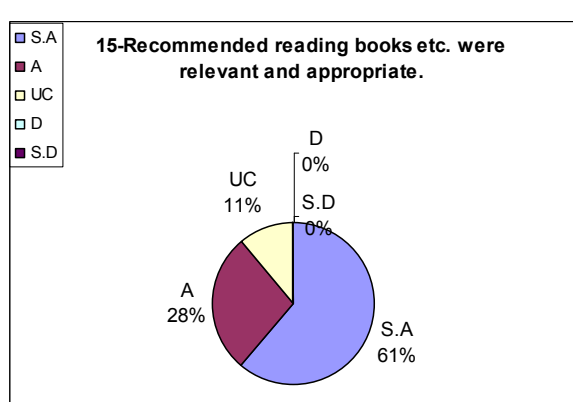
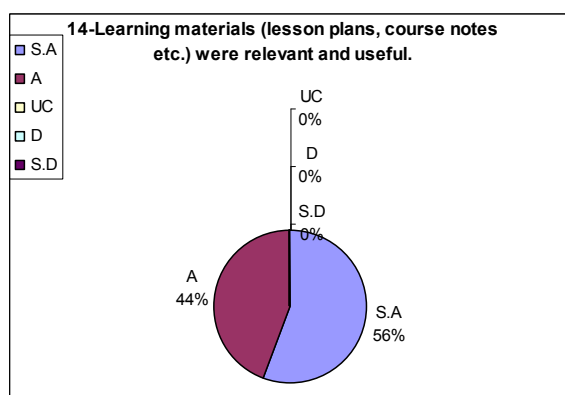
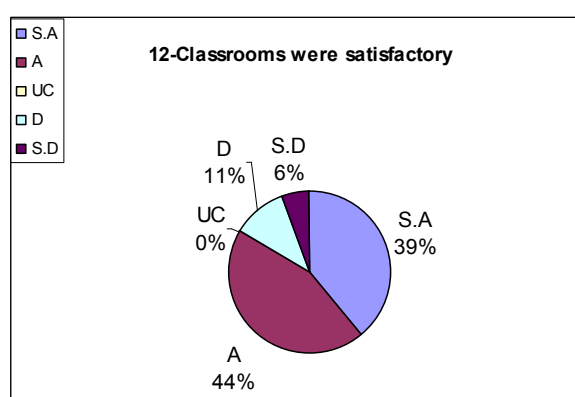
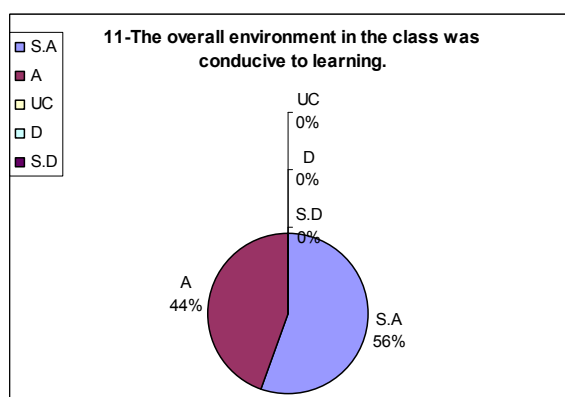
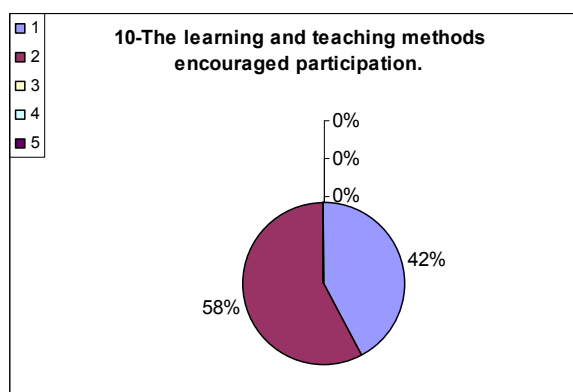
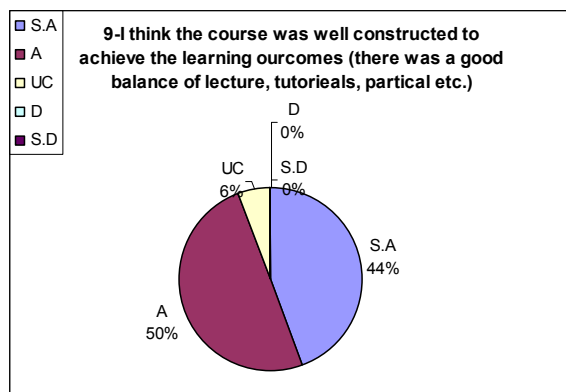
- Ratta - was the best feature of the course. The course was totally "Ratta".
- Concepts not clear, no proper learning methods, as the course was taught by various teachers due to unavailability of the respective teacher.
- Class teacher should set the paper by himself.
- Course contents were not properly organized.
- Learning environment was not good.
- Practicals and field visits can improve the course effectiveness.
- Proper class room should be provided for conducive environment.

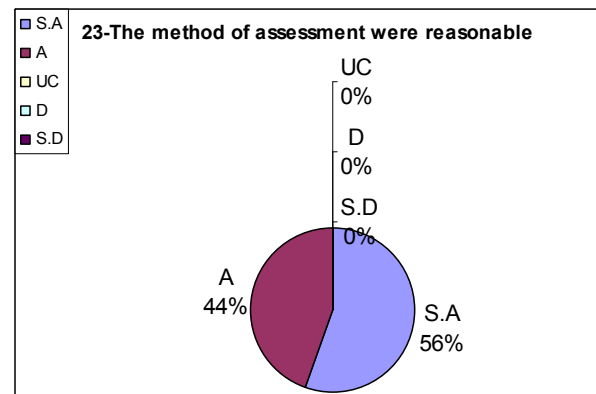
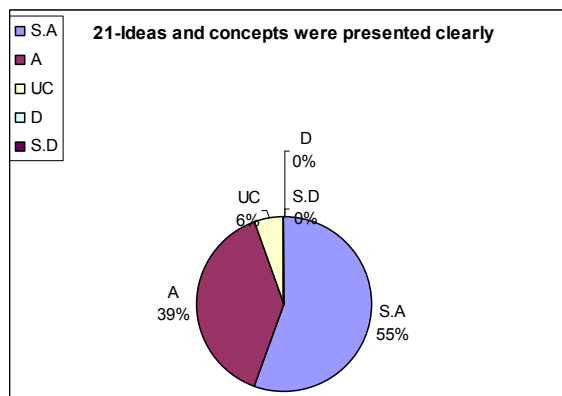
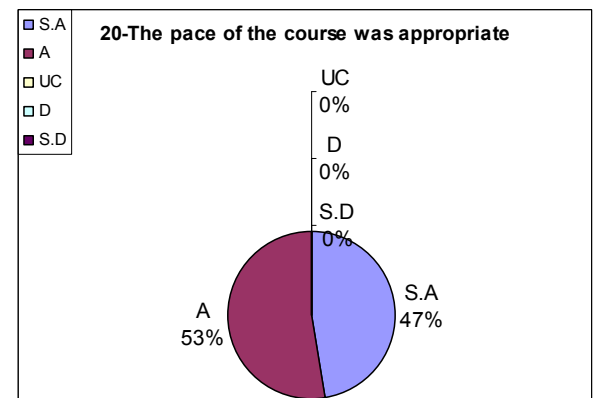
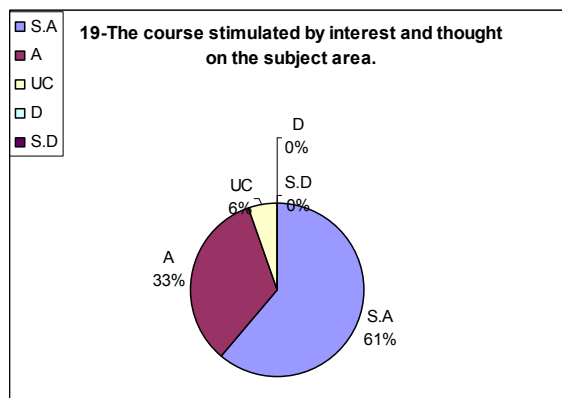
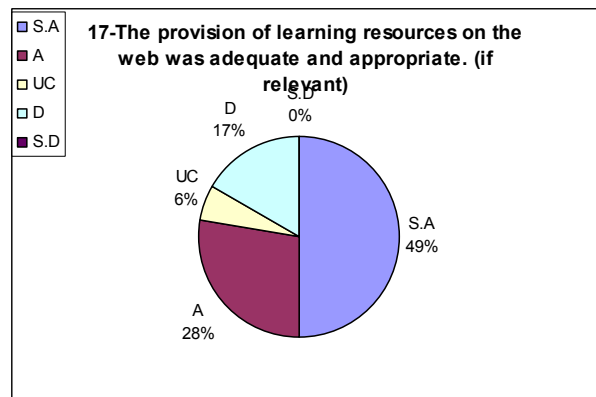
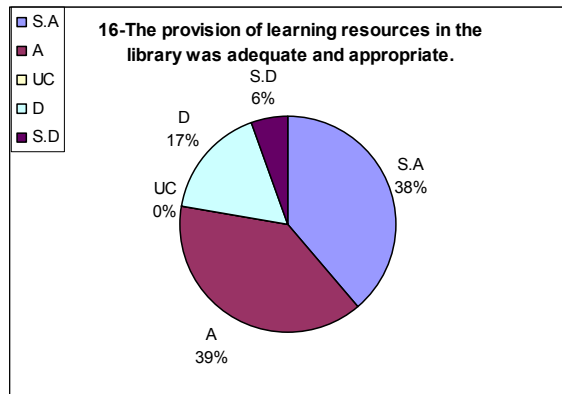
- Discipline in the library was not good so learning environment should be improved.
- Course could have been improved if the teacher were regular to his classes.

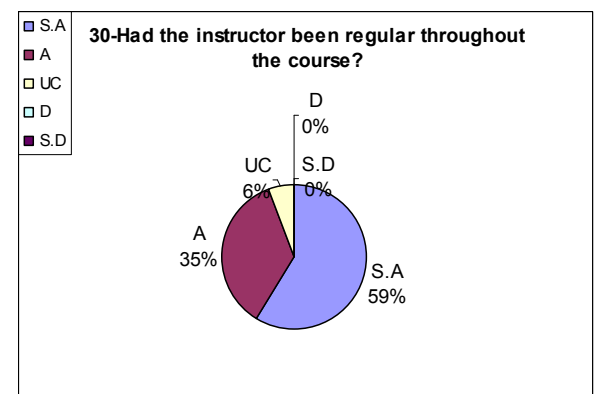
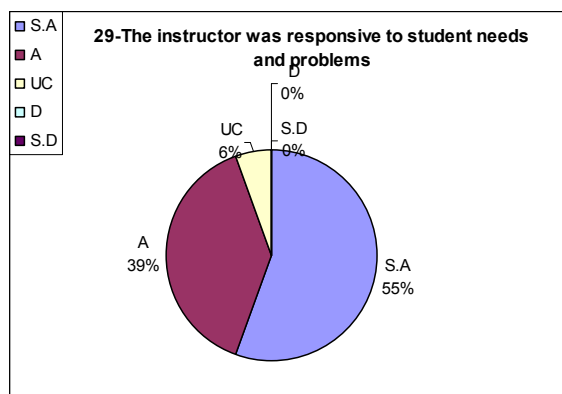
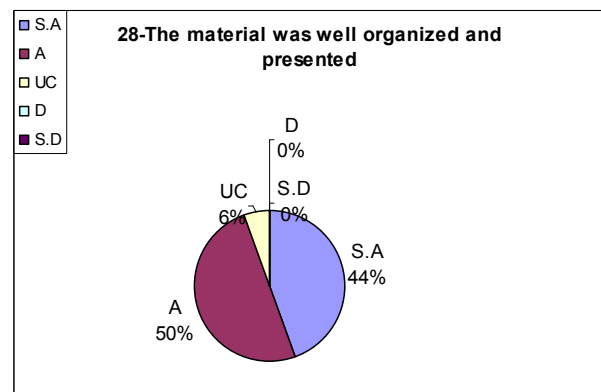
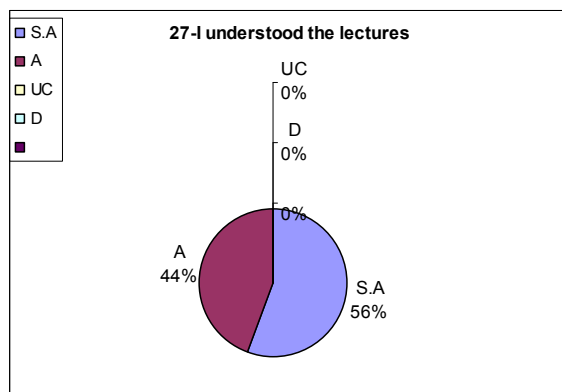
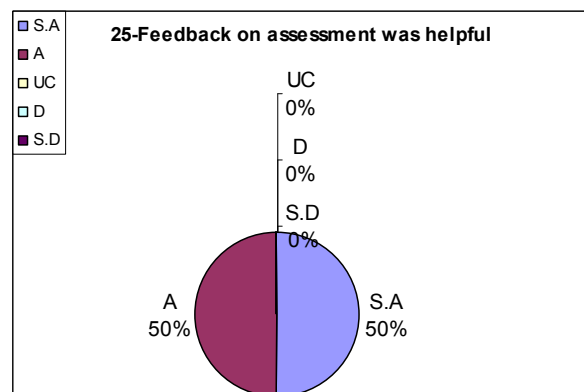
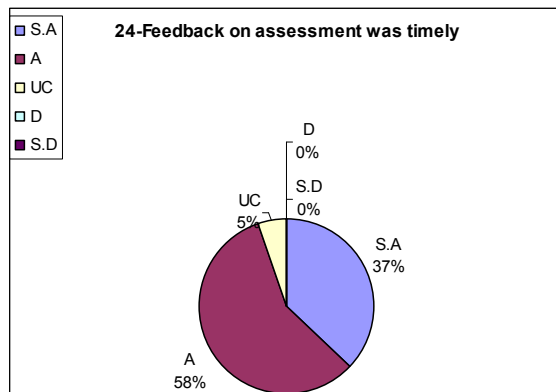
PP 510 (Teacher 2)

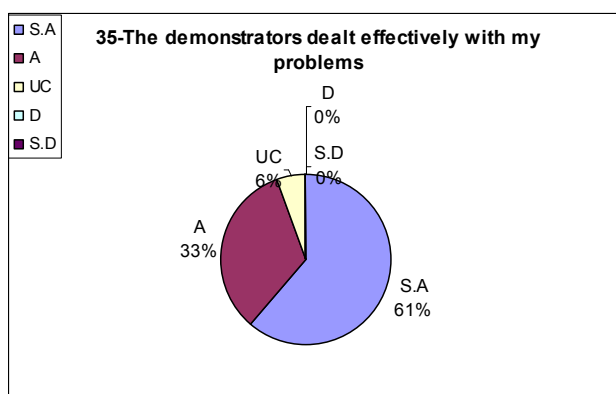
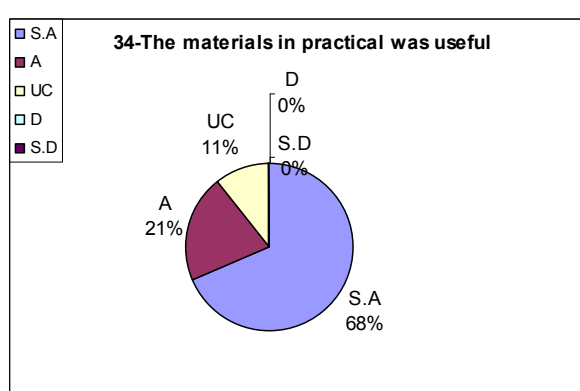
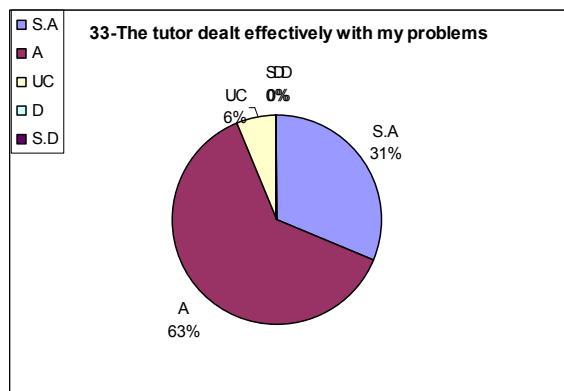
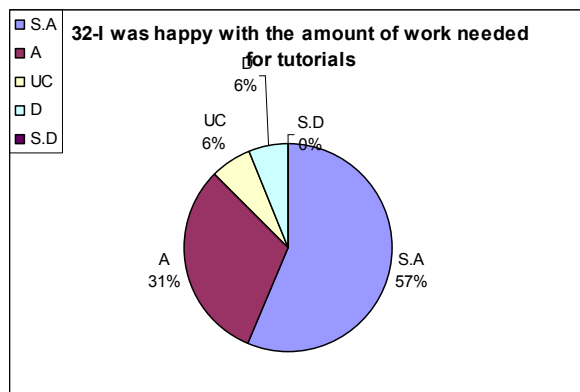
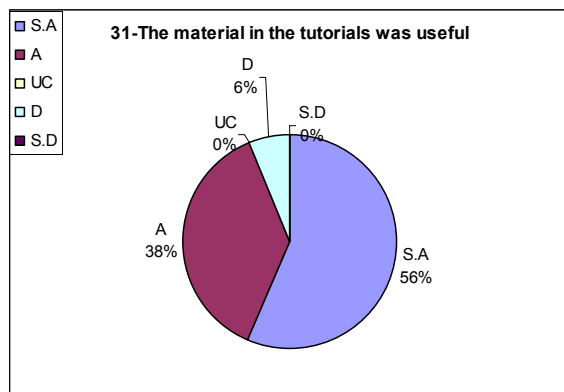
Pie-charts based on evaluation of course revealed that the students were satisfied with the course. However 11 % students were uncertain that the course was well organized. Likewise 5 % students were uncertain that the course was well structured and teaching methods boosted participation.











General Comments about this Course

Weaknesses:

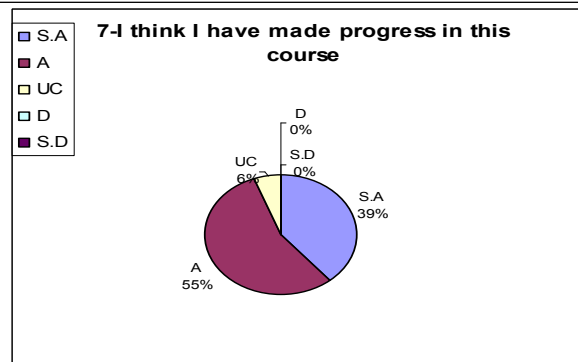
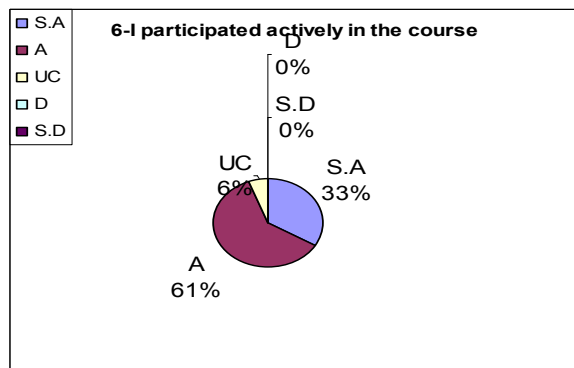
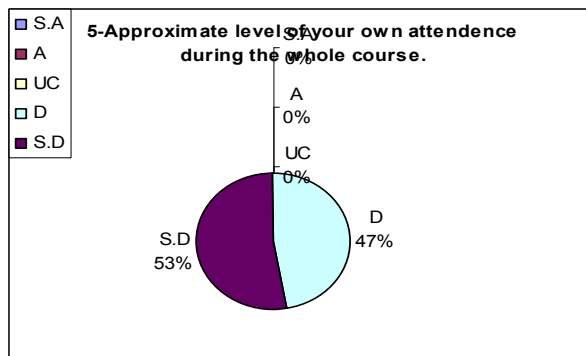
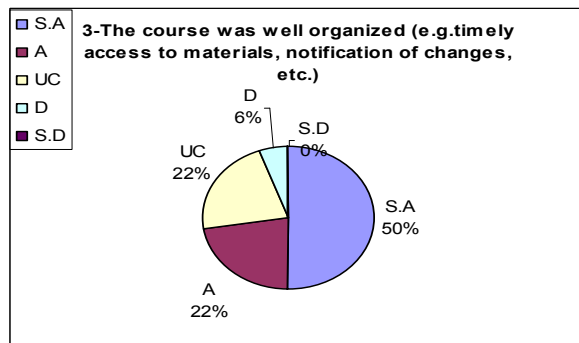
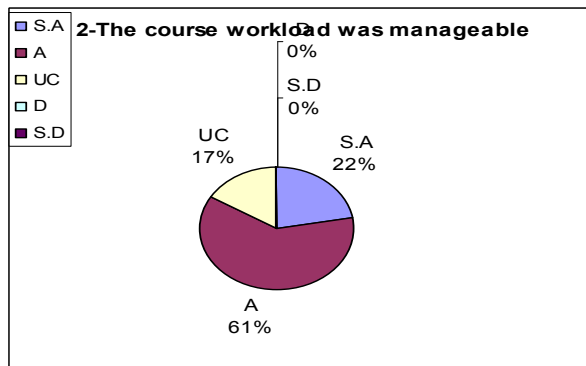
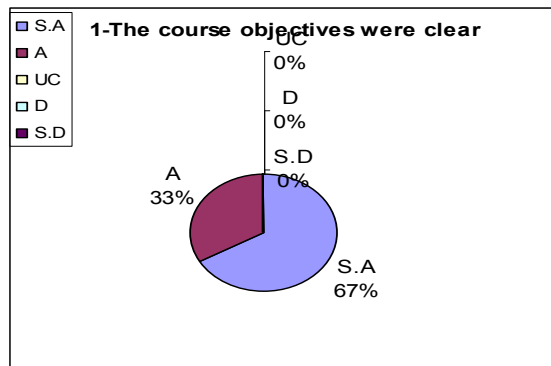
- More practicals will improve the course.
- Lab equipments were not adequate.
- Projector and multimedia should be used to deliver lectures.
- Proper materials were not available for practical demonstrations.

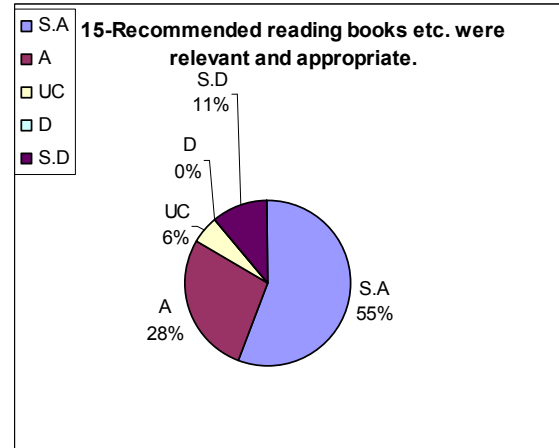
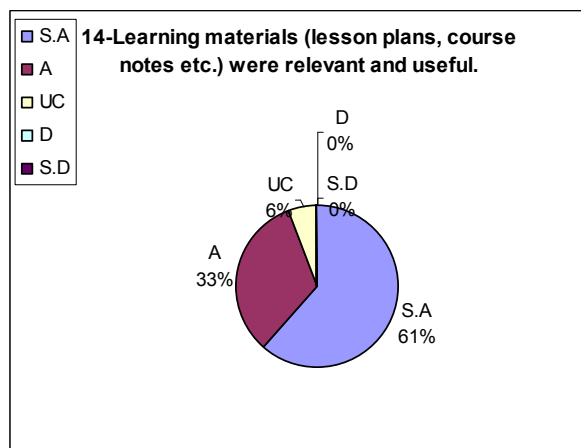
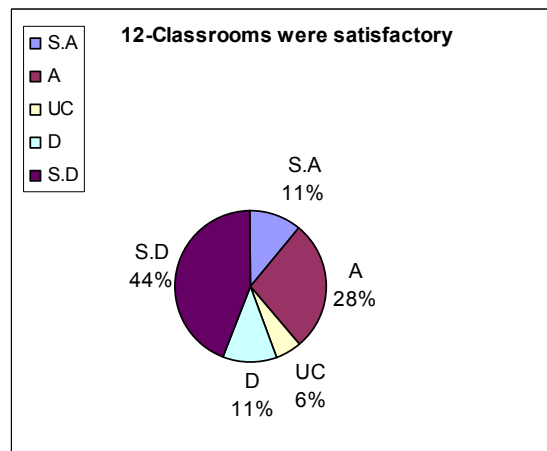
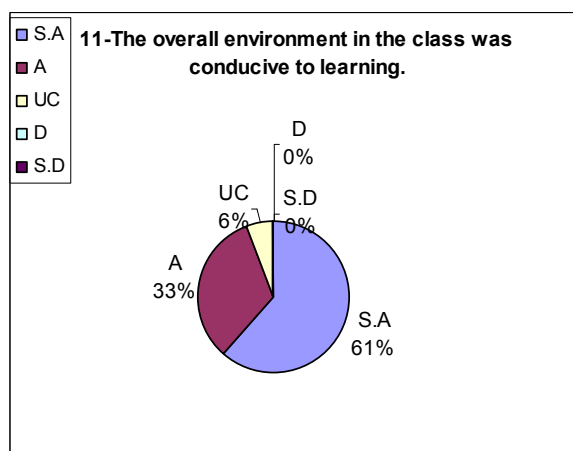
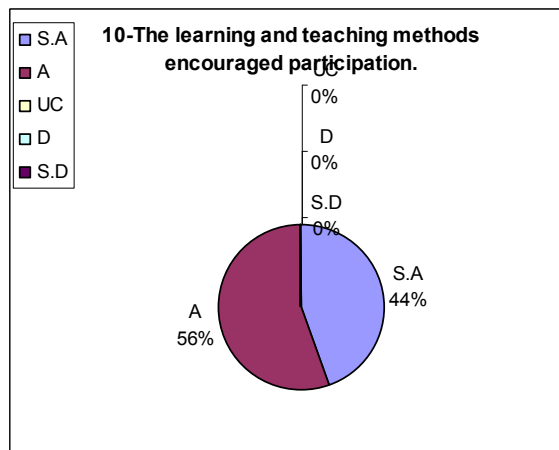
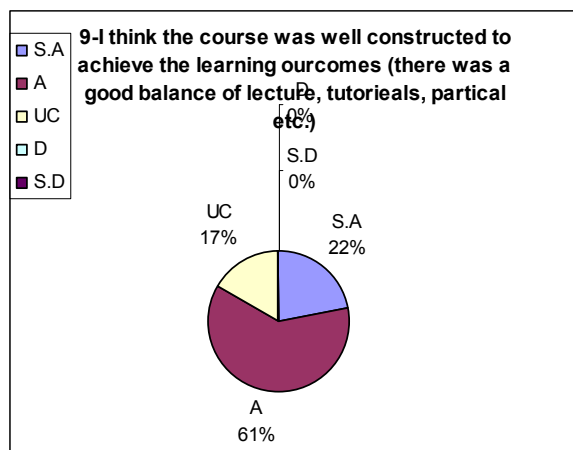
Strengths:

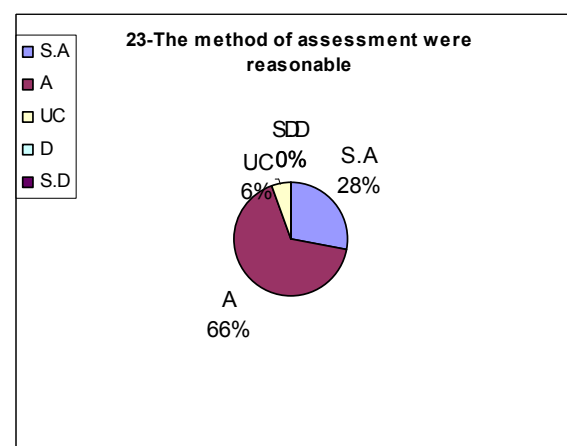
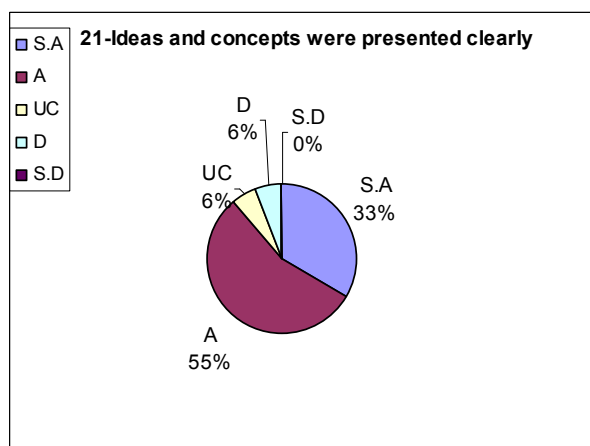
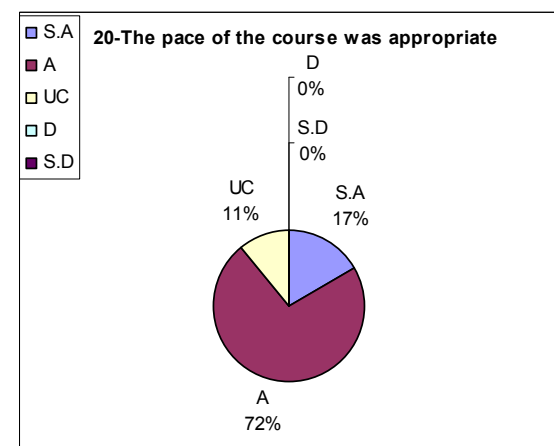
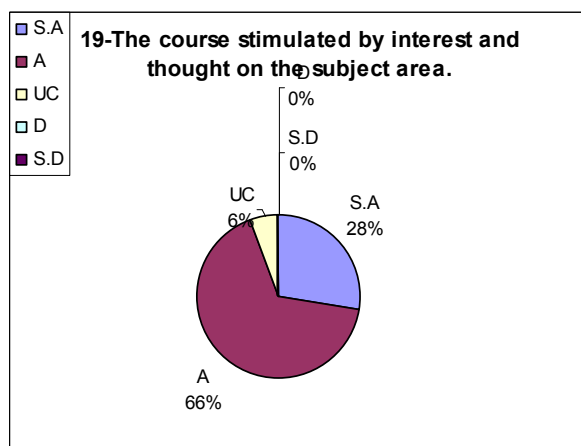
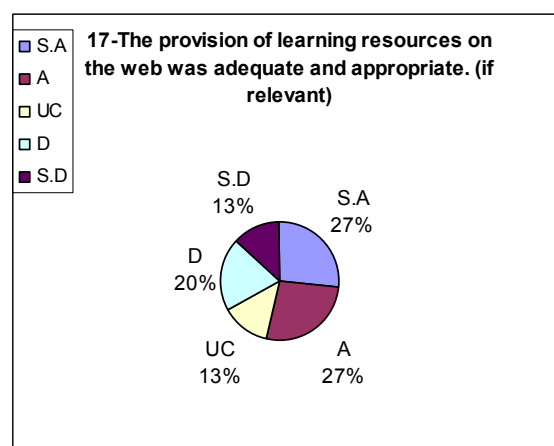
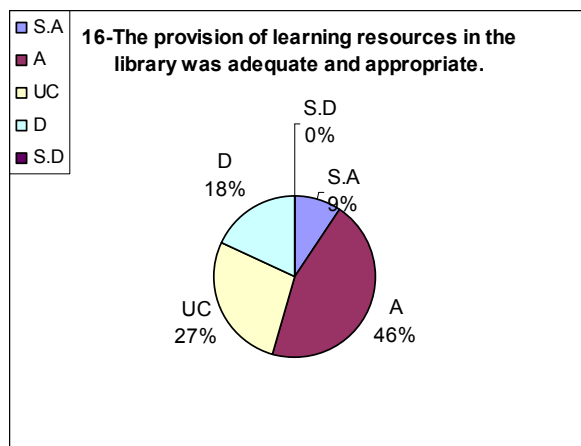
- Course was informative and interesting.

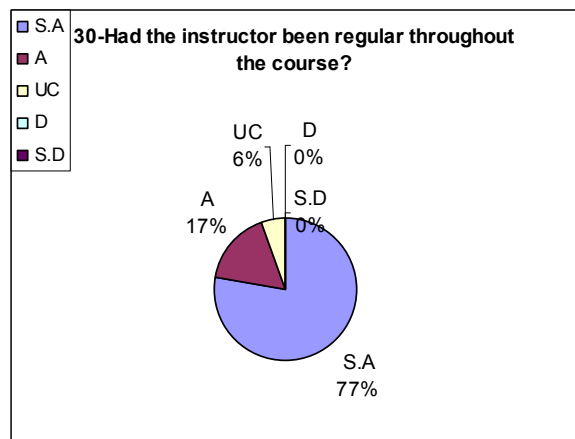
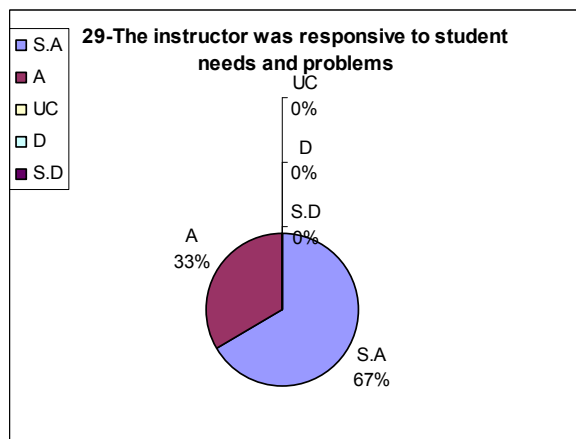
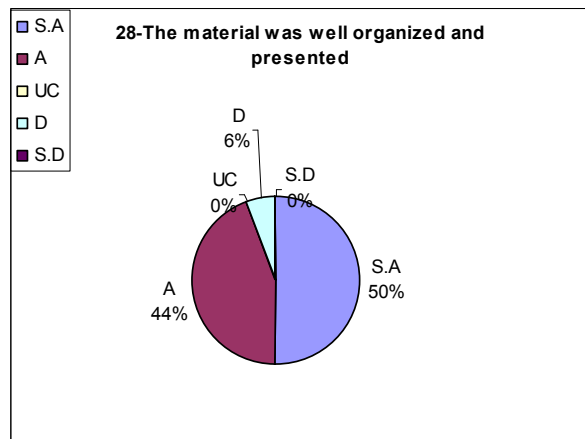
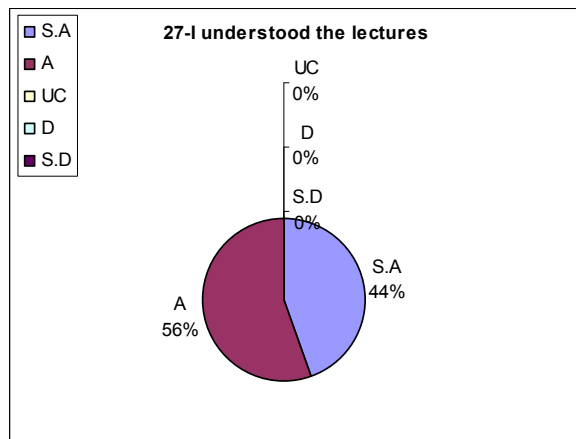
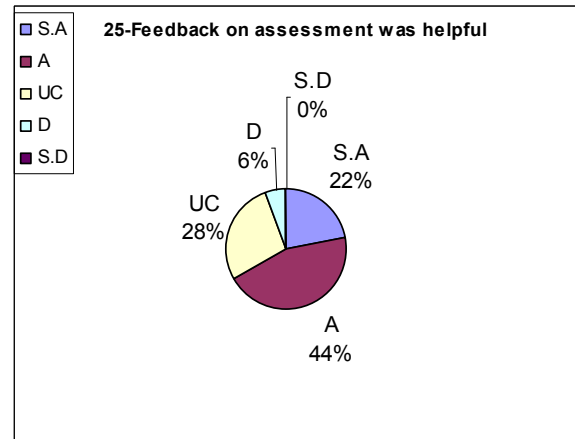
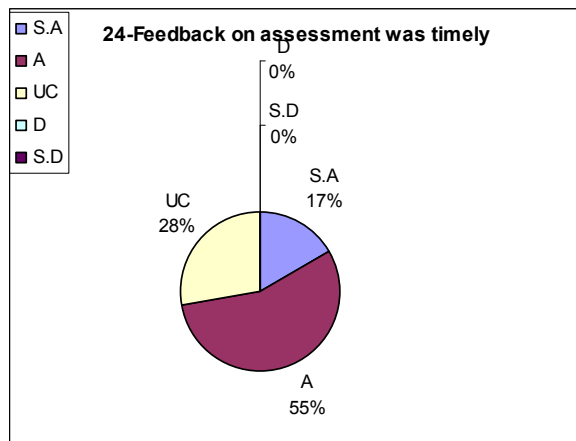
PP 506 (Teacher 5)

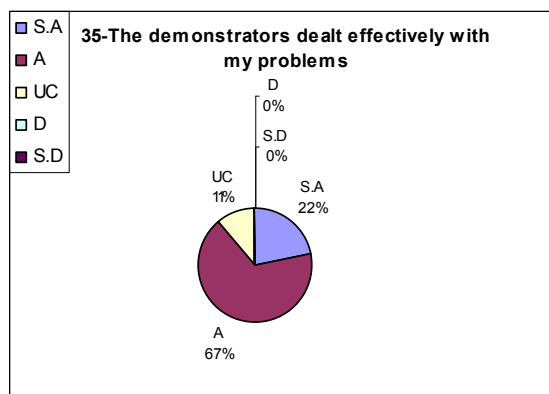
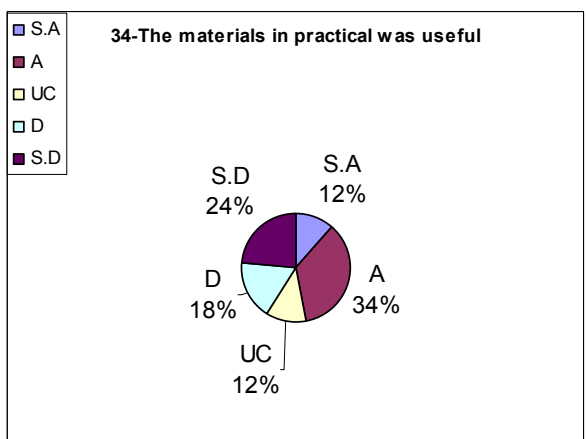
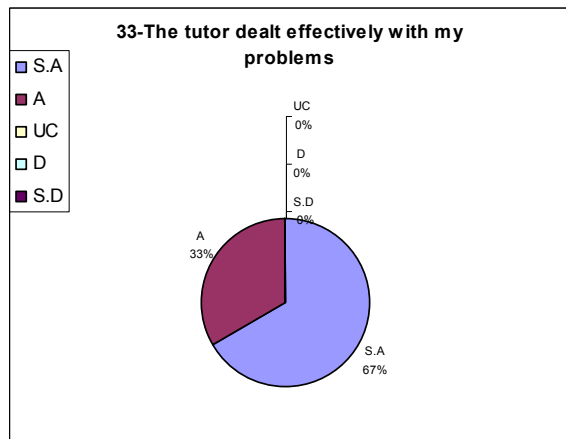
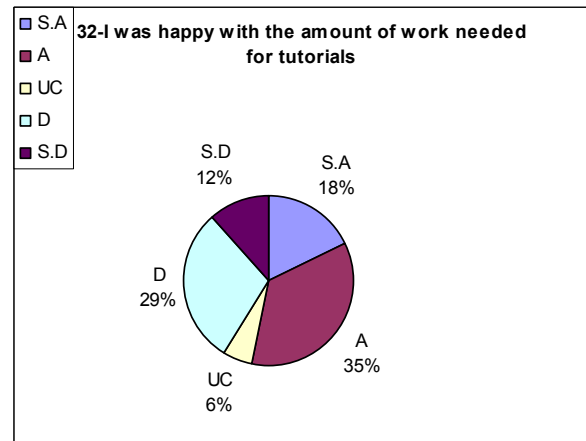
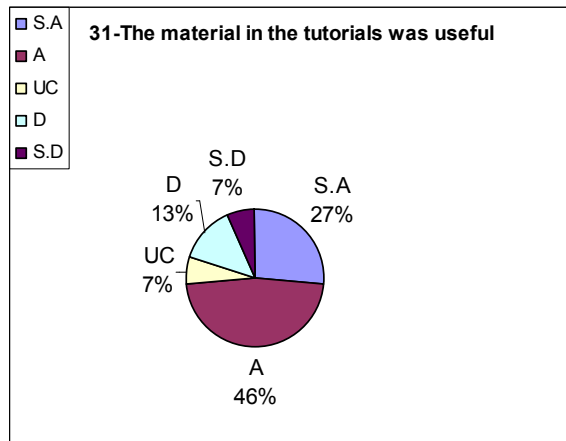
It is evident from the following graphs that 17 % students were uncertain that the workload was manageable. Likewise 28 % respondents did not agree that the course was well organized. Whereas 6 % students were uncertain that they actively participated in the course and made progress in the course. Seventeen percent of the students were uncertain that the course was well structured. About 45 % students did not agree that learning resources in the library were adequate and appropriate.











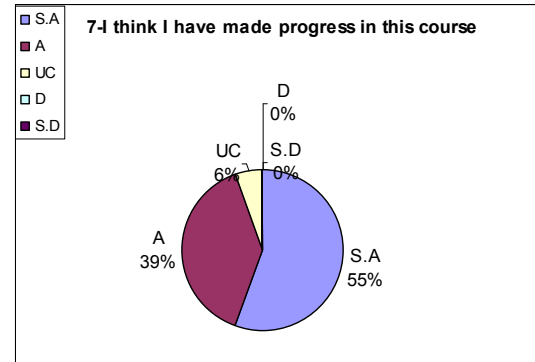
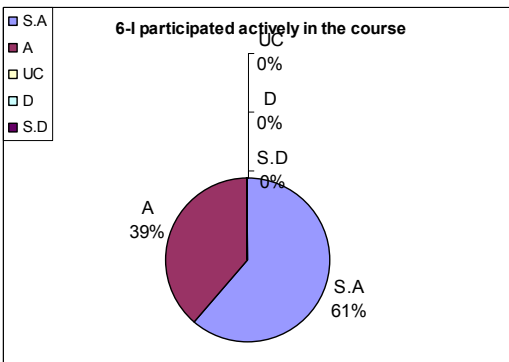
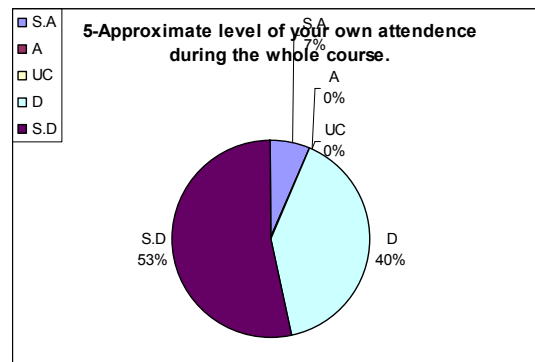
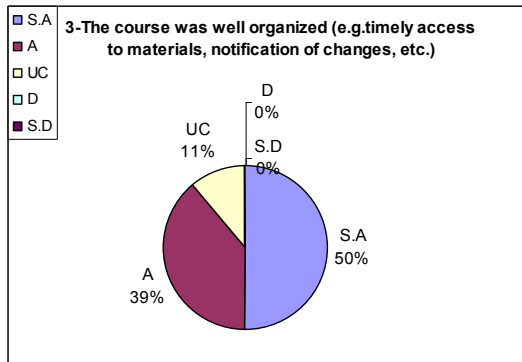
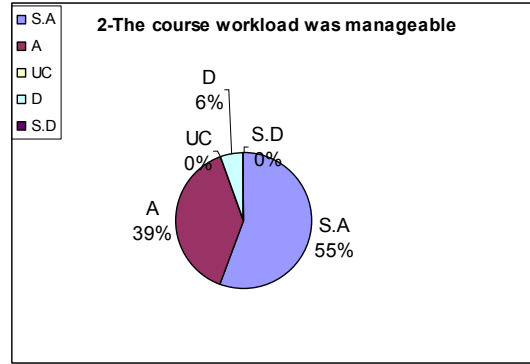
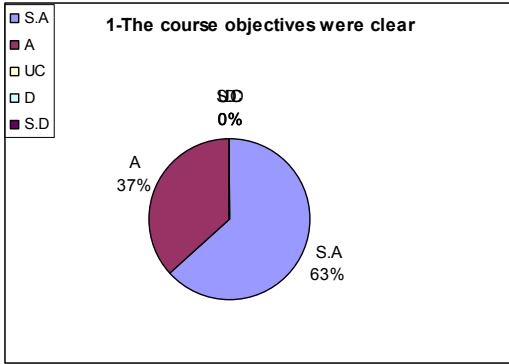
General Comments of Students about the Course

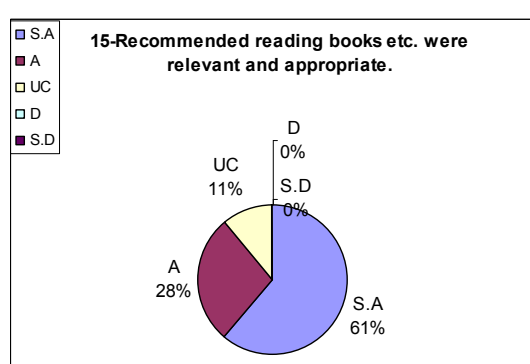
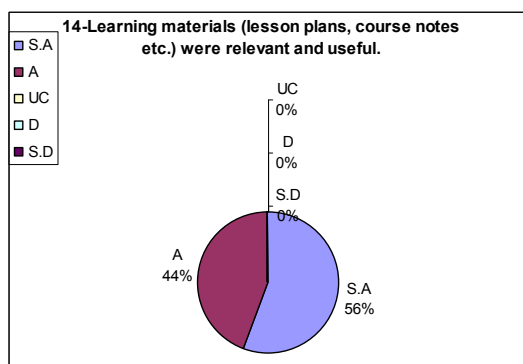
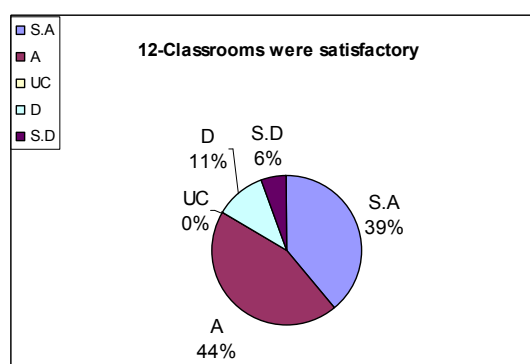
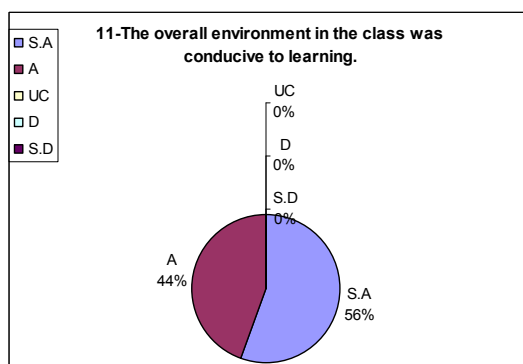
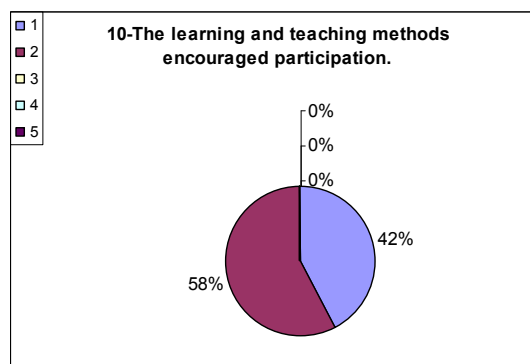
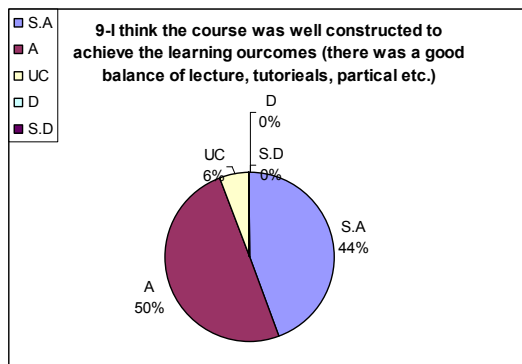
Weaknesses:

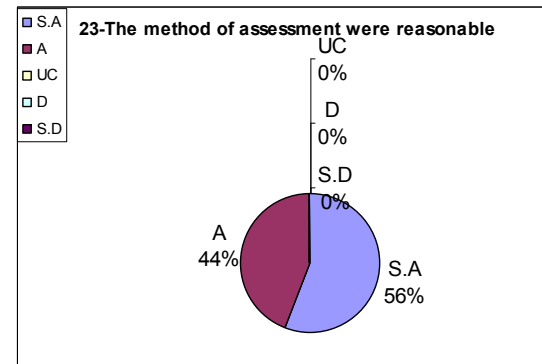
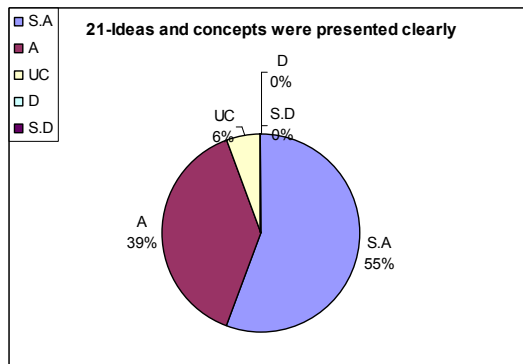
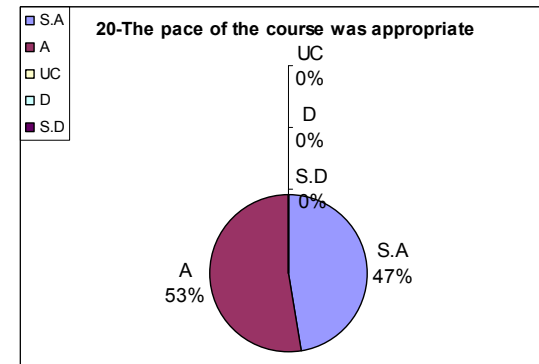
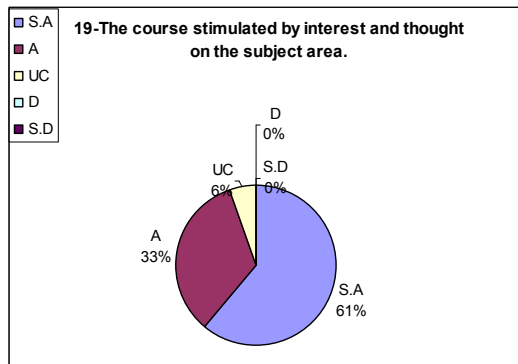
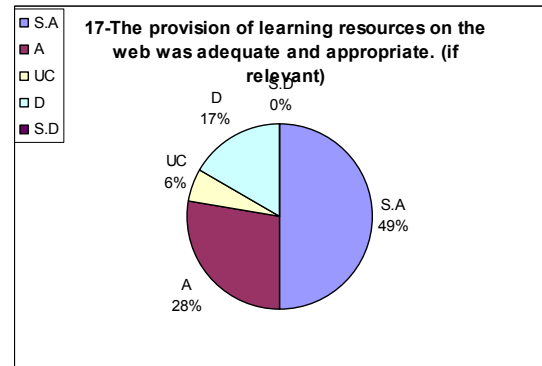
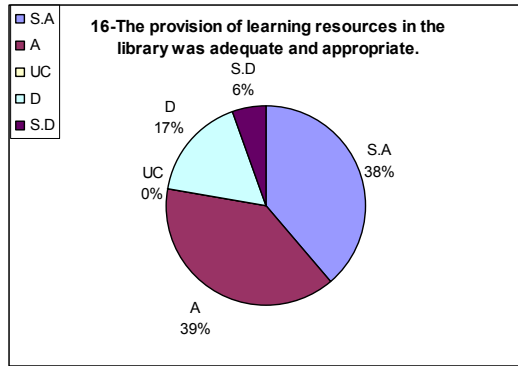
- Learning environment in class was not satisfactory.
- The course should have clear objectives.
- The course contents were not clear.
- Relevant information about course was not available in the books available in library.
- Course can be improved by practical demonstrations and presentations in class.
- Practically, lab requirements were not fulfilled.

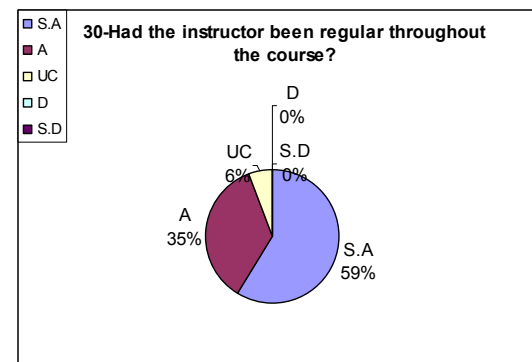
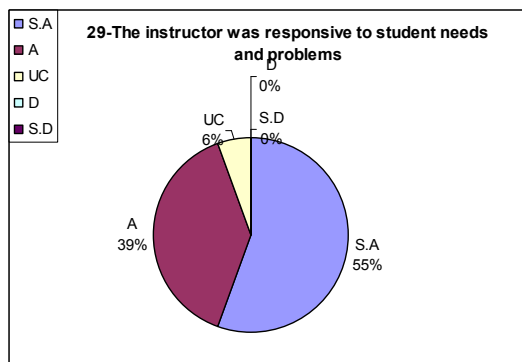
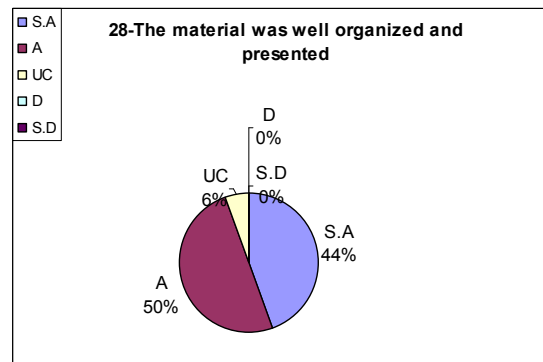
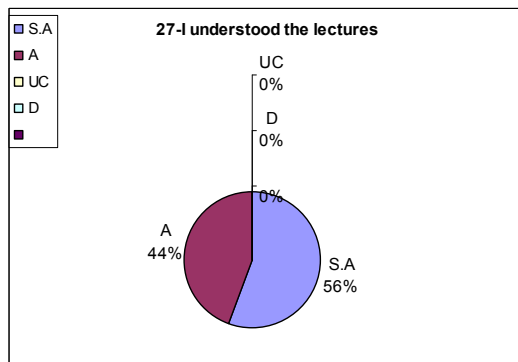
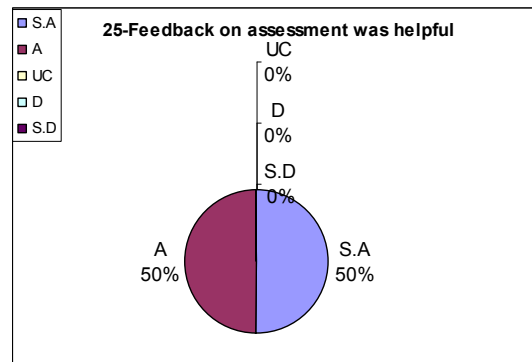
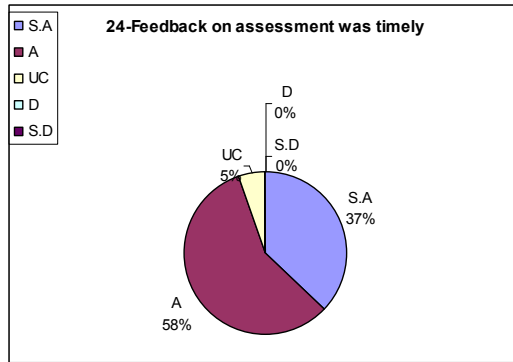
PP 710 (Teacher 4)

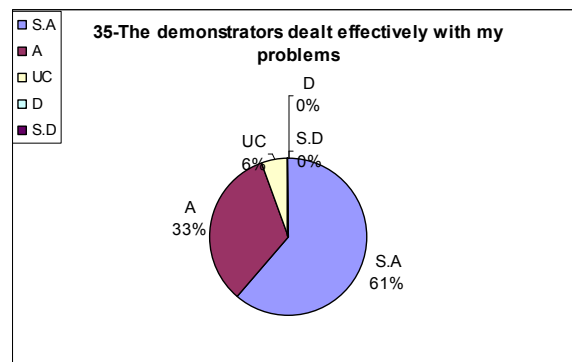
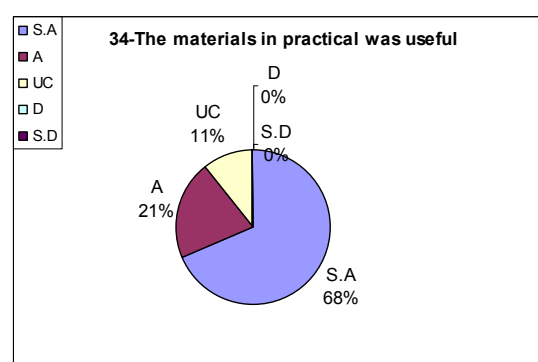
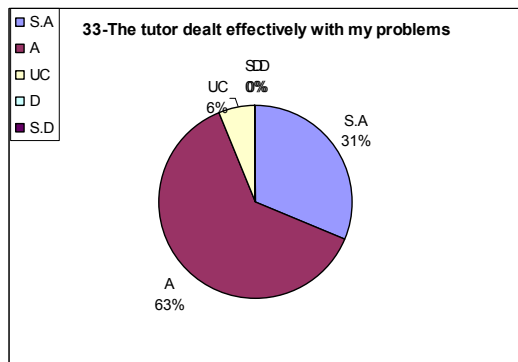
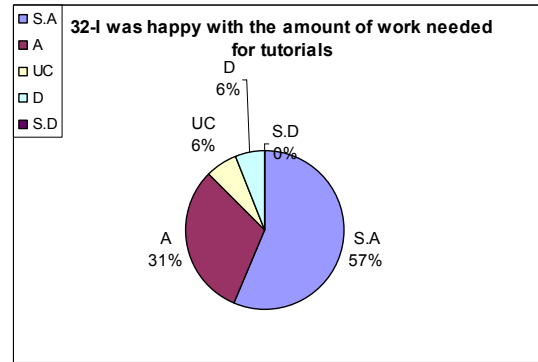
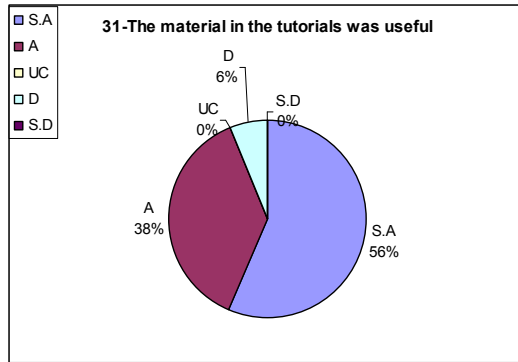
While evaluating the course only 6 % students disagreed that the course work was manageable. On the other hand 83 % students showed satisfaction over class room environment. Likewise 77 % students indicated that learning resources in the library were not adequate. Where 11 % students were not certain that the recommended books were adequate.











General Comment of Students about the Course

Weaknesses:

- Paper should include objective and subjective part.
- Lab equipment was not appropriate.
- Practicals can improve the course.
- Course could be improved by more pictures, slides and models about diseases.

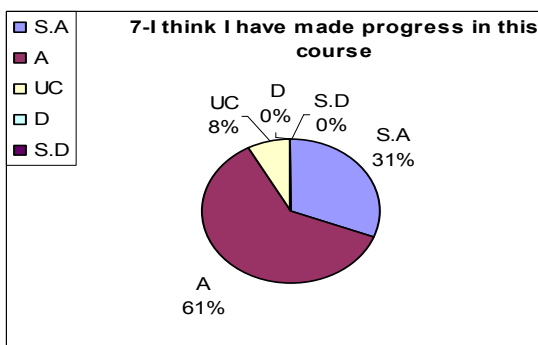
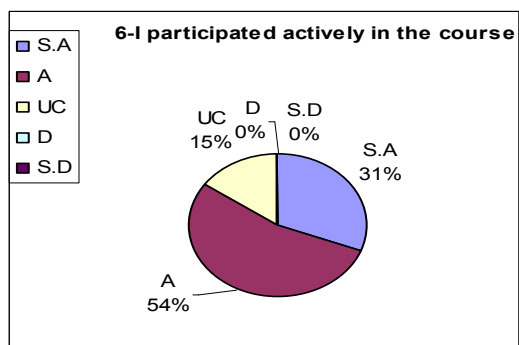
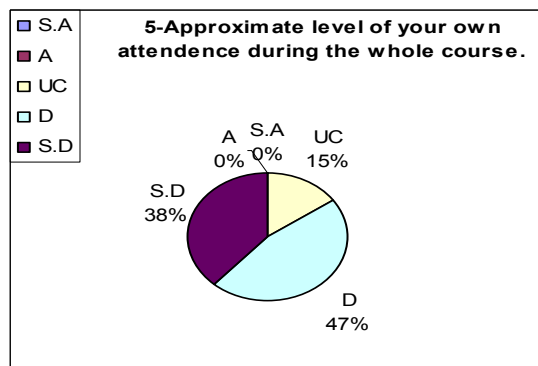
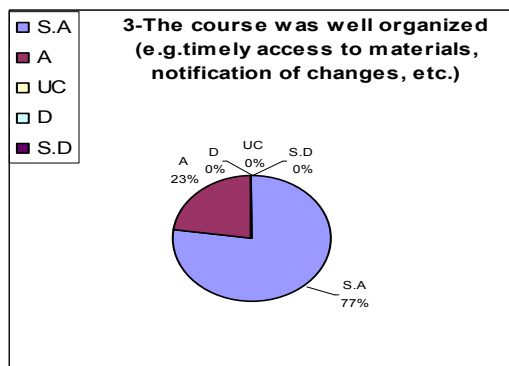
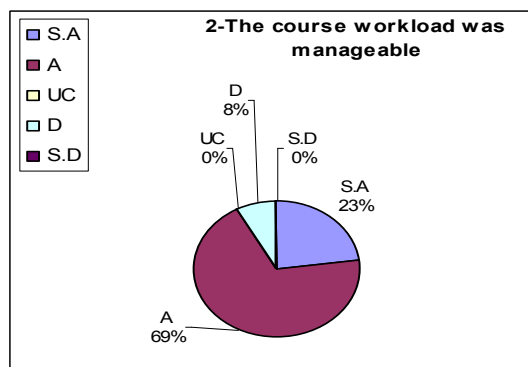
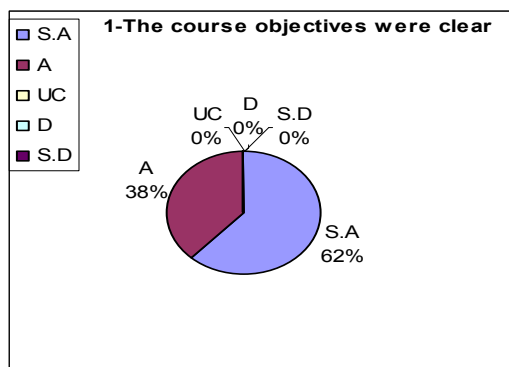
Strengths:

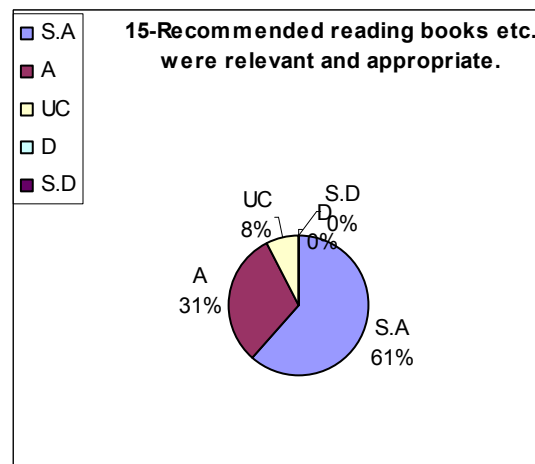
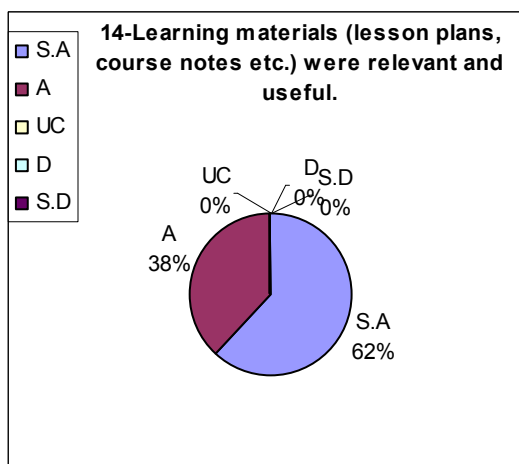
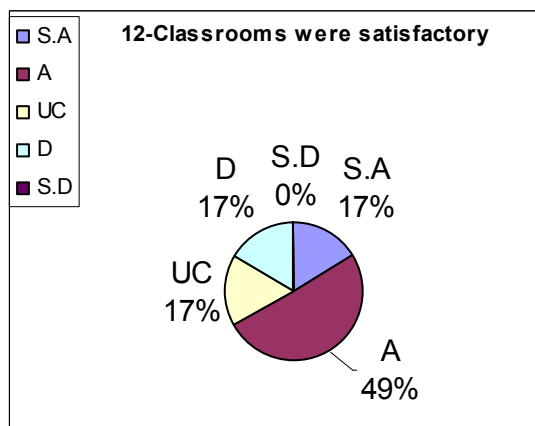
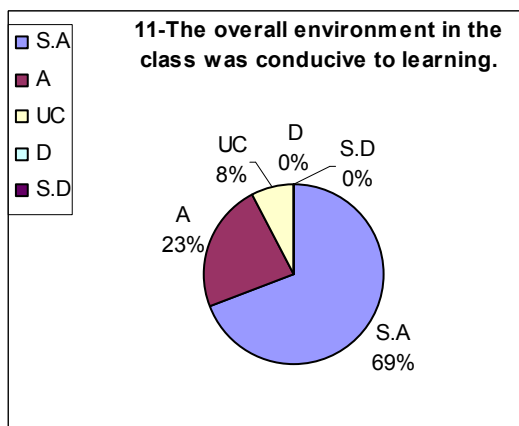
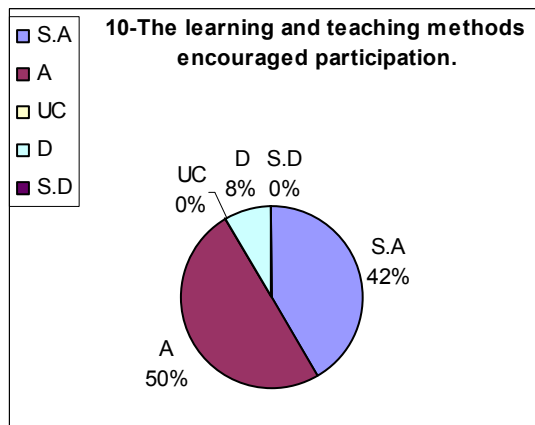
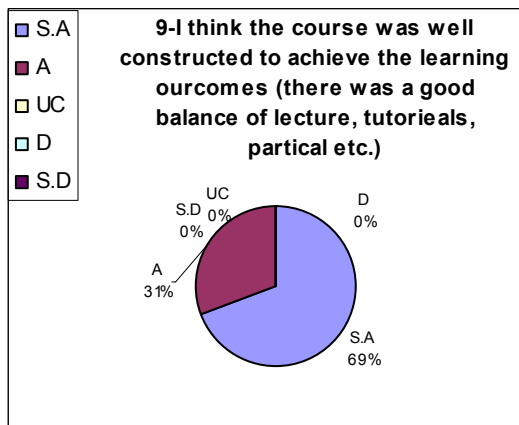
- Course was relevant to field.

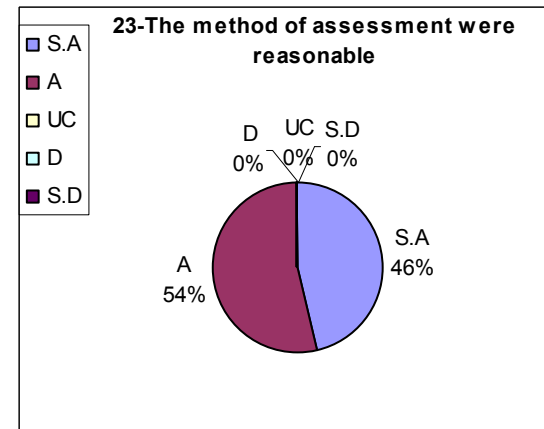
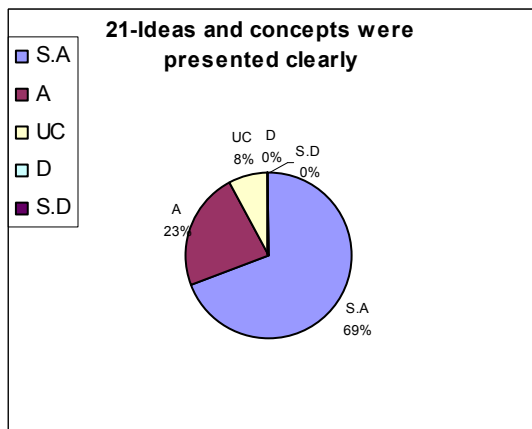
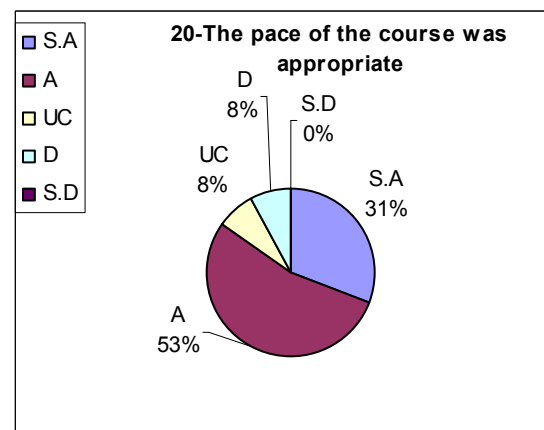
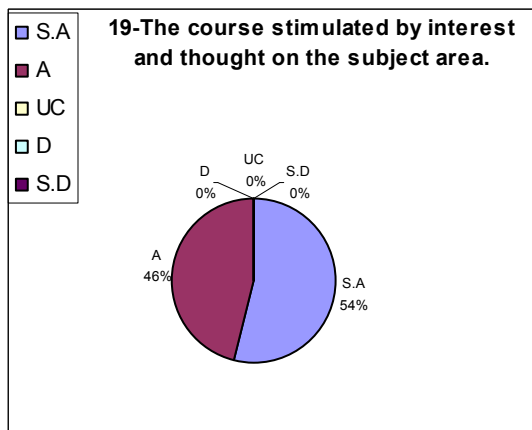
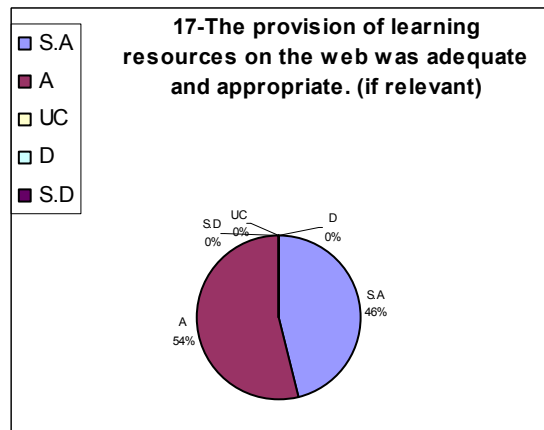
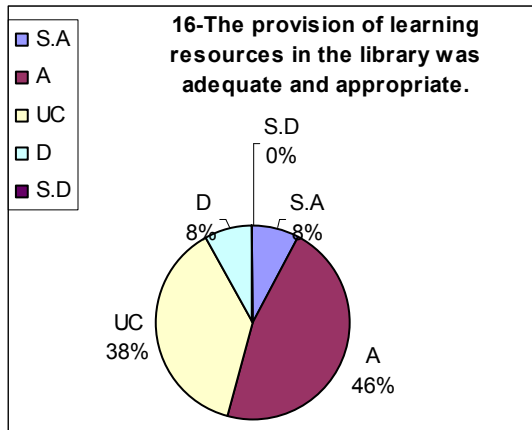
- The course was completed (fully).

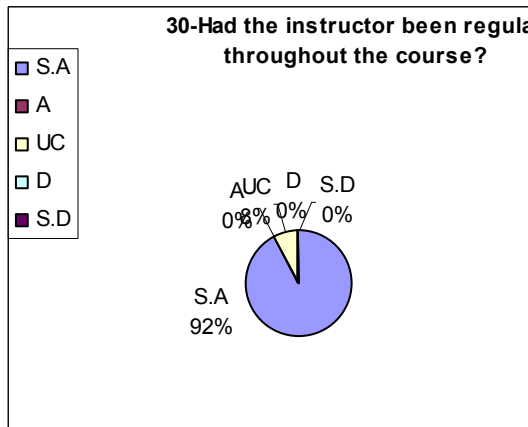
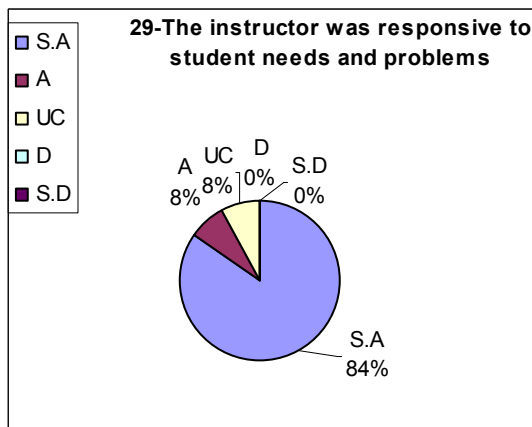
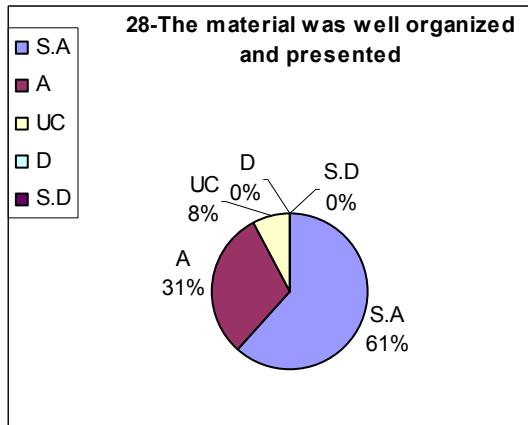
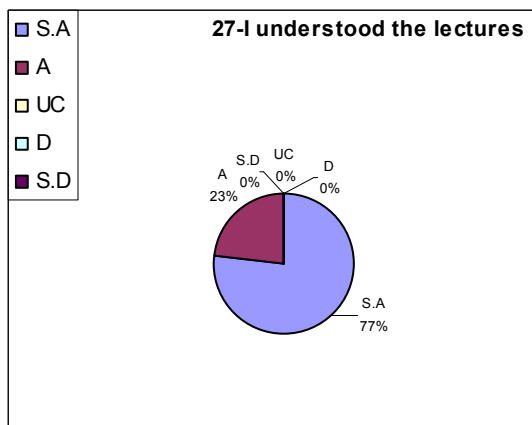
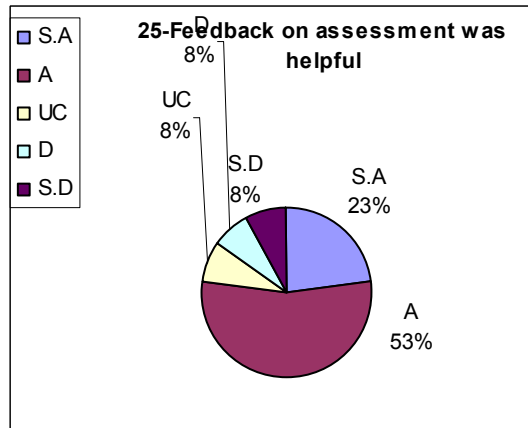
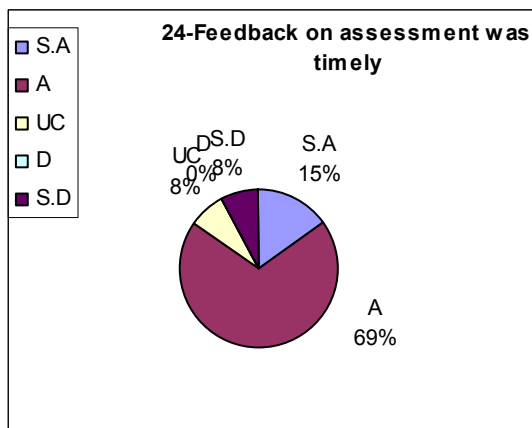
PP 708 (Teacher 3)

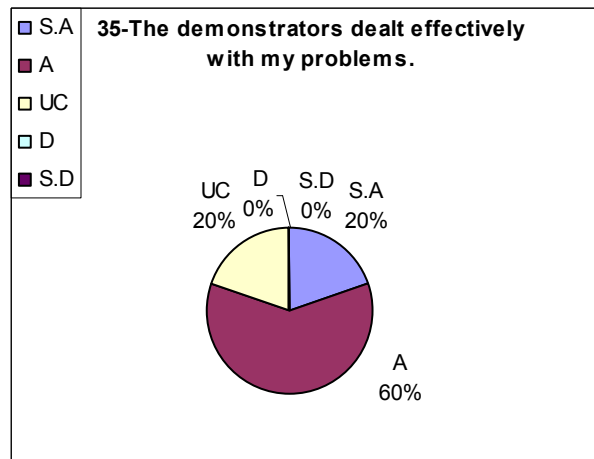
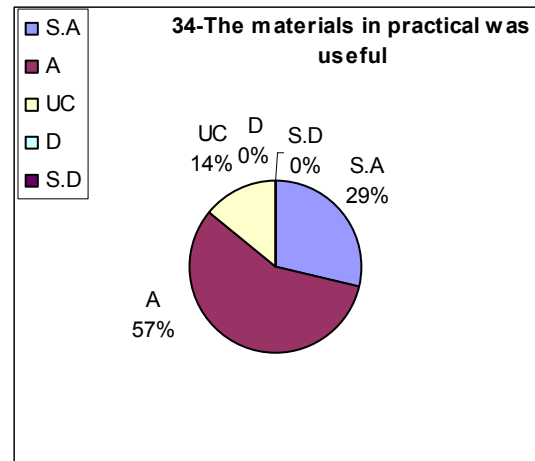
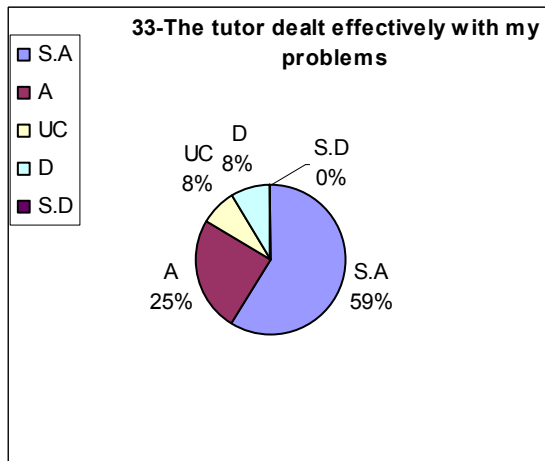
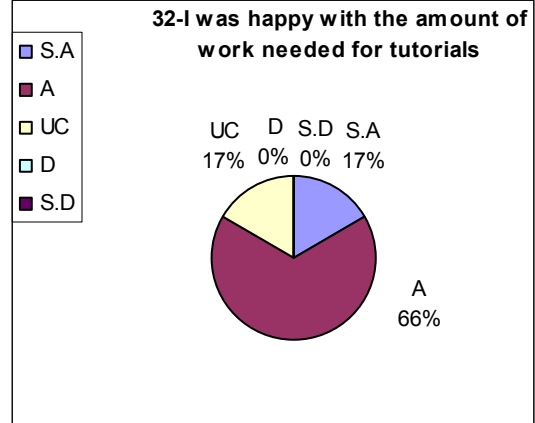
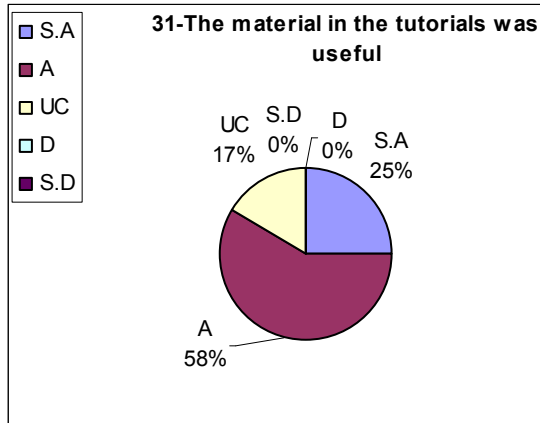
The results of survey presented in the following graphs revealed that overall evaluation of the course by the students was satisfactory. However 15 % respondents were uncertain about the level of their own attendance and their active participation in this course. Eight percent were uncertain as they had made progress in this course. Similarly 44 % of the respondents did not agree about the conducive environment of the class room. Forty six percent did not agree that learning resources in the library were appropriate.











General Comment of Students about the Course

Weaknesses:

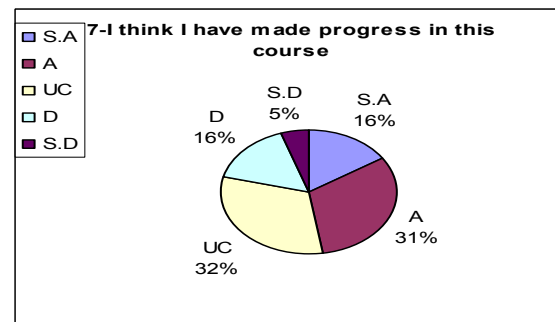
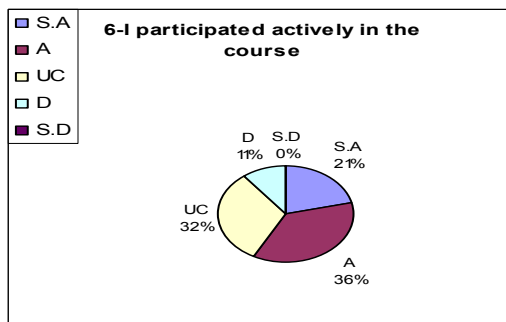
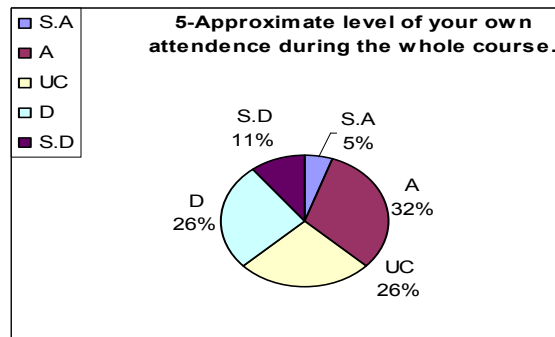
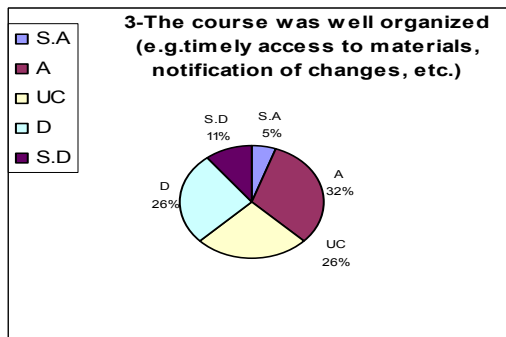
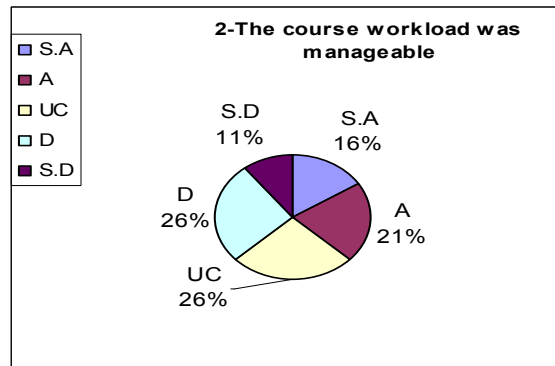
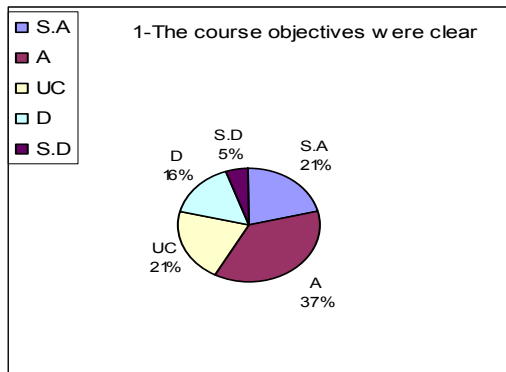
- Practical should be added to this course.
- Learning resources were unsatisfactory.
- Recommended books were not available in the library.

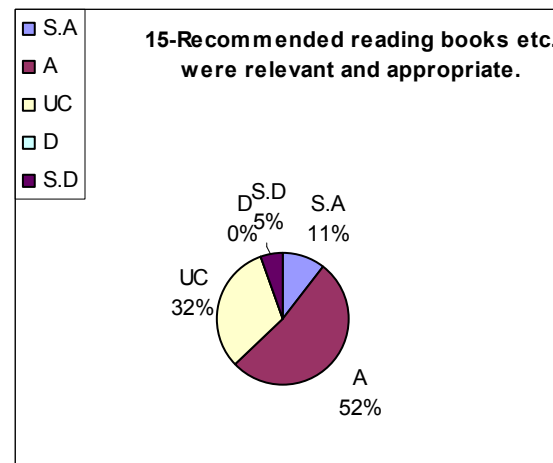
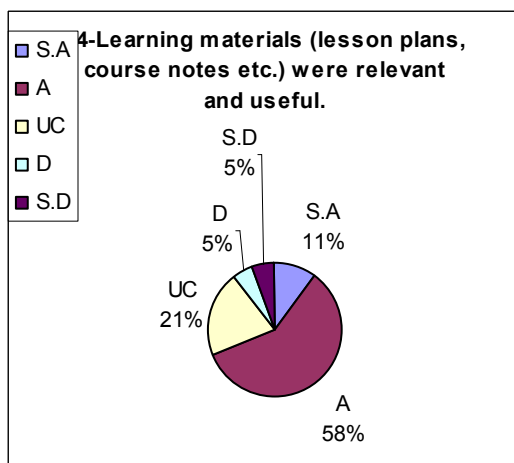
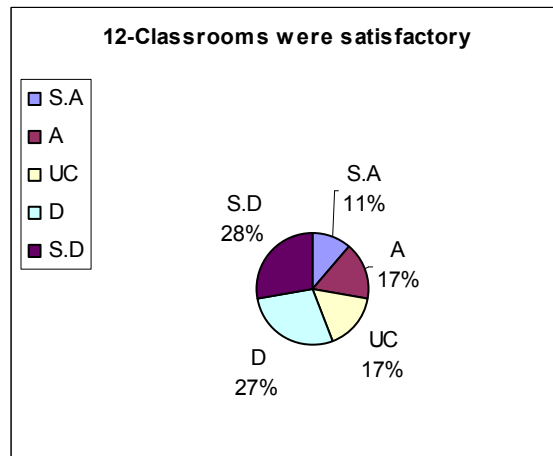
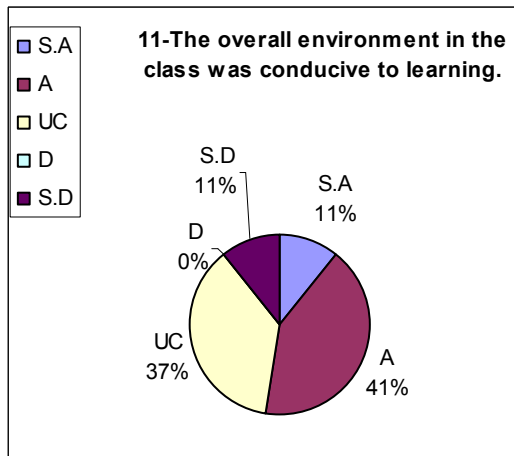
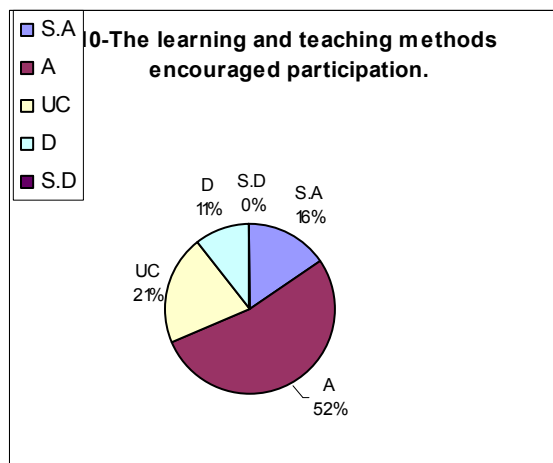
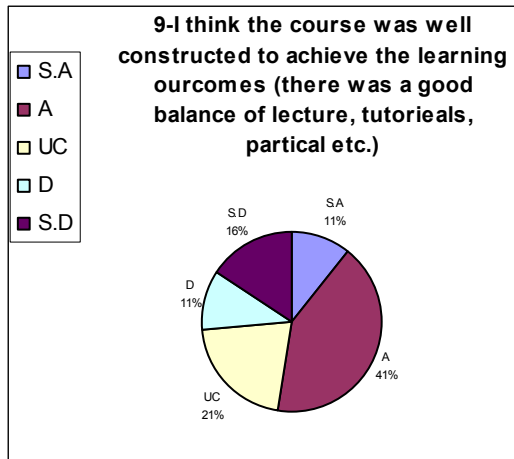
Strengths:

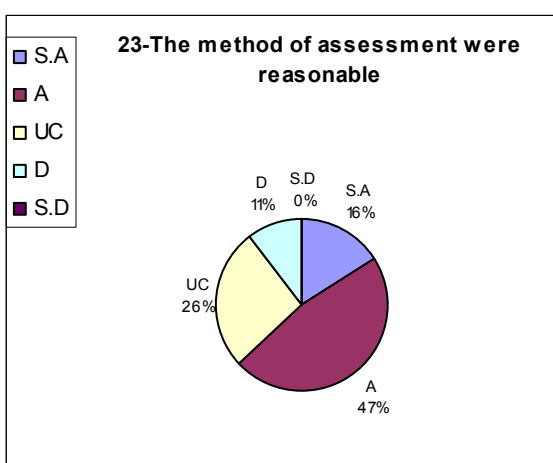
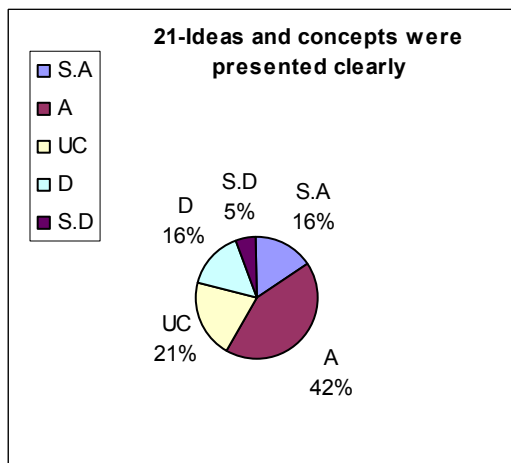
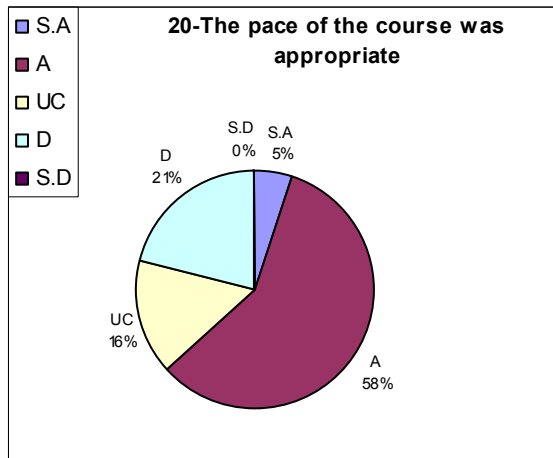
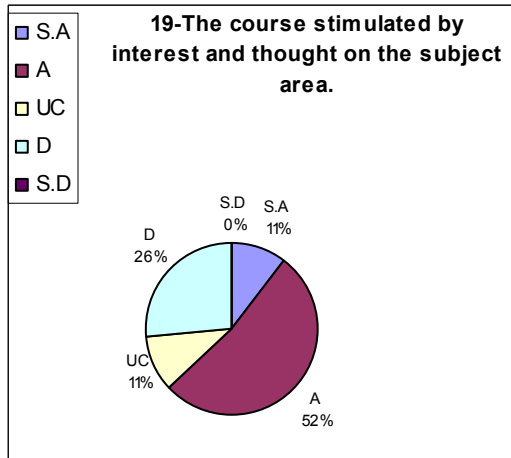
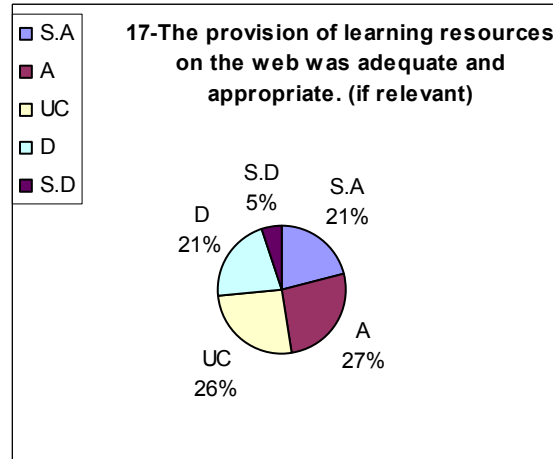
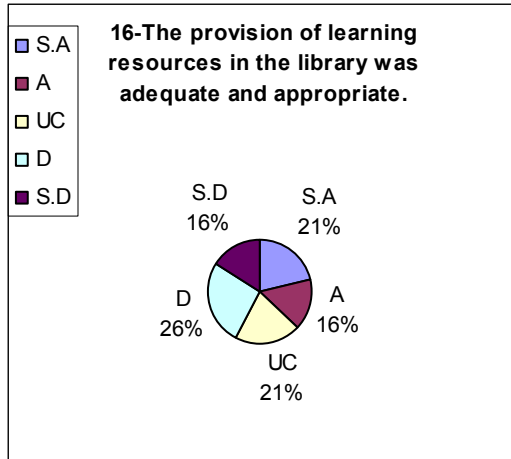
- Course was interesting and knowledgeable.
- Course was helpful for future.

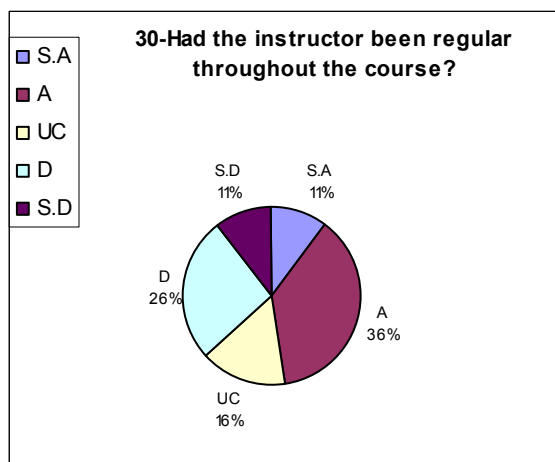
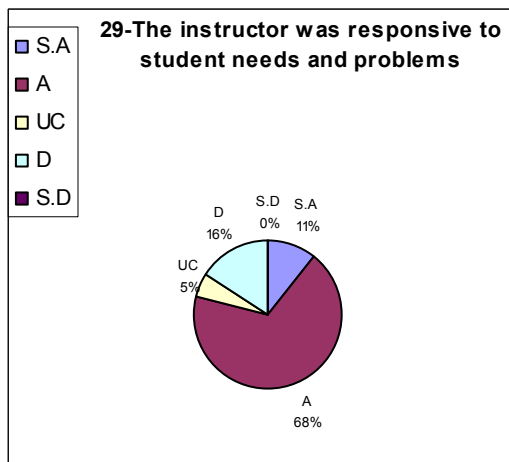
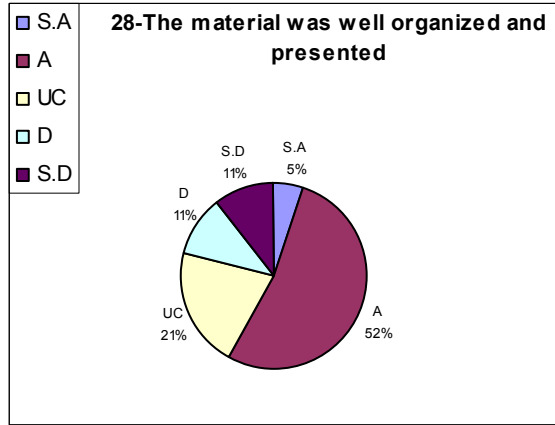
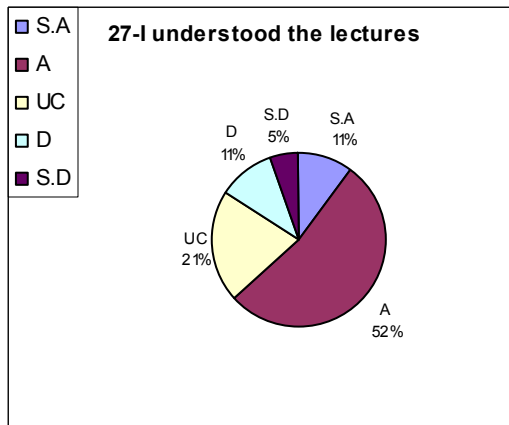
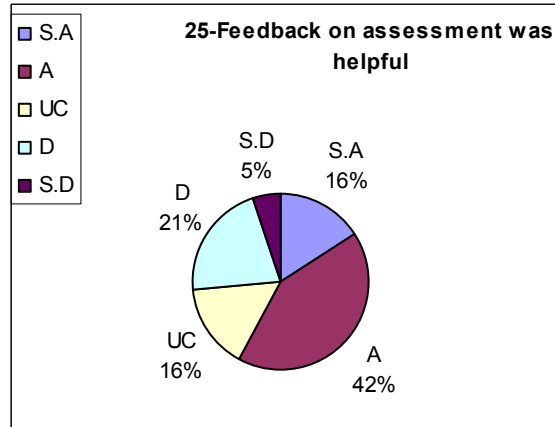
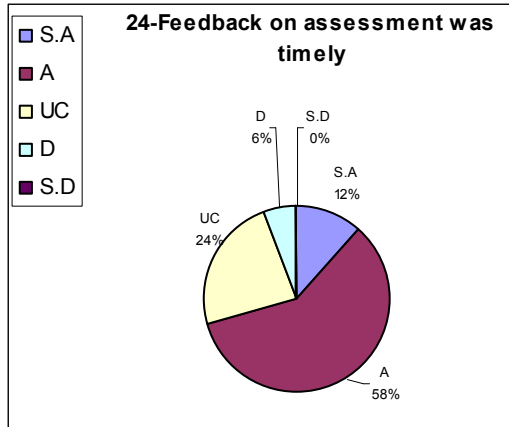
PP 502 (Teacher 7)

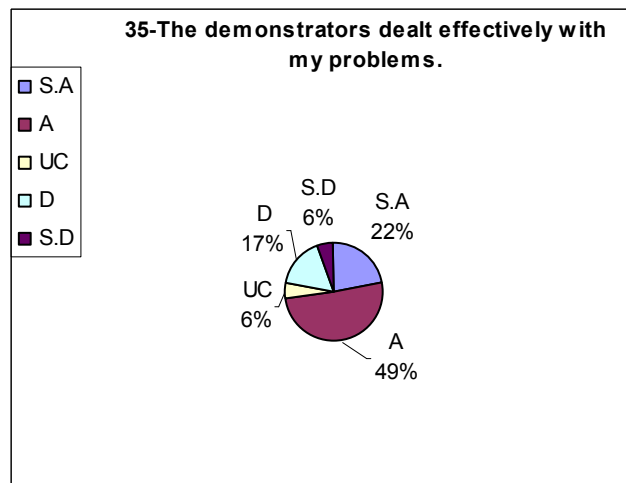
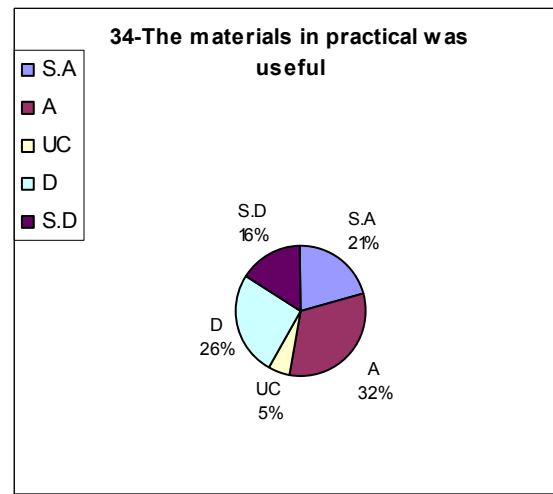
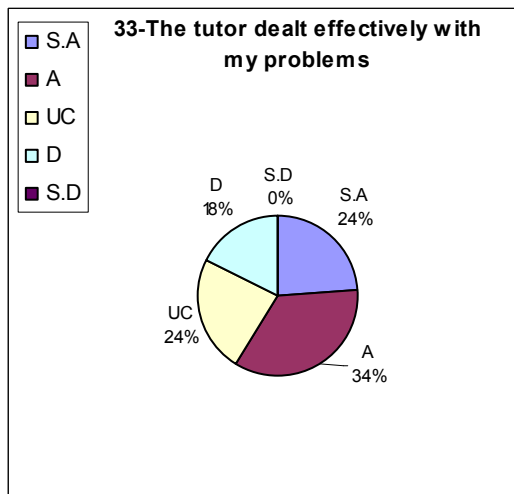
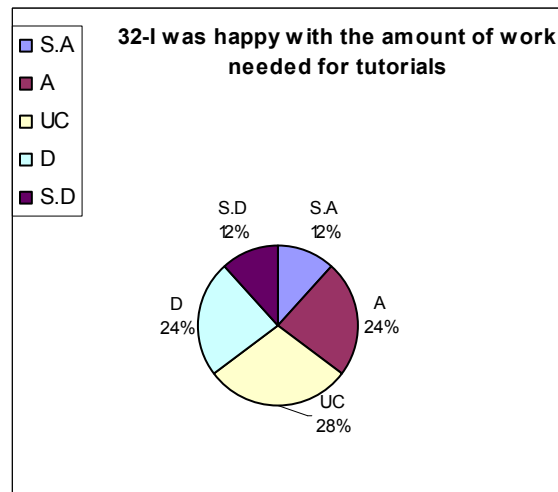
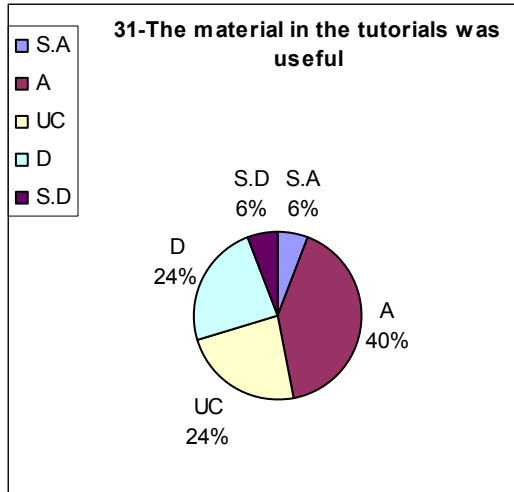
Evaluation of this course did not reveal excellent results. As 42 % students did not agree that course objectives were clear. Similarly 63 % students did not agree that the workload was manageable. Whereas 63 % of the respondents showed that the course was not well organized and their level of attendance was not upto the mark. Whereas 53 % students stated that they did not make progress in this course. Results of other questions are also similar as shown below.











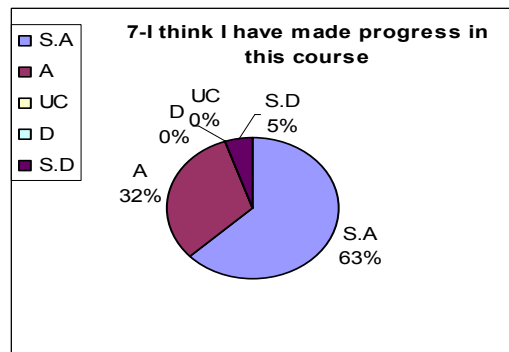
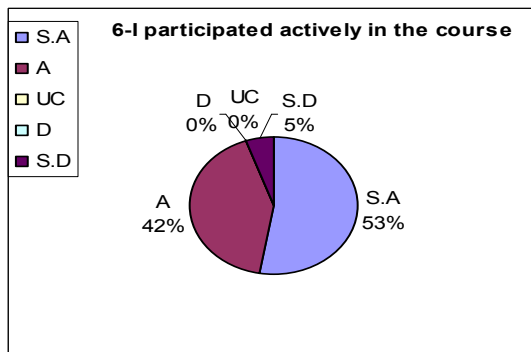
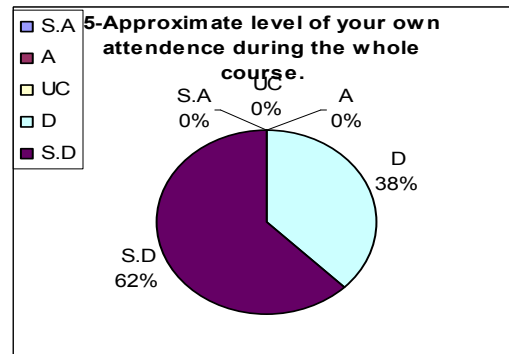
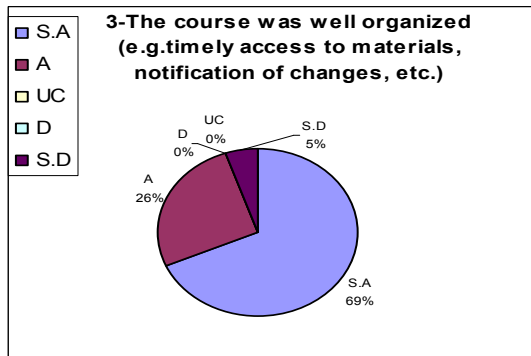
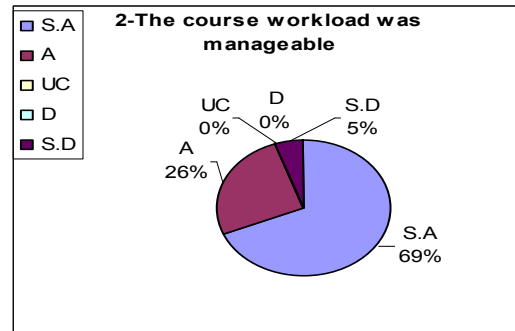
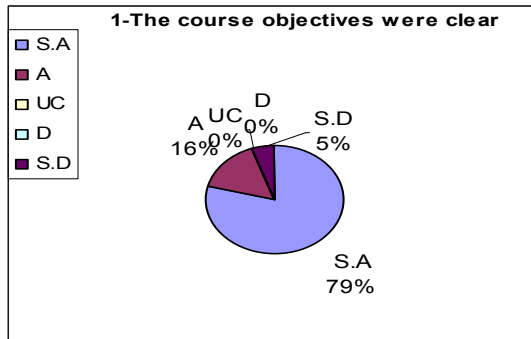
General Comments of Students about the Course

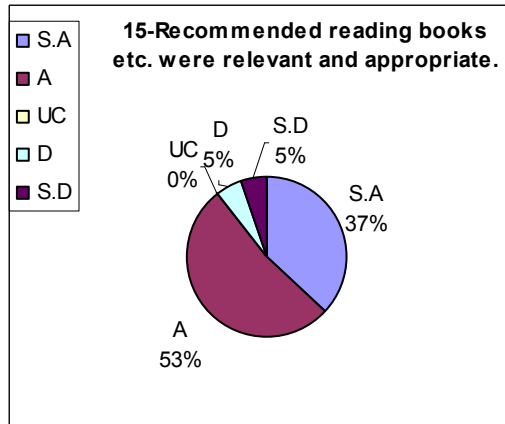
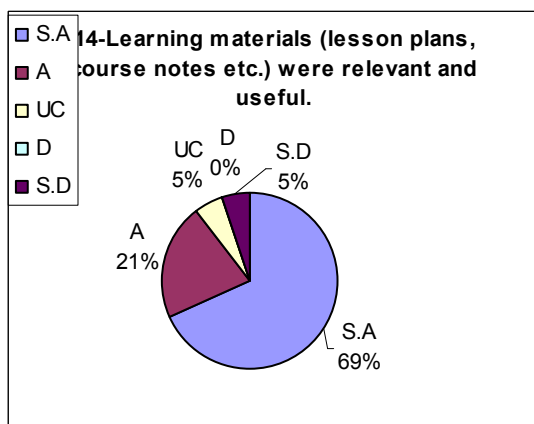
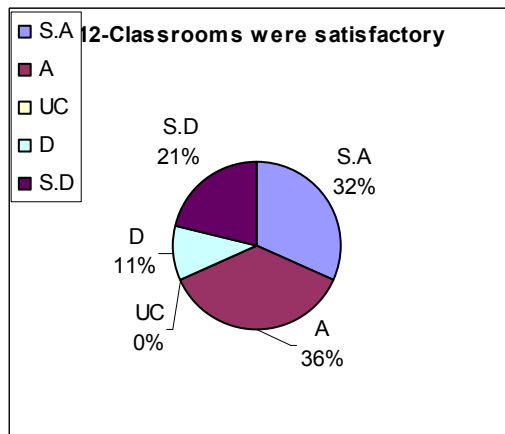
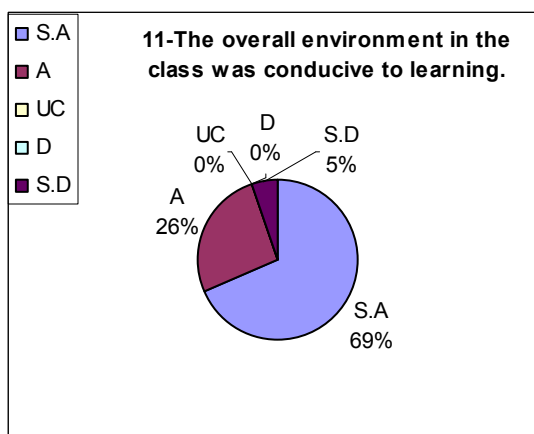
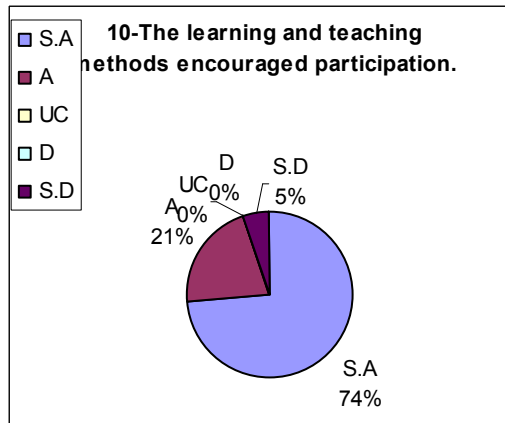
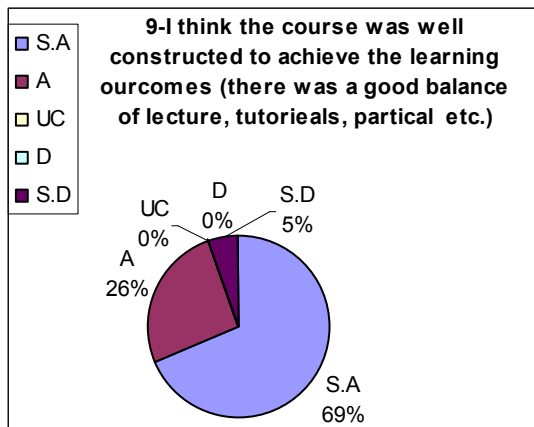
Weaknesses:

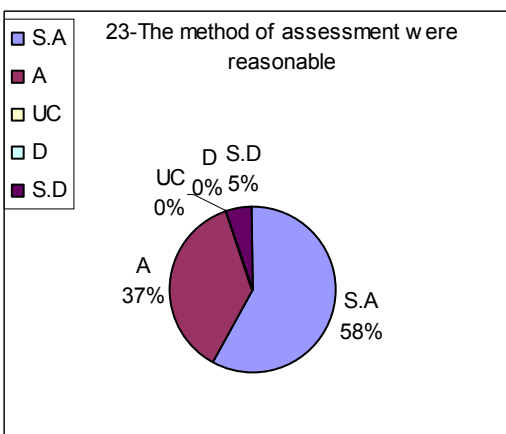
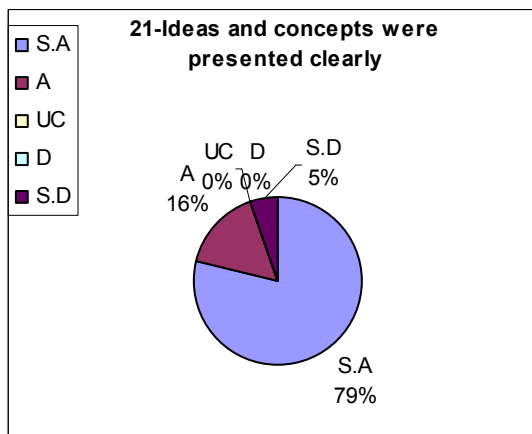
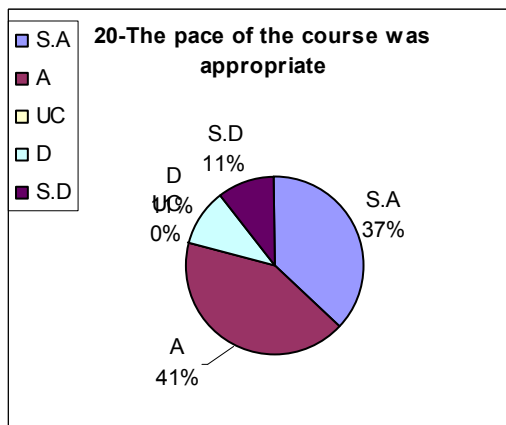
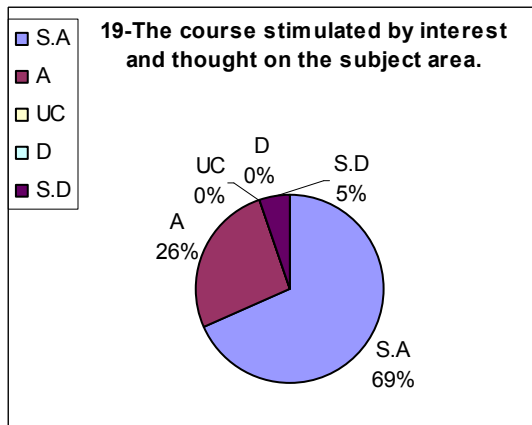
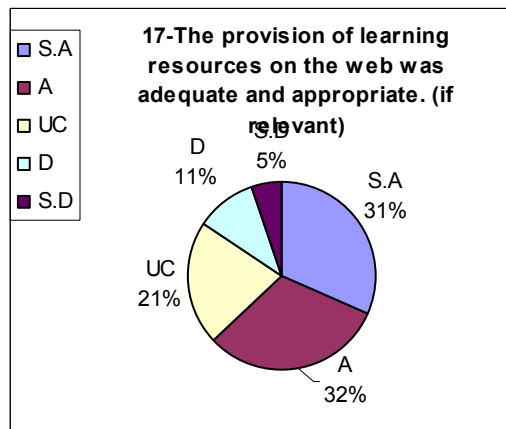
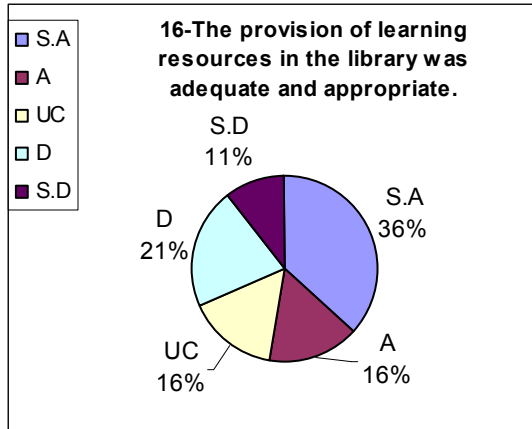
- Course was confusing.
- Proper handouts should be provided.
- Course objectives should be clear.

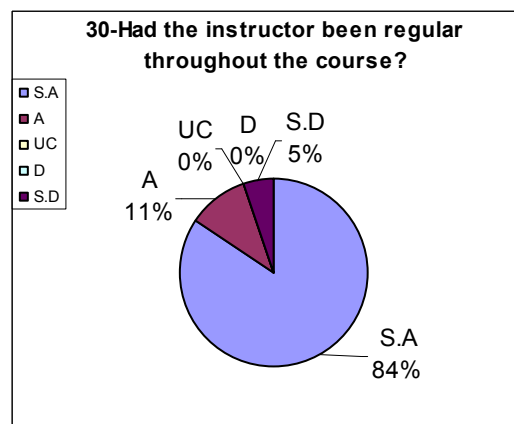
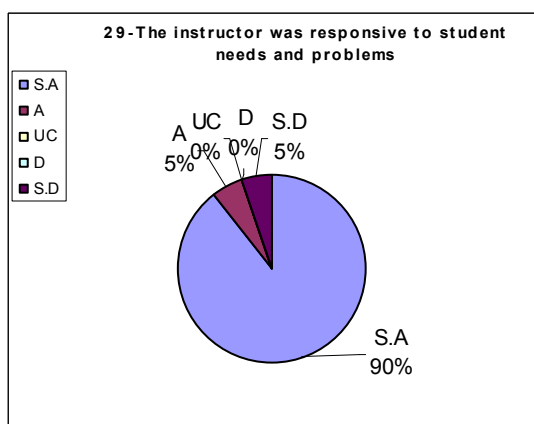
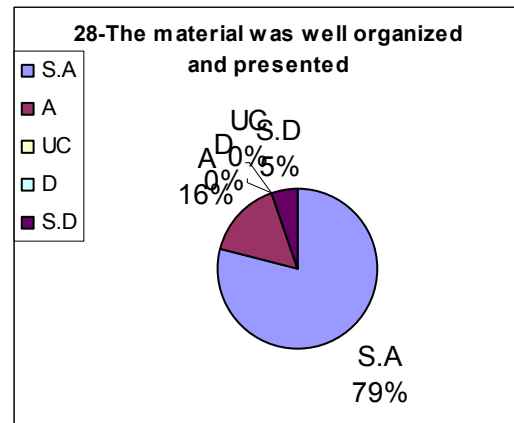
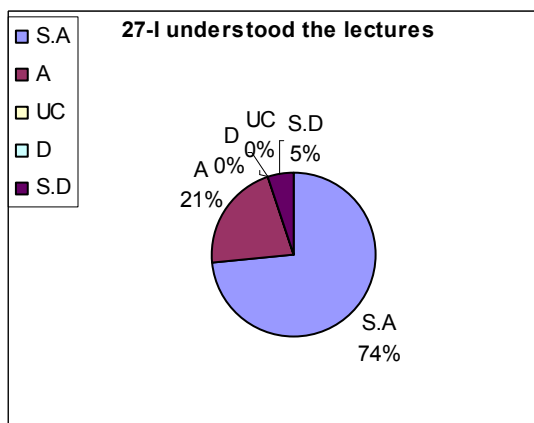
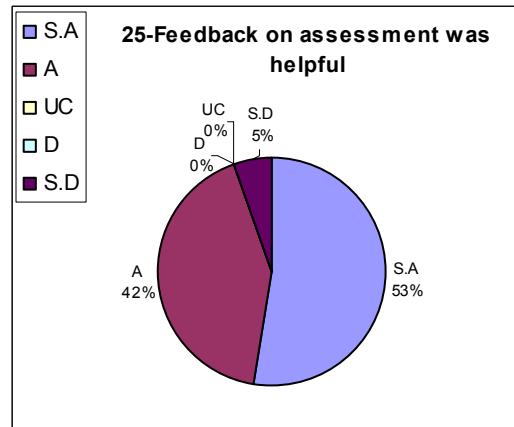
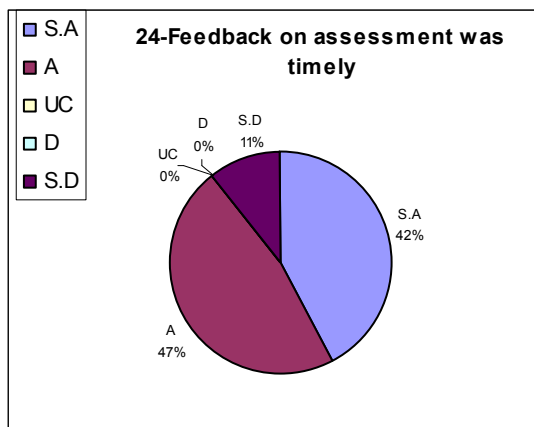
PP 508 (Teacher 1)

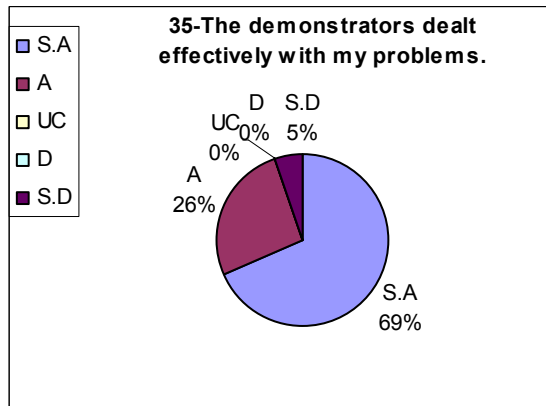
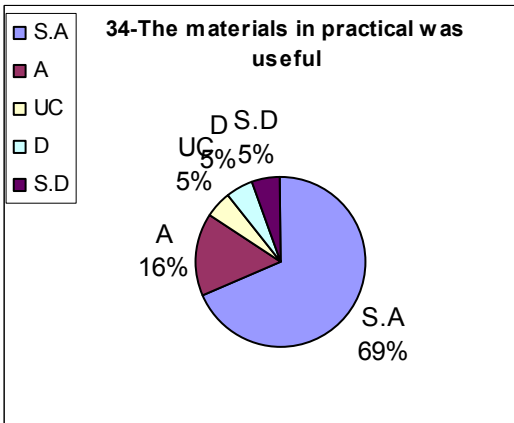
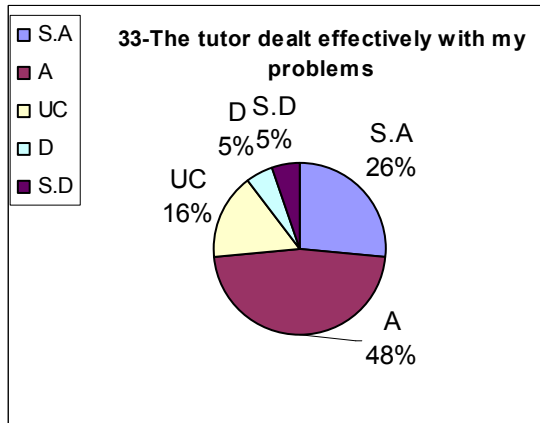
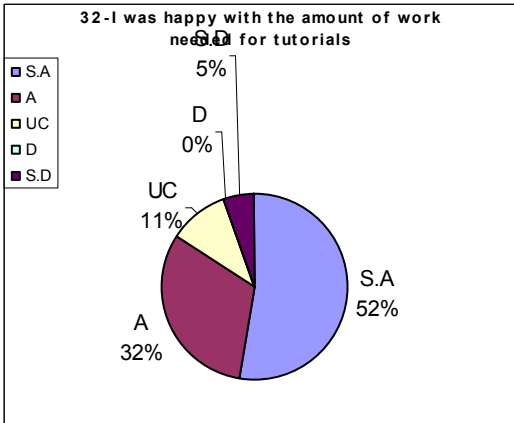
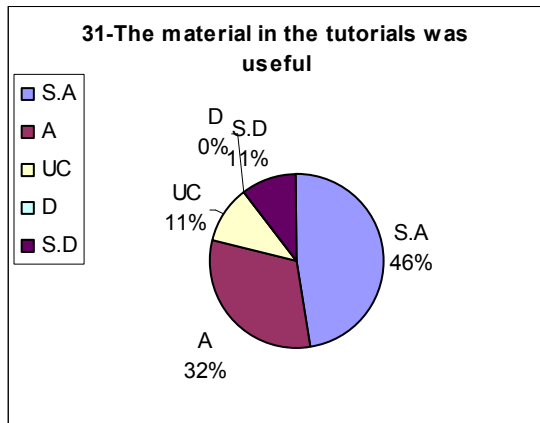
It is evident from the following charts that most of the students were satisfied with the course. However 62 % students strongly disagreed with the level of their own attendance in this course. Five percent respondents disagreed that they actively participated, made progress and teaching methods encouraged their participation in this course. But 68 % students were of the view that class room environment was satisfactory. Similarly 52 % students agreed that learning resources in the main library were adequate. But 37 % pointed out that they were not provided appropriate learning resources.











General Comments of the Students about the Course

Weaknesses:

- Practical durations should be increased.
- Course can be improved by adding more practicals and new techniques.
- Lab equipment/facilities should be improved.
- Class room condition should be improved.

Strengths:

- Course was informative.

Alumni Survey Results

Since majority of the Plant Pathology graduates joins research institutions and universities, Proforma 7 (Annexure-VII) were sent to them for their feedback. The overall results of program assessment by the Alumni are presented in Fig-3.

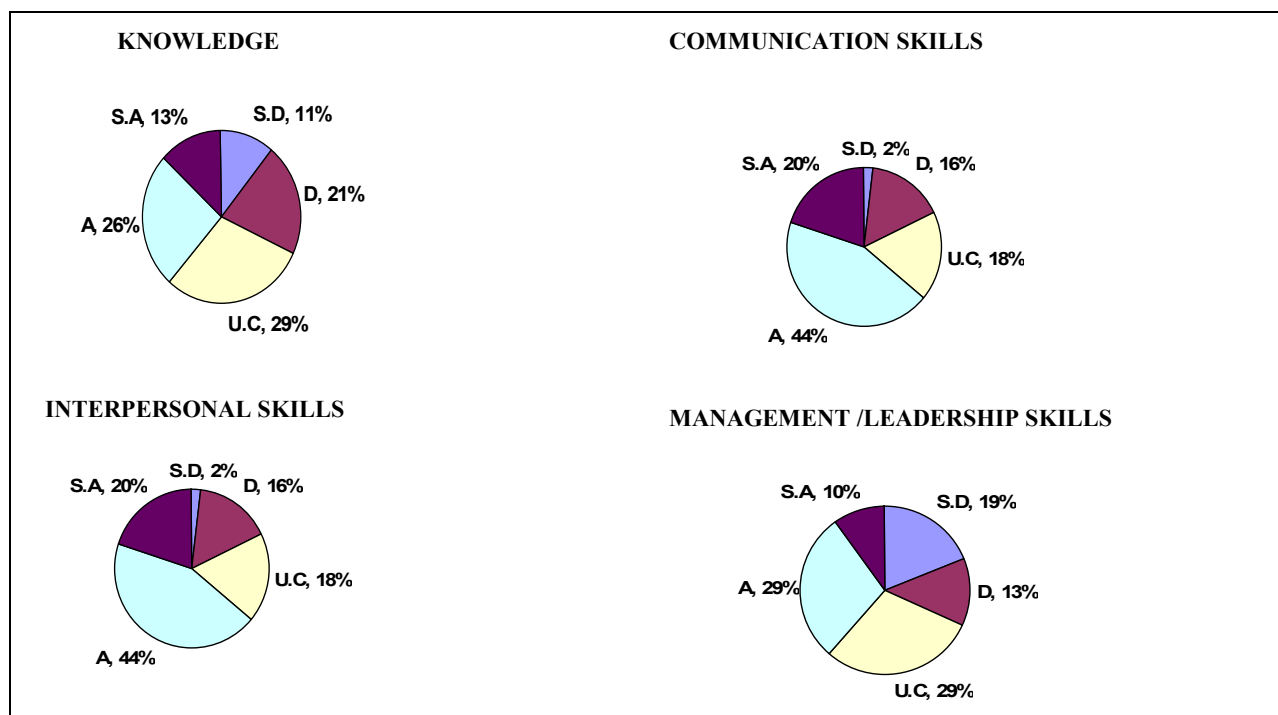


Fig.3 Results of the Alumni Survey

S.D = Strongly Disagree; S.A = Strongly Agreed; A = Agreed D = Disagree U.C = Uncertain

It is evident from the pie chart regarding knowledge that 39 % of the students were agreed, while 61 % students were disagree and uncertain. The chart regarding communications skills showed that 67 % of the students were agreed and 33 % were disagreed and uncertain. The chart regarding interpersonal skills showed that 64 % of the students strongly agreed while 36 % disagreed and uncertain. Management/ leadership skills chart revealed that 39 % of the students agreed and 61 % disagreed and uncertain. The results of individual parameters are given in the following Fig.4 -7.

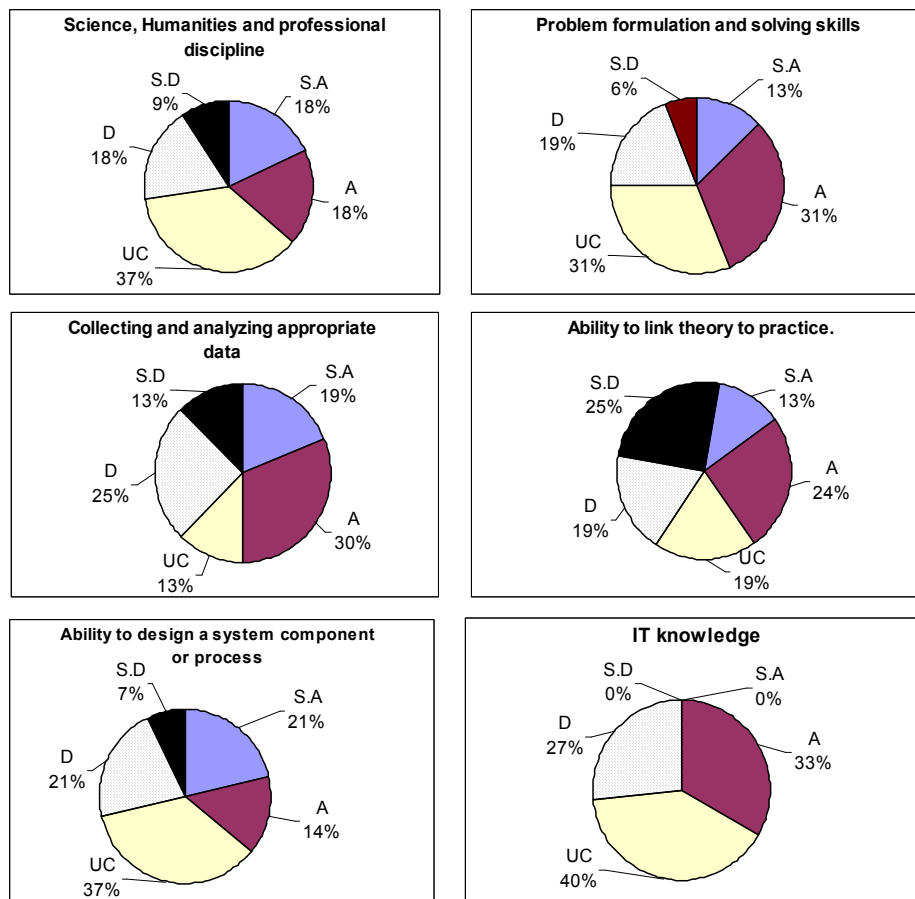


Fig.4 Knowledge

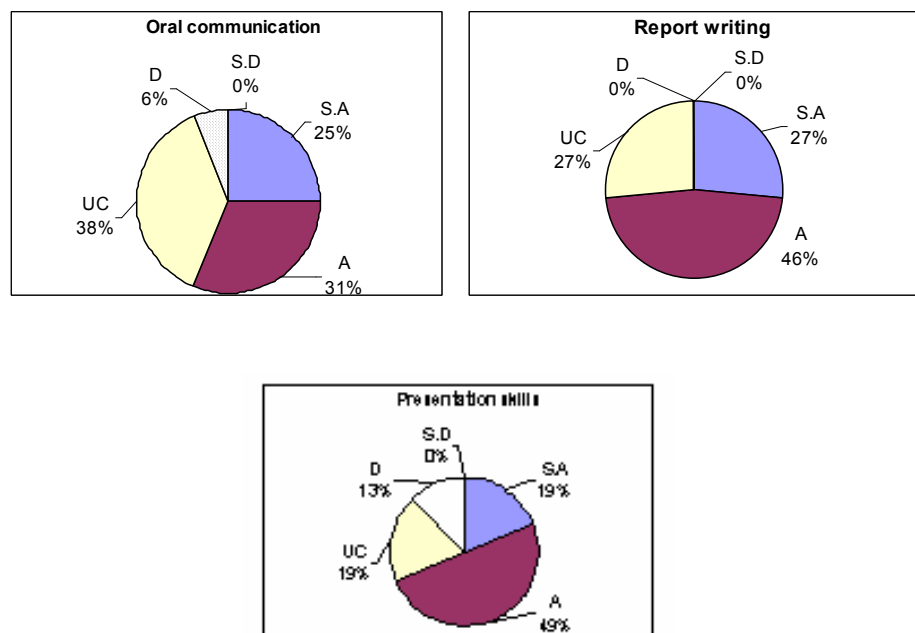


Fig. 5 Communication Skills

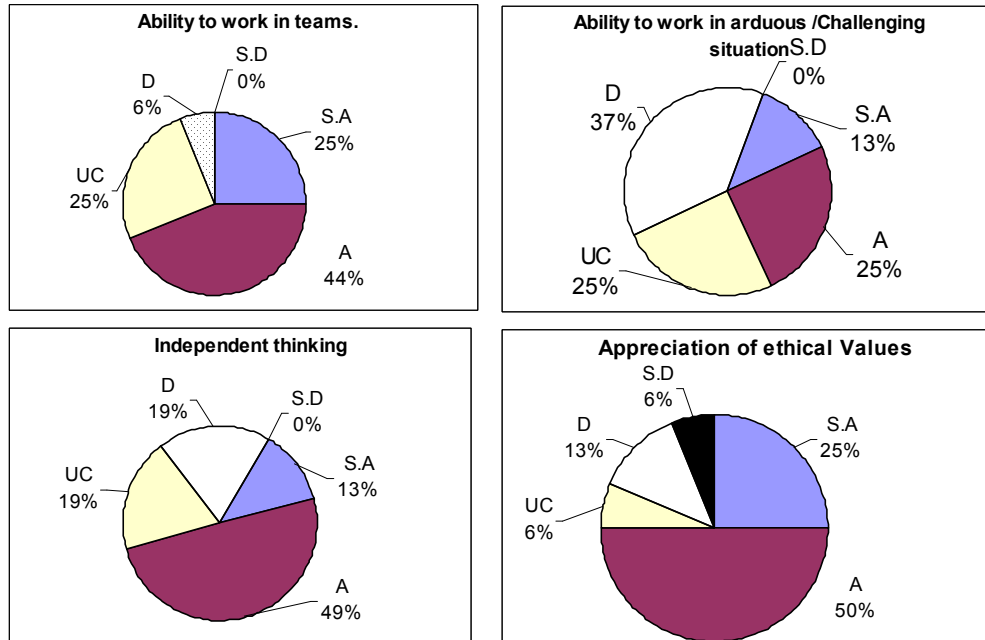


Fig. 6 Interpersonal Skills

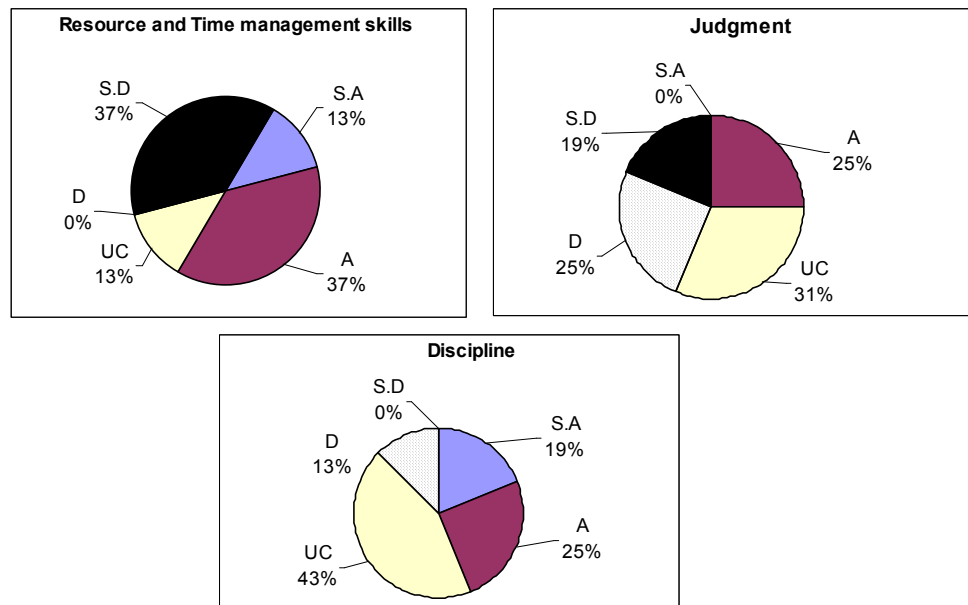


Fig. 7 Management/Leadership Skills

Skills and Capabilities Reflected in Performance as Plant Pathologists

Students are trained in a way that they develop ability to apply knowledge of plant pathology as professionals. They can exploit their confidence level and communication skills effectively in writing, oral, use of modern tools, techniques and skills for their profession to formulate and design the experiments/project and to work effectively in a team, to manage disease problems and imbibe ability to recognize future needs.

Survey of Graduating Students

Results of survey of graduating students based on Proforma 3 (Annexure III) are given in Fig- 8. The graduating students in the last semester were surveyed before the award of degree. More than 45 % students showed their satisfaction regarding all the parameters on average, whereas 25 % of the students surveyed were highly satisfied regarding all information asked. The results of graduating students are summarized and given in Fig. 8.

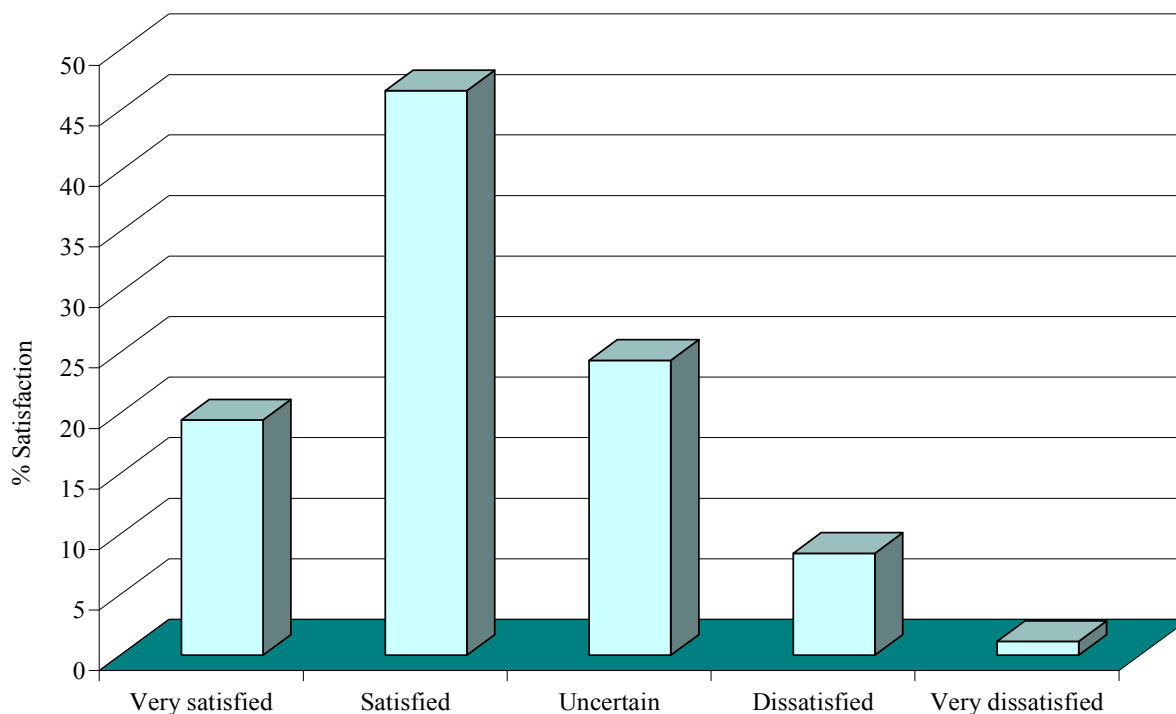


Fig. 8 Survey of Graduating Students

Best Aspects of the Programme

1. Highly qualified faculty
2. Induction of national professors through the Higher Education Commission of Pakistan
3. Helping attitude of the chairperson for all students in research and extra curricular activities
4. Timely advice
5. Phytodoctor forum

Weaknesses:

1. Some research facilities such as ELISA, PCR are not available
2. There is need for the faculty to get foreign training in the discipline of molecular biology.

Affectivity of Internship Experience

The internship experience was found effective in enhancing, ability to work in team, independent thinking, appreciation of ethical values, professional development, time management skills, judgment and discipline Fig- 9; Table 3.

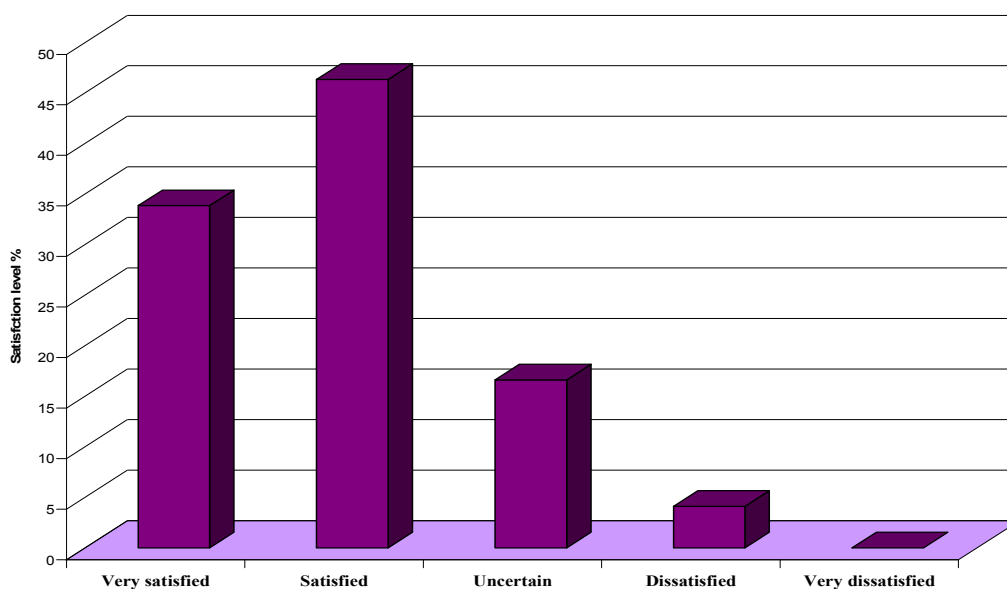


Fig. 9 Affectivity of Internship Experience

Table 3 The Internship Experience is Effective in Enhancing Professional skills of the graduating students

Sr. No	Parameter	Very satisfied (%)	Satisfied (%)	Uncertain (%)	Dissatisfied (%)	Very dissatisfied (%)
a	Ability to work in teams	63	37	0	0	0
b	Independent thinking	27	55	18	0	0
c	Appreciation of ethical values	20	60	20	8	0
d	Professional development	8	54	23	15	0
e	Time management skills	40	40	20	0	0
f	Judgment	50	40	10	0	0
g	Discipline	33	45	22	0	0
h	The link between theory and practice	30	40	20	10	0

Standard 1-3: The results of Program's assessment and the extent to which they are used to improve the program must be documented.

Strength of the Department

The main strength of the department is the availability of all expertise viz. Mycology, Bacteriology, Nematology, Virology, Epidemiology and Disease Management, with full acquaintance of their respective subjects, having vast knowledge of local agriculture production systems and disease problems. Majority of the faculty members have local degrees and are experts in their fields. Their work has been published in national and international Journals (Table 4; Annexure 11). They have also implemented national research projects and are highly conscious of the problems to be taken by the post-graduate students. Two National Professors, Dr. S.M. Mughal and Dr. Kishwar Sultana, from Higher Education Commission (HEC) specialized in their subjects are currently in action (Table 5).

Weaknesses Identified in the Program

Advanced teaching and research is being handicapped due to lack of important equipment as ELISA Reader, plate washer, homogenizers, PCR equipment and ultracentrifuge for post-graduate students. Latest literature and reviews are hardly available. There is a need for short term foreign training to young faculty members.

Green-house and animal-house facilities are also lacking. Lecture rooms, common rooms, post-graduate laboratories, library and survey/field diagnostic aids are also lacking. The students' work indicates that there is some opportunity for improving communication skills and the focusing on the practical aspects.

This is the first assessment report; the department is looking forward to see the implementation of the measures.

Standard 1-4: The department must assess its overall performance periodically using quantifiable measures.

Performance of the faculty members pertaining to research activities indicates that there are 240 research papers, 81 other publications and 15 projects in the credit of faculty members of the plant pathology department (Table-4 and 5).

Table 4. Present Performance Measures for Research Activities

Faculty	Publications	Others	Projects
Dr. Irfan Ul-Haque	30	49	3
Dr. Abdul Rauf	38	1	3
Dr. Tariq Mukhtar	35	7	1
Dr. Abid Riaz	13	1	1
Mr. Usman Raja	6	0	1
Ms. Gulshan Irshad	6	0	1
Dr. Muhammad Ashfaq	10	3	1
Dr. Farah Naz	4	0	0
Total	142	61	11

Table 5: National Professor appointed by the Higher Education Commission to strengthen the Program

Faculty	Publications	Others	Projects
Dr. S. M. Mughal (National Professor, HEC)	58	20	2
Dr. Kishwar Sultana (National Professor, HEC)	40	0	2
Total	98	20	4

Major Future Improvement Plans

- To impart quality education in Plant Pathology through audio visual aids and modern tools along with provision of latest literature, journals, books, reviews and access to internet.
- To extend facilities for plant disease diagnosis, herbarium, museum, culture bank and develop extension material.
- To prepare hand-outs, brochures and pamphlets for the farmers and advisory services
- To equip the post-graduate laboratories (Mycology, Nematology, Bacteriology and Virology) with the modern and sophisticated equipments stated above.
- Human Resource development in Plant Pathology to meet future challenges for sustainable agriculture leading to self sufficiency in food
- To emphasize problem oriented research on specific diseases prevalent in the arid ecology.
- Overall enhancement of knowledge and skills of faculty members in relation to the latest global advancements in this discipline through exchange programs, short training and collaborative research projects within and outside Pakistan.

Community Services Provided by the Department

The department is providing following community services:

- Organization of farmers' day (local Pothohar area).
- Holding of an international conference of Pakistan Phytopathological Society.

- Workshop for college teachers in pathogen identification and characterization techniques.
- Advisory services to the farmers as and when desired.
- Advisory services to protected farming in tunnels.
- Advisory services on disease diagnosis and management to provincial agriculture department (local).
- Guidance and supervision of students of various departments.
- Supervision of students on internship in various organizations in the Punjab.

A number workshops and seminars organized are given in Table 6.

Table 6: Short courses, Seminars, Workshops and Conferences arranged by the Department

Year	Short Courses	Seminars	Workshops/Conferences
2004-05	0	2	1
2005-06	0	3	1
2006-07	0	4	1

Evaluation of the Administrative Services Offered by the Department

- The department maintains a ratio of 4:1 for the academic (technical) and administrative non-technical staff which fulfils the standard set by the HEC (Table 7).
- Administrative meetings (departmental, university, academic council, and syndicate) are attended as and when required. Generally two meetings of academic council are held per month. Board of studies of the department meets quarterly.
- Quick office disposal; no complaint pertaining to delay has ever received from authorities.
- Proper record of individual students, their theses etc. are maintained.

Students are reasonably happy about the administrative services provided by the department as evident from the graduating student's survey.

Table 7 Quantitative Assessment of the Department (Last three years)

Sr. #	Particular	No.	Remarks
i	Undergraduates (B.Sc. Hons.) produced	55	70% of them joined M.Sc, 25% got employment and 5% did not continue their education.
ii	M.Sc degree awarded	37	5 students joined PhD program; the remaining got employment, currently holding various positions
iii	Ph.D.	2	In employment
iv	Post-Doc fellowship	2	Canada & UK
v	Students: Faculty ratio	12:1	
vi	Technical : Non Technical ratio	4:1	
vii	Average grade point	3	Fulfils the HEC criteria

The evaluation process indicated high efficiency of system and satisfactory impact of outcomes. Almost all the graduate and post graduates got jobs in various organizations (provincial department, universities, research organizations, banks and private firms).

Employer Survey

A survey was conducted to get the employer's point of view about the working of our former students in their organizations (Proforma 8, Annexure 8).

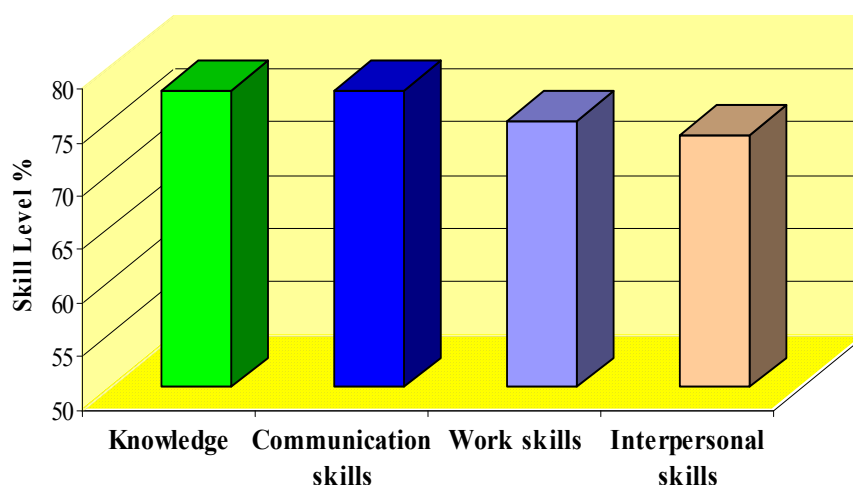


Fig. 10 Employer survey for the determination of students skill level

Feed back about 26 employees was obtained from organizations viz. National Agriculture Research Centre Islamabad (NARC), Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Federal Seed Certification Department, Islamabad and Department of Agricultural Extension Punjab. Their views are reflected in the bar diagram below. The major emphasis was to know the employers comments on the quality of education regarding: knowledge, communication skill, work skill and interpersonal skill these students have. Survey reflects that our graduates fall above average and in all areas, their abilities were rated above 70% Fig-10. This indicates that our graduates are well adaptable and show their better potential in any given environment. However, some employers have given general comments about some weaknesses, particularly the practical workability. The point has been well noted and will be tried to overcome for our future and current students.

CRITERION 2: CURRICULUM DESIGN AND ORGANIZATION

Criterion 2: CURRICULUM DESIGN AND ORGANIZATION

Degree Title: B.Sc. (Hons) Agriculture, Majoring Plant Pathology and M.Sc. (Hons) in Plant Pathology

Intent: All the courses for degree program were developed by a committee constituted by the Higher Education Commission, Pakistan. The committee consisted of experts and learned professors, subject matter specialists from other universities and research organizations from Pakistan. When and if needed, curriculum for the Department of Plant Pathology is revised/updated through different bodies. At department level, Board of Studies, which comprised of senior faculty members, is responsible for updating the curriculum. This body is authorised to formulate syllabus and course content. The chairperson of the Department is the convener of this body. The courses are then sent to the Board of Faculty for approval. The Dean of the Faculty, who is also the convener, conducts meeting. As per university rules courses after the approval from the Faculty Board, are placed before the University Academic Council for their approval.

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.

Degree plan

Presently three degree programs are organized by the department.

B.Sc. (Hons) Agric. majoring in Plant Pathology: The B.Sc. (Hons) degree program consists of 4 academic years/ 8 semesters.

Pre-requisites: minimum academic requirements

A person holding intermediate science certificate (Pre-Medical & Pre-Engineering) or an equivalent certificate from any recognized institute with at least second division or overall 45 % marks. The candidates domiciled in the Barani Areas of Punjab are eligible for admission. The admission to the university is on merit which is determined on entry test and past academic performance. Merit is determined as per following formula:

Mid Examination	10%
Intermediate	50%
Entry Test	40%

Degree requirements

As a whole a student has to study 140 credit hours. In first four semesters, students study minor courses (Agriculture Sciences, Information Technology and Veterinary Sciences etc.). After the completion of four semesters, students choose a specialized field (major) of study. In the next four semesters courses of major specialized subject are taught including some other courses of other departments (Table 8). The final semester includes internship of 15 credit hours. Students are placed in research institutes to learn research techniques practically. Degrees are awarded after completing the required number of credit hours (courses) followed by internship report and its presentation.

Minimum Grade Point Average (GPA) for obtaining the degree is 2.50. To remain on the roll of the university a student shall be required to maintain the following minimum Cumulative Grade Point Average (CGPA) in each semester to be on the roll of the University.

Semester	CGPA
First	0.75
Second	1.00
Third	1.25
Fourth	1.50
Fifth	1.75
Sixth	2.00
Seven	2.25
Eight	2.50

Examination and Weightage

a) Theory

In theory paper, students' evaluation is done by mid-term examination, assignments/quizzes and final examination. Both the mid-term and final examinations are compulsory. 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/she will 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 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 undergraduate.

Scheme of studies and Course contents of B. Sc. (Hons.) Agriculture

Scheme of studies for B.Sc. (Hons.) Agri. is given in (Table 8). Detailed course contents of under-graduate and post graduate schemes of studies are given in Annexure 11 and 12, respectively.

Table 8. Scheme of Studies for B. Sc. (Hons.) Agriculture

First Semester		
Course No.	Course Title	Credit Hours
AGR-301	Basic Agriculture	3(2-2)
AEC-301	Principles of Agricultural Economics	3(3-0)
ENG-301	Functional English	3(3-0)
HORT-301	Introduction to Horticulture	3(2-2)
IS-301/ ET-301	Islamic Studies/ Ethics	2(2-0)
MATH-301/ BIOL-301	Mathematics-I/ Biology-I	3(3-0) 3(2-2)
SS-301	Introduction to Soil Science	3(3-0)

Second Semester

Course No.	Course Title	Credit Hours
AGR-302	Summer Crops	3(2-2)
ENG-302	Communication Skills	3(3-0)
FT-302	Introduction to Food Sciences Technology	2(2-0)
HORT-302	Principles of Horticultural Practices	2(1-2)
MATH-302/ BIOL-302	Mathematics-II/ Biology-II	3(3-0) 3(2-2)
RF-302	Introduction to Rangeland & Wildlife Management	3(2-2)
SS-302	Soil and Water Conservation	2(2-0)
SSH-302	Pakistan Studies	2(2-0)

Third Semester

Course No.	Course Title	Credit Hours
AGR-401	Winter Crops	3(2-2)
AS-401	Animal Husbandry	3(2-2)
ENT-401	Introductory Entomology	2(1-2)
FT-401	Food Processing and Preservation	3(2-2)
IT-401	Introduction to Information Technology	3(1-4)
PBG-401	Introductory Genetics	2(1-2)
PP-401	Introduction to Plant Pathogens	2(1-2)
RF-401	Introduction to Agro forestry and Watersheds	2(1-2)

Fourth Semester

Course No.	Course Title	Credit Hours
AGR-402	Field Crop Physiology	3(2-2)
ENT-402	Applied Entomology	3(2-2)
AEE-402	Introduction to Agricultural Extension Education	3(3-0)
AS-402	Poultry Husbandry	2(1-2)
PBG-402	Introductory Plant Breeding	3(2-2)
PP-402	Introduction to Plant Pathology	3(2-2)
STAT-402	Introduction to Statistics	3(3-0)

Fifth Semester

Course No.	Course Title	Credit Hours
General Courses		
AEN-501	Farm Mechanization	2(1-2)
AGRO-501	Arid Zone Agriculture	2(2-0)
SOC-501	Rural Pestal Sociology	2(2-0)
Major Courses		
PP-501	Introductory Mycology	3(2-2)
PP-503	Introductory Plant Nematology	3(2-2)
PP-505	Introduction to Prokaryotes	3(2-2)
PP-507	Introduction to Plant Viruses	3(2-2)
PP-509	Beneficial Microorganisms	3(2-2)

Sixth Semester

Course No.	Course Title	Credit Hours
General Courses		
AEN-502	Conservation Engineering and Water Resources Development	2(1-2)
SS-508	Instrumentation and Laboratory Techniques	2(0-4)
Major Courses		
PP-502	Introduction to Molecular Plant Pathology	3(2-2)
PP-504	Diseases of Field Crops	3(2-2)
PP-506	Diseases of Horticultural crops	3(2-2)
PP-508	Clinical Plant Pathology	3(1-4)
PP-510	Plant Resistance to Diseases	3(2-2)

Seventh Semester

Course No.	Course Title	Credit Hours
General Courses		
STAT-601	Experimental Designs	2(1-2)
MGT-601	Introduction to Agri. Business Management	2(2-0)
Major Courses		
PP-601	Principles and Methods of Plant Disease Management	3(2-2)
PP-603	Range and Forest Pathology	2(1-2)
PP-605	Seed and Post Harvest Pathology	3((2-2)
PP-609	Project Planning and Scientific Writing	2(1-2)
ENT-603	Plant Resistance to Insect Pests	3(2-2)

Eighth Semester

Course No.	Course Title	Credit Hours
PP-602	Internship Including Report writing and Presentation	15(0-30)

M.Sc. (Hons) Agric.

A minimum of 2 years/ four semesters duration program after B.Sc.(Hons) Agriculture majoring Plant Pathology.

Pre-requisites

A candidate seeking admission to the course must have passed the B.Sc. (Hons) Plant Pathology Degree with a minimum C.G.P.A. of 2.75 and must be a resident of the Punjab Barani Area. Merit for post graduate program is determined as per following formula

Matric	10%
Intermediate	15%
B. Sc. (Hons.)	35%
Entry test	40%

Degree requirements M.Sc. (Hons) Agric.

The requirement is 45 credits comprising 35 credits of course work and 10 credits of research thesis. All M.Sc. students are required to pass a comprehensive examination and thesis evaluation and examination by an external examiner and supervisory committee.

Ph.D.

The duration of course of the degree of Doctor of Philosophy in full residence is not less than six semesters and not more than ten semesters.

Pre-requisites

A candidate seeking admission to the Course must have passed the Master Degree with CGPA of 3.00. Merit for post graduate program is determined as per following formula.

Matric	05%
Intermediate	10%
B.Sc. (Hons)	15%
M.Sc. (Hons)	30%
Entry test	40%

Degree Requirements

The program contents meet the program objectives as highlighted and provided by the Pakistan Higher Education Commission. Minimum 18 credits of course work is compulsory; out of which 9 credits are of core/compulsory courses. Course work following a synopsis defense, seminar, comprehensive exam and submission of thesis to be approved by the University and examined by two foreign internationally recognized scientists from the university of technologically advanced countries. Detailed course contents of Post-graduate schemes of studies are given in Table 9.

Post-graduate Schemes of Studies

Table 9: Post-graduate Courses (M. Sc. (Hons) Agri./Ph. D. Agri)

Course No.	Course Title	Credit Hours
PP-701	Mycology I (Lower Fungi and Basidiomycetes)	3(2-2)
PP-702	Mycology (Ascomycetes and Fungi Impefecti)	3(2-2)
PP-703	Plant Bacteriology	3(2-2)
PP-704	Plant Nematology	3(2-2)
PP-705	Genetics of Phytopathological Concepts	3(3-0)
PP-706	Plant Virology	3(2-2)
PP-707	Physiology of Diseased Plants	3(3-0)
PP-708	Genetics of Host-parasite Interaction	3(3-0)
PP-709	Urban Plant Pathology	3(2-2)
PP-710	Principles of Plant Pathology	3(3-0)
PP-711	Ecology of Plant Pathogens	3(2-2)
PP-712	Plant Disease Epidemiology	3(2-2)
PP-713	Plant Disease Management I (Chemical Control)	3(2-2)
PP-714	Plant Disease Management II (Biological, Physical, Cultural and Regulatory Methods.	3(2-2)
PP-715	Integrated Disease Management	2(1-2)
PP-716	Molecular Plant-microbe Interaction	3(3-0)
PP-717	Forest and Shade Tree Pathology	3(2-2)
PP-718	General Plant Pathology	3(2-2)
PP-719	Special Problem	1(1-0)
PP-720	Seminar	1(1-0)

Standard 2-1: The curriculum must be consistent and support the program's documented objectives.

Table 10 shows that the curriculum of the plant pathology department is consistent with the program objectives.

Table 10: Courses versus Outcomes

Courses	Outcomes					
	1	2	3	4	5	6
PP-609, PP-704, PP-710, PP-719, PP-720	x	xx	x	xxx	xxx	x
PP-502, PP-706, PP-708, PP-716, PP-705	xx	xxx	xxx	x	xx	xxx
PP-504, PP-506, PP-508, PP-510, PP-601, PP-603, PP-605, PP-713, PP-714, PP-709, PP-718	xxx	x	xxx	x	xx	xxx
PP-715, PP-711, PP-712	x	xx	xx	xx	xx	xxx
PP-401, PP-402, PP-501, PP-503, PP-505, PP-507, PP-509, PP-701, PP-702,	xxx	xxx	x	xx	xxx	xx

+ = Moderately satisfactory

++ = Satisfactory

+++ = Highly satisfactory

Assessment of the Plant Pathology Curriculum

The assessment of curriculum given in Table 10 and the courses are cross tabulated according to the program outcomes.

- The curriculum fits very well and satisfies the core requirements for the program, as specified the respective accreditation body.
- The curriculum satisfied the general arts and professional and other disciplines required for the program according to demands and requirements set by the Higher Education Commission of Pakistan.

Standard 2-2: Theoretical backgrounds, problem analysis and solution design must be stressed within the program's core material.

Table-11 indicates courses that play vital role in building theoretical background, problem analysis and solution design.

Table 11: Detail of courses representing theoretical background, problem analysis and solution design.

Elements	Courses	Title of the Courses
Theoretical background	PP-401	Introduction to Plant Pathogens
	PP-402	Introduction to Plant Pathology
	PP-501	Introductory Mycology
	PP-503	Introductory Plant Nematology
	PP-505	Introduction to Prokaryotes
	PP-507	Introduction to Plant Viruses
	PP-502	Introduction to Molecular Plant Pathology
	PP-601	Principles and Methods of Plant Disease Management
	PP-701	Mycology I (Lower Fungi and Basidiomycetes)
	PP-702	Mycology (Ascomycetes and Fungi Imperfecti)
	PP-703	Plant Bacteriology
	PP-704	Plant Nematology
	PP-706	Plant Virology
	PP-710	Principles of Plant Pathology
	PP-718	General Plant Pathology
Problem analysis	PP-504	Diseases of Field Crops
	PP-504	Diseases of Field Crops
	PP-506	Diseases of Horticultural crops
	PP-603	Range and Forest Pathology
	PP-605	Seed and Post Harvest Pathology
	ENT-603	Plant Resistance to Insect Pests
	PP-705	Genetics of Phytopathological Concepts
	PP-707	Physiology of Diseased Plants
	PP-711	Ecology of Plant Pathogens
	PP-712	Plant Disease Epidemiology
	PP-716	Molecular Plant-microbe Interaction
	PP-717	Forest and Shade Tree Pathology
	PP-719	Special Problem
Solution design	PP-509	Beneficial Microorganisms
	PP-508	Clinical Plant Pathology
	PP-510	Plant Resistance to Diseases
	PP-609	Project Planning and Scientific Writing
	PP-602	Internship Including Report writing and Presentation
	PP-708	Genetics of Host-parasite Interaction
	PP-709	Urban Plant Pathology
	PP-713	Plant Disease Management I (Chemical Control)
	PP-715	Integrated Disease Management
	PP-720	Seminar

Standard 2-6: Information technology component of the curriculum must be integrated throughout the program

While the curriculum was prepared, all aspects of information technology were considered and after a critical analysis, relevant aspects were integrated into the program as:

- Three computer and I.T. courses (6 credit hours) and two courses of statistics (6 credit hours) based on computer practical usage were included in the curriculum to fulfill the I.T. requirements for the students of B.Sc (Hons) Agric. degree.
- Computer and I.T. courses (3 credit hours) have been integrated in the curriculum of M.Sc (Hons) and Ph.D. students which fulfill the requirements for equipping the students with I.T knowledge.

Standard- 2.7: Oral and written communication skills of the student must be developed and applied in the program.

Two seminars, each with one credit hour are compulsory at the Post-graduate level.

- A course of 2 credit hours developing communication skills has been integrated in the curriculum of B.Sc. (Hons) Agriculture level.
- Assignments are given to B.Sc. (Hons) Agric., M.S.c (Hons) & Ph.D. students on specific titles (part of the course) which are presented orally and are submitted as written report, to increase their oral and written communication skills.

CRITERION 3: LABORATORIES AND COMPUTING FACILITIES

Criterion 3: Laboratories and Computing Facilities

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

Laboratory Title: These are only general laboratories each for undergraduate and postgraduate students.

- **Location and Area:** Faculty of Agriculture and Food Sciences, B-Block, 2nd Floor, Main Campus
- **Objectives:** Laboratories are used for practical exercise and demonstrations to graduate students in their and major courses, experimental studies for the research students and undertaking the research projects funded by the University, H.E.C, P.S.F, P.A.R.C and other agencies.
- **Shortcoming:** Laboratories are not spacious and inadequate. The standard requirements in view of equipment, available resources and expansion programme. Major apparatus viz. microscopes, autoclave, incubator, deep freezer, refrigerators, laminar flow cabinet, pH meter, electric balance, slide and overhead projectors, shaker, hitter, pipettes are out dated and out of order as well.
- **Safety Regulations:** The department is located on the 2nd floor; there are no emergency exits for the labs. No fire extinguishers have been installed in any laboratory. No first aid kits / facilities for minor hazards and accidents/injuries are provided in the laboratories/department. However, the University maintains a medical dispensary for such incidents.

Standard-3.1: Laboratory manuals/documentation/instructions for experiments must be available and edaily accessible to faculty and students.

Laboratory manuals for each subject (Mycology, Nematology, Virology, Bacteriology, disease diagnosis diseases management) are not available. However some manuals are being prepared by the academic staff.

In nutshell there are no proper safety arrangements and no security plan is available in case of emergency. The laboratories are not spacious and inadequate. The equipments are out of order. Equipments regarding molecular approaches are lacking e.g. Stereoscope, centrifuge (slow and ultra), PAG-Electrophoresis apparition, P.C.R. Spectrophotometer, N.P.L.C. relevant software, chemicals and biochemicals.

Standard-3.2: There must be support personal for instruction and maintaining the laboratories.

Only one laboratory attendant is available to maintain laboratory, equipment, glassware, chemicals, material etc. Three laboratory attendants assist the students in practicals, cleaning and washing. The laboratory attendants do not have the relevant knowledge. There is need of one Lab. Technician with good laboratory skills.

Standard-3.3: The University computing infrastructure and facilities must be adequate to support program's objectives.

- **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.

CRITERION 4: STUDENT SUPPORT AND ADVISING

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 there and arranges various cultural activities and solves the students' problems. However currently there is no Parent/Teacher association.

Standard-4.1: Courses must be offered with sufficient frequency and number for students to complete the program in a timely manner.

- Courses are taught as per HEC criteria.
- At undergraduate level subjects/courses are offered as per scheme of study provided by the HEC and approved by Academic Council. Postgraduate level courses are however offered according to the availability of the teacher and number of students.
- 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: Courses in the major area of study must be structured to ensure effective interaction between students, faculty and teaching assistants.

Both theoretical and field/practical aspects are focused to prepare the students for field challenges. Theoretical problems are explained and assignments are also given to the students whereas, practical are carried out in the labs and filed. Field visits and 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.

- Courses are structured and decided in the board of studies meeting.

- At commencement of each semester, faculty members interact frequently among themselves and with students. Students are welcome to ask question in class and even after the class.
- Emphasis is always given for an effective interaction between each section of B.Sc. (Hons) classes.

Standard-4.3: Guidance on how to complete the program must be available to all students and access to qualified advising must be available to make course decisions and career choices.

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

- Students are informed about the program requirement through the chairman office.
- Through the personal communication of the teachers with the students.
- Monthly meetings are organized by the head of the department for counseling of the students. In addition, students can also contact with the relevant teachers whenever they face any problem.
- It is necessary for the students to participate in the monthly meeting.
- In case of some problem, Director Student Affairs appointed by the university helps the students. Tutorial System in all departments has also been introduced. Two periods on Thursday are reserved for extracurricular activities. Due to great significance, students must be motivated to participate in such activities. However, there is no such counseling cell in the department.
- Student 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 like Pakistan Phytopathological Society, Mycology and Plant Pathology Society, Pakistan Society of Nematologists, Pakistan Botanical Society and other relevant professional societies.
- Realizing the need for exploring job opportunities for the university graduates, Directorate of Placement Bureau has been established.

CRITERION 5 PROCESS CONTROL

Criterion 5: Process Control

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

Standard-5.1: The process by which students are admitted to the program must be based on quantitative and qualitative criteria and clearly documented. This process must be periodically evaluated to ensure that it is meeting its objectives.

- The process of admission is well established and is followed as per rules and criteria set by HEC. For this purpose an advertisement is published in the national news papers by the Registrar office.
- Admission criteria for B.Sc. (Hons) Agri. are F.Sc. pre medical or pre engineering with minimum of second division and entry test.
- Admission criteria for M.Sc. (Hons) and Ph.D. are same as mentioned under Criterion 2.
- Admission criteria are revised every year before the announcement of admission.

Standard-5.2: The process by which students are registered in the program and monitoring of students progress to ensure timely completion of the program must be documented. This process must be periodically evaluated to ensure that it is meeting its objectives.

- 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.
- After the 4th semester students are allotted different majors (e.g. Plant Pathology, Entomology etc.) by the Dean Faculty of Crop and Food Sciences.
- 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, 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: The process of recruiting and retaining highly qualified faculty members must be in place and clearly documented. Also processes and procedures for faculty evaluation, promotion must be consistent with institution mission statement. These processes must be periodically evaluated to ensure that it is meeting with its objectives.

Recruitment policy followed by the University is the same as recommended by the 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, scrutinized by the scrutiny committee, and 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 Principal 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.
- Standard set by HEC are followed.
- At present, no procedure exists for retaining highly qualified faculty members. However, the revised pay scales structure is quite attractive.
- HEC also supports appointment of highly qualified members as foreign faculty Professors, National Professors and deputed them to the concerned departments of the University.

Standard 5-4: The process and procedures used to ensure that teaching and delivery of course material to the students emphasizes active learning and that course learning outcomes are met. The process must be periodically evaluated to ensure that it is meeting its objectives.

- To provide high quality teaching, department periodically revises the curriculum in views of field 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 documentation, copying and internet facilities are available.
- Notes are also prepared by the teachers and given to the students.
- Most of the lectures are supplemented by overheads, slides and pictures.
- 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: The process that ensures that graduates have completed the requirements of the program must be based on standards, effective and clearly documented procedures. This process must be periodically evaluated to ensure that it is meeting its objectives.

The controller of examinations announces the date regarding commencement of examination. After each semester, the controller office notifies 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 students who secure highest marks. Degrees are awarded to the students on the convocation that is held every year.

CRITERION 6: FACULTY

Criterion 6: Faculty

Standard 6-1: There must be enough full time faculty who are committed to the program to provide adequate coverage of the program areas/courses with continuity and stability. The interests and qualifications of all faculty members must be sufficient to teach all courses, plan, modify and update courses and curricula. All faculty members must have a level of competence that would normally be obtained through graduate work in the discipline. The majority of the faculty must hold a Ph.D. in the discipline.

Currently there are eight full time faculty members out of which seven are Ph.D. Their field of specialization is mycology, plant virology, phytonematology and plant bacteriology (Table 12).

Table 12. Faculty Distribution by Program Areas in Plant Pathology

Program area of specialization	Courses in the area and average number of sections per year	Number of faculty members in each area	Number of faculty with Ph.D. degree
General Plant Pathology	25	05	
Mycology	03	01	04
Plant Virology	02	02	02
Phyto nematology	02	01	01
Plant Bacteriology	02	01	01
Others	04	-	
Total	38	10	08

Standard 6-2: All faculty members must remain current in the discipline and sufficient time must be provided for scholarly activities and professional development. Also, effective programs for faculty development must be in place. Effective Programs for Faculty Development

- Professional training and availability of adequate research and academic facilities are provided to the faculty members according to the available resources.
- Currently one faculty member is abroad on study leave for post doctoral degree as sponsored by the HEC where as one member is doing his Ph.D. in UK.

- Incentives in the form of allowances to these supervisors have been implemented lately to promote high standard research.
- Existing facilities include mainly internet access, which is available through local area network. In addition library facility with latest books is also available.
- Effective programs for faculty development has been just introduced since the last semester. Faculty held a monthly seminar and organizes workshops from time to time.
- Support for attending conferences can lead to enhancement of research initiatives at the university.
- There is university-funded program, which provides financial support for research projects by the young faculty members.

Standard 6-3: All faculty members should be motivated and have job satisfaction to excel in their profession.

The young faculty is mobilized by timely back up and appreciation by the senior faculty members. Avenues for research funding are provided through university research fund. There should be the programs and processes in place to attract good faculty members e.g. teaching and research awards annually, reasonable teaching load and class size, social activities and better salary package.

Results of faculty survey employing Proforma 5 (Annexure-V) were summarized and are given Table 13. The results showed satisfaction of the teachers over most of the parameters. However, level of monitoring, cooperation with colleagues and the cooperation of teachers needs to be addressed.

Table 13: Results of Faculty Survey

S #	Parameter	Dr. Irfan-Ul-Haque	Dr. Abdul Rauf	Dr. Tariq Mukhtar	Dr. S. M Mughal	Dr. Kishwar Nazir	Dr. Abid Riaz	Dr. M. Ashfaq	Ms Gulshan Irshad	Dr. Farah Naz
1	Your mix of research, teaching and community service	B	A	A	A	A	B	B	B	B
2	The intellectual stimulation of your work	B	A	B	A	A	B	B	B	B
3	Type of teaching/research you currently do.	A	A	A	B	B	A	B	B	B
4	Your interaction with students	A	A	A	A	A	A	A	A	A
5	Cooperation you received from colleagues	B	B	B	A	A	B	A	B	A
6	The mentoring available to you	B	B	B	B	B	B	A	A	A
7	Administrative support from the department	B	A	B	A	A	A	B	B	B
8	Providing clarity about the faculty promotion process	A	A	A	B	B	A	B	A	A
9	Your prospects for advancement and progress through ranks	A	A	B	A	A	B	A	B	A
10	Salary and compensation packages	B	A	A	B	B	B	B	A	A
11	Job security and stability at the department	B	A	A	C	D	B	A	B	A
12	Amount of time you have for yourself and family	B	B	B	B	B	A	B	C	B
13	The overall climate at the department	A	A	B	A	A	A	A	B	A
14	Whether the department is utilizing your experience and knowledge	A	A	A	A	A	A	A	B	A
15	What are the best programs/ factor currently available in your department that enhances your motivation and job satisfaction?	Cooperative attitude of staff and the students	Friendly working environment	Good interaction between teachers and students and among teachers	Favorable academic/ research and writing environment.	Sound climate for working and research	Up gradation has good effect on job satisfaction	Best coordination among the faculty members	Cooperative atmosphere	-
16	Suggest programs/factors that could improve your motivation and job satisfaction	Further facilitation in provision of research/practical facilities as well as space	Establishment of research groups and interdepartmental collaboration based on area of research may be strengthened	Availability of modern approaches in Plant pathology	Development of laboratories for research work	-	Lab. conditions should be improved	Self contentment	-	-

A= Very Satisfied; B= Satisfied; C= Uncertain; D= Dissatisfied; E= Very Dissatisfied

CRITERION 7: INSTITUTIONAL FACILITIES

Criterion 7: Institutional Facilities

According to this criterion, the institution must have the infrastructure to support new trends in learning such as e-learning including digital publications, journals etc.

- The library must possess an up-to-date technical collection relevant to the program and must be adequately staffed with professional personnel. Insufficient library's technical collection of books. Recommended books and relevant journals of the programs are not available to the students.
- These aspects need to be strengthened in number and space.
- Class rooms must be adequately equipped and offices must be adequate to enable faculty to carry out their responsibilities.

Standard wise description of this criterion is given a under

Standard- 7.1: The institution must have the infrastructure to support new trends in learning such as e-learning.

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 do not have access to the 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 intercom is connected with the internet and the services are often breached.
- Breach of power intermittently, due to which research and academic work both are suffered.
- Majority of equipments is either out of order or outdated.
- Latest and modern molecular equipments or apparatus are lacking.
- Untrained supporting staff.
- Faculties lack practical knowledge of modern and molecular techniques.
- Scanty budget for consumables.
- Fans and tube lights are out of order and are not properly and timely repaired.

Standard- 7.2: The library must possess an up-to-date technical collection relevant to the program and must be adequately staffed with professional personnel.

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 in its library.

Standard- 7.3: Class-rooms must be adequately equipped and offices must be adequate to enable faculty to carry out their responsibilities.

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. 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 other are having their desks in the laboratories.

CRITERION 8: INSTITUTIONAL SUPPORT

Criterion 8: Institutional Support

The university administration has been struggling hard to strengthen all the departments, upgrade them and establish new faculties and Institutes. The university is also trying to attract highly qualified faculty.

Standard 8-1: 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.

- At present department is having a very meager financial resource to maintain the present needs of the department. Individual research grants for students and faculty are mainly supporting the departmental research activities. Due to lack of proper facilities, the students conduct their research in National Agricultural Research Institute. There is a dire need for increasing the financial resources allocated to the department to establish a departmental library, laboratories and computer facilities. Plant Pathology department has recently submitted a project for strengthening of department. We are hoping to receive funding during the next year. Suggestions and factors that can contribute to the motivation of the faculty are given as follows:
- Research grants for young faculty members may be allocated.
- Foreign trainings should be arranged for the faculty members.

Standard 8-2: There must be an adequate number of high quality graduate students, research assistants and Ph.D. students.

The intake of B.Sc. (Hons) and M.Sc. (Hons) students is once in a year. However Ph.D. students are enrolled in each semester. A strict merit policy is applied during admission coupled with GRE/NTS or entry test. A detail of the students enrolled during the past seven years is given in Table 14.

Table 14: Enrollment in Different Programs from 2001-07

Discipline	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
B.Sc. (Hons)	12	13	11	11	11	08	16
M.Sc. (Hons)	05	08	08	11	05	09	12
Ph.D.	-	04	01	02	02	04	03

Standard- 8.3: Financial resources must be provided to acquire and maintain Library holdings, laboratories and computing facilities.

Total budget of the department for the financial year 2007-08 is just Rs 32000, which hardly fulfills the departmental needs particularly for the purchase of equipment, chemicals for laboratories and books for the department library.

SUMMARY AND CONCLUSION

The self assessment report of the Department of Plant Pathology, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi, presents historical and chronological developments since 1979 when Barani Agriculture College was initiated. With its limited and meager role from supporting under-graduate courses of college to University level in 1994, a full fledged department of Plant Pathology was established initiating M.Sc and Ph.D degree programmes in 1977 and 1999, respectively. Since then, the discipline has progressed remarkably and made significant contribution in several aspects mainly, the identification of disease problems in the area, curricula development, research methodology and human resource development. The department now provides a variety of programmes such as Mycology, Bacteriology, Virology, Nematology and has produced eminent scientists who work in various universities, research institutes, agricultural extension departments and private organizations.

Since the discipline deals with health and productivity of crop plants and the diseases, which are the limiting factors, its mission is to impart quality education, introduce new and innovative techniques and conduct research so that effects of diseases are alleviated. For this purpose, six specific objectives were sought which are measurable and achievable. These were analyzed thoroughly in accordance with the criteria set by Higher Education Commission. 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 satisfactory. Teachers' evaluation revealed satisfactory standards, the score of eight teachers of the department ranged from 3.47 to 4.66, with an average of 4.2. Students' evaluation score ranged between 3.06 and 4.28 with a mean of 3.79 points in 0-5 scale. Alumni surveys revealed variable results with regards to knowledge, interpersonal skills, management and leadership skill. Weaknesses were identified which are related to space, laboratories and equipment and seven improvement have been suggested. Community services provided by the department are summarized and employer survey indicated that the graduates fall above average and their abilities were rated above 70%.

Curriculum design, development and organization are based upon set, well defined and approved criteria. Pre-requisites are fully observed, examinations are conducted as per schedules and academic schemes are fully prepared in advance. The number of courses, along with their titles and credit hours for each semester, course contents for degree programme is

fully planned. Their efficacy was measured through different standards and it was found to range between satisfactory to highly satisfactory.

The facilities and shortcomings in the laboratory are discussed. It was concluded that proper laboratory and computer facilities are needed to further strengthen the discipline on scientific lines. Proper steps are taken to guide the students for programme requirements, communication, meetings, tutorial system, tours, students-teacher interaction etc. They are well informed of relevant scientific societies, job opportunities and other such activities. Some improvements have been suggested.

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 proper rules, which are properly followed. At present there are eight faculty members and almost all are highly qualified in their fields. However, faculty members need motivation for advanced knowledge and research. Faculty survey results were variable but still satisfactory. Internship experience was highly effective and useful with 70% satisfactory results.

Institutional facilities were measured through Criterion 3; infrastructure, library, class room and faculty offices and in each case, short comings and limitation are highlighted. Institutional facilities need to be strengthened. Accordingly, institutional support will greatly promote and strengthen academic, research, management and leadership capabilities.

In conclusion, performance of the department may be further improved considering the following points.

1. Class rooms need improvement to help developing conducive environment for student's learning. Proper lightening, aeration, provision of multimedia and sound systems can improve quality of learning.
2. Laboratories need rehabilitation and new equipments. Besides there is need for repair of the old equipments so that the graduate and postgraduate students may carry out their research without any difficulty.
3. There is dire need for refresher courses for the newly appointed teachers pertaining to teaching methodology, education psychology, research and developments and evaluation of students. The HEC may be requested to arrange such trainings.

4. There is need to improve level of cooperation among the faculty members and students for better output.
5. Faculty members have pointed out that salaries and compensation be improved for more satisfactory job performance.
6. There is also need to improve mix of research and teaching proportion to produce professionally sound graduates.
7. At present there are no arrangements for professional and behavioral training of the supporting staff. Such trainings will improve their abilities for enhancing the quality of research and teaching.
8. The survey has also pointed out shortage of personal computers and slow speed of internet. Improvement in this area will also boost the level of research and teaching.
9. The budget allocated to the department hardly meets the requirements of the department for the purchase of chemicals, glassware and other items required for conducting of research.
10. The survey has revealed that several courses need updation and more emphasis on practical work is required.
11. At present there is no departmental library. Allocation of sufficient funds for this purpose will be helpful in subscribing reputed journals and purchase of books that will ultimately boost quality of learning, teaching and research.
12. The survey results have also revealed that faculty members are also in need of professional foreign trainings which will enable them to carryout research on molecular aspects of plant pathology. The HEC may be requested to arrange short term foreign trainings for improving skills and broadening vision of the fresh and senior faculty.

Program Team Members

Prof. Dr Irfan-UI-Haque (Coordinator)

Dr Tariq Mukhtar (Member)

Dr Farah Naz (Member)

Annexure 1

Proforma - 1

Student Course Evaluation Questionnaire

(To be filled by each Student at the time of Course Completion)



Department _____ Course No _____

Course Title _____ Teacher Name _____

Year of Study _____ Semester / Term _____

Please give us your views so that Course quality can be improved. You are encouraged to be frank and constructive in your comments

CORE QUESTIONS

Course Content and Organization	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
1. The course objectives were clear	☐	☐	☐	☐	☐
2. The Course workload was manageable	☐	☐	☐	☐	☐
3. The Course was well organized (e.g. timely access to materials, notification of changes, etc.)	☐	☐	☐	☐	☐
4. Comments					

Student Contribution	☐ <20%	☐ 21-40%	☐ 41-60%	☐ 61-80%	☐ >81%
	Strongly Agree	Agree	uncertain	Disagree	Strongly Disagree
5. Approximate level of your own attendance during the whole Course	☐	☐	☐	☐	☐
6. I participated actively in the Course	☐	☐	☐	☐	☐
7. I think I have made progress in this Course	☐	☐	☐	☐	☐
8. Comments					

Learning Environment and Teaching Methods	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
9. I think the Course was well structured to achieve the learning outcomes (there was a good balance of lectures, tutorials, practical etc.)	☐	☐	☐	☐	☐
10. The learning and teaching methods encouraged participation.	☐	☐	☐	☐	☐
11. The overall environment in the class was conducive to learning.	☐	☐	☐	☐	☐
12. Classrooms were satisfactory	☐	☐	☐	☐	☐
13. Comments					

Learning Resources	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
	☐	☐	☐	☐	☐

14. Learning materials (Lesson Plans, Course Notes etc.) were relevant and useful.	☐	☐	☐	☐	☐
15. Recommended reading Books etc. were relevant and appropriate	☐	☐	☐	☐	☐
16. The provision of learning resources in the library was adequate and appropriate	☐	☐	☐	☐	☐
17. The provision of learning resources on the Web was adequate and appropriate (if relevant)	☐	☐	☐	☐	☐
18 Comments					

Quality of Delivery	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
19. The Course stimulated my interest and thought on the subject area	☐	☐	☐	☐	☐
20. The pace of the Course was appropriate	☐	☐	☐	☐	☐
21. Ideas and concepts were presented clearly	☐	☐	☐	☐	☐
22. Comments					

Assessment	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
23. The method of assessment were reasonable	☐	☐	☐	☐	☐
24. Feedback on assessment was timely	☐	☐	☐	☐	☐
25. Feedback on assessment was helpful	☐	☐	☐	☐	☐
26. Comments					

Additional Core Questions

Instructor / Teaching Assistant Evaluation	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
27. I understood the lectures	☐	☐	☐	☐	☐
28. The material was well organized and presented	☐	☐	☐	☐	☐
29. The instructor was responsive to student needs and problems	☐	☐	☐	☐	☐
30. Had the instructor been regular throughout the course?	☐	☐	☐	☐	☐

Tutorial	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
30. The material in the tutorials was useful	☐	☐	☐	☐	☐
31. I was happy with the amount of work needed for tutorials	☐	☐	☐	☐	☐
32. The tutor dealt effectively with my problems	☐	☐	☐	☐	☐

Practical	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
33. The material in the practicals was useful	☐	☐	☐	☐	☐
34. The demonstrators dealt effectively with my problems.	☐	☐	☐	☐	☐

Overall Evaluation 35. The best features of the Course were: 36. The Course could have been improved by:

Equal Opportunities Monitoring (Optional) 37. The University does not tolerate discrimination on any irrelevant distinction (e.g. race, age, gender) and is committed to work with diversity in a wholly positive way. Please indicate below anything in relation to this Course which may run counter to this objective:
--

Demographic Information: (Optional)	
38. Full/part time study:	Full Time ☐ Part Time ☐
39. Do you consider yourself to be disabled:	Yes ☐ No ☐
40. Domicile:	
41. Gender:	Male ☐ Female ☐
42. Age Group:	less than 22 ☐ 22-29 ☐ over 29 ☐
43. Campus:	Distance Learning/ Collaborative ☐

THANK YOU

Annexure 2

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)

Annexure 3

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.

Annexure 4

Proforma 4

RESEARCH STUDENT PROGRESS REVIEW FORM



(To be filled out by Master/ M.Phil / Ph.D Research Students on six monthly basis)

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: _____

Annexure 5



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 your 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: _____

Annexure 6

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:	
	a. Ph.D. Qualifying examination (Y/N)	
	b. Comprehensive examination (Y/N)	
	c. Research paper in HEC approved Journal	
	d. 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.	

Annexure 7

Proforma 7



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_____



Annexure 8

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?

VI. Information About Organization

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

Proforma 9

Annexure 9

Faculty Resume



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

<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> Date Title Agency / Organization Total Award Amount Segment the list under following headings: • Completed • Funded and in progress • In review
<i>Other Research or Creative Accomplishments</i>	<i>List patents, software, new products developed, etc.</i>
<i>Selected Professional Presentations</i>	

Annexure 10

Proforma 10

Teacher Evaluation Form

(To be filled by the student)



Course Title and Number: _____

Name of Instructor: _____ Semester _____

Department: _____ Degree _____

Use the scale to answer the following questions below and make comments

A: Strongly Agree B: Agree C: Uncertain D: Disagree E: Strongly Disagree

Instructor:					
1. The Instructor is prepared for each class	A	B	C	D	E
2. The Instructor demonstrates knowledge of the subject	A	B	C	D	E
3. The Instructor has completed the whole course	A	B	C	D	E
4. The Instructor provides additional material apart from the textbook	A	B	C	D	E
5. The Instructor gives citations regarding current situations with reference to Pakistani context.	A	B	C	D	E
6. The Instructor communicates the subject matter effectively	A	B	C	D	E
7. The Instructor shows respect towards students and encourages class participation	A	B	C	D	E
8. The Instructor maintains an environment that is conducive to learning	A	B	C	D	E
9. The Instructor arrives on time	A	B	C	D	E
10. The Instructor leaves on time	A	B	C	D	E
11. The Instructor is fair in examination	A	B	C	D	E
12. The Instructor returns the graded scripts etc. in a reasonable amount of time	A	B	C	D	E
13. The Instructor was available during the specified office hours and for after class consultations	A	B	C	D	E
14. Course:					
15. The Subject matter presented in the course has increased your knowledge of the subject	A	B	C	D	E
16. The syllabus clearly states course objectives requirements, procedures and grading criteria	A	B	C	D	E
17. The course integrates theoretical course concepts with real-world applications	A	B	C	D	E
18. The assignments and exams covered the materials presented in the course	A	B	C	D	E
19. The course material is modern and updated	A	B	C	D	E

Comments:

Instructor: _____

Course: _____

Annexure 11
List of Publications

Professor Dr. M. Irfan-UI-Haque

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Sultana, K. and Bashir, B. H. 2007. Distribution of Medicinally Important Mushrooms of Mountainous/ Northern Areas of Pakistan. Electronic Journal of Environment, Agricultural and Food Chemistry (EJEAFChe), Vol. 6 (8):2309-2317.

Sultana, K and Qureshi, A.R. 2007. Impact of Mushrooms and Toad -Stools on Environment Electronic Journal of Environment, Agricultural and Food Chemistry (EJEAFChe), Vol. 6 (11):2534-2542.

Sultana, K and Qureshi, A.R. 2007. Checklist of Basidiomycetes f Kaghan Valley of Pakistan Journal of Botany (In special issue) In press. In International Symposium at Islamabad

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Qureshi. A. R., Ghufraan, M.A. **Sultana, K.** and **Ashraf, A.** Ethnobotanical

Annexure 12
Survey of Graduating Students

Sr. No	Parameter	Very satisfied (%)	Satisfied (%)	Uncertain (%)	Dissatisfied (%)	Very dissatisfied (%)
1	The work in the program is too heavy and induces a lot of pressure	33	42	25	0	0
2	The program is effective in enhancing team working abilities	15	62	23	0	0
3	The program administration is effective in supporting learning	8	46	38	8	0
4	The program is effective in developing analytical and problem solving skills	23	61	8	8	0
5	The program is effective in developing independent thinking	15	31	54	0	0
6	The program is effective in developing written communication skills	0	62	15	15	8
7	The program is effective in developing planning abilities	15	46	23	16	0
8	The objectives of the program have fully achieved	23	46	23	8	0
9	Whether the contents of curriculum are advanced and meet program objectives	23	31	23	23	0
10	Faculty was able to meet the program objectives	31	38	23	8	0
11	The environment was conducive for learning	23	46	16	15	0
12	Whether the infrastructure of the department was good	33	33	25	9	0
13	Whether the program comprised of co-curricular and extra-curricular activities	15	47	30	0	8
14	Whether scholarships were available to students in case of hardship	15	62	15	8	0

Annexure 13

Detailed Course Contents of Under Graduate Scheme of Studies Plant Pathology

PP-401 INTRODUCTION TO PLANT PATHOGENS 2(1-2)

Theory:

Types of Plant Pathogens, General taxonomy, characteristics, morphology, and ecology of Plant Pathogens (Fungi, Bacteria, Virus, Nematode, Phytoplasma, Higher Parasitic Plants).

Practicals

Preparation of media and isolation techniques for plant pathogens. Demonstration of various plant pathogens through slides, live specimens and their comparative study.

Books Recommended

Text:

1. Agrios, G.N. 2005. Plant Pathology, 4th edition, Academic Press, New York, USA.

Reference:

1. Singh, R.S. 1982. Plant Pathogens: The Fungi. Oxford and IBH Publishing Company, New Delhi, India
2. Singh, R.S. 1989. Plant Pathogens: The Prokaryotes. Oxford and IBH Publ. Company, New Delhi, India
3. Alexopoulos, C. J., C.W. Mims and M. Blackwell. 1996. Introductory Mycology. 4th edition, John Wiley and Sons, Inc., New York, USA
4. Lucas, J.A. 1999. Plant Pathology and Plant pathogens. Blackwell Scientific Publications, Oxford, U.K.
5. Johnson, R. 1999. Plant Pathology. Blackwell Scientific Publications, Oxford, U.K.

PP-402 INTRODUCTION TO PLANT PATHOLOGY 3(2-2)

Theory:

Definition of disease in plants; Nature and causes of plant diseases. Effects of disease on host plant; Nature of losses and economic importance of plant diseases. Symptoms, etiology, methods of perpetuation, disease cycle and management of representative parasitic diseases of field and horticultural crops. Principles of plant disease management.

Practicals:

Collection and preservation of diseased specimens, plant disease identification. Study of symptoms of plant diseases. Demonstration of equipments and machinery used in plant disease management.

Books Recommended:

Text:

1. Agrios, G.N. 2005. Plant Pathology, 4th edition, Academic Press, New York, USA.

Reference:

1. Mehrotra, R.S. 1980. Plant Pathology. Tata McGraw Hill Publishing Company, New Delhi, India.
2. Hafiz, A. 1986. Plant Diseases. Pakistan Agricultural Research Council, Islamabad, Pakistan.
3. Johnson, R. 1999. Plant Pathology. Blackwell Scientific Publications, Oxford, U.K.
4. Lucas, J.A. 1999. Plant Pathology and Plant pathogens. Blackwell Scientific Publications, Oxford, U.K.

PP-501 INTRODUCTORY MYCOLOGY 3(2-2)

Theory:

Introduction and importance of fungi, taxonomy, morphology, nutrition and reproduction of fungi with special reference to families and genera of agricultural and industrial importance.

Practicals:

Collection, isolation, preservation and identification of fungi important to agriculture; study of key morphological characters of fungi, the basis of classification of various groups of fungal pathogens.

Books Recommended:

Text:

1. Alexopoulos, C.J., C.W. Mims and M. Blackwell. 1996. Introductory Mycology. 4th edition, John Wiley and Sons, Inc. New York, USA.

Reference:

1. Barnett, H. 1976. Fundamentals of Mycology. 2nd edition, Edward Arnold, London, UK.
2. Sharma, P.D. 1987. The Fungi, Rastogi and Company., Meerut, India.
3. Talde, U.K. 1994. Advances in Mycology and Aerobiology Vol-20. TTPP Publishers, New Delhi, India.

PP-503 INTRODUCTORY PLANT NEMATOLOGY 3(2-2)

Theory:

Introduction, history and importance of nematodes; taxonomy, morphology and biology of plant parasitic and soil inhabiting nematodes; plant-nematode relationship; distribution and means of spread; management of nematodes.

Practicals:

Sampling, extraction, staining and identification of nematodes from soil and infested plant materials; methods of maintenance and culturing of nematodes; use of nematicides and cultural practices for the management of nematode diseases of plants.

Books Recommended:

Text

1. Perry, R.N. and Moens, M. 2006, Plant Nematology.
2. Dasgupta, M.K. 1998, Phytonematology. TTPP Publishers, India.

3. Jairajpuri, M.S.,2002. Nematodes Structures
4. Dropkin, V.H. 1989. Introduction to Plant Nematology. John Wiley and Sons, Inc., New York, USA

Reference:

1. Mai, M.F. and H.H. Lyon. 1975. Pictorial Key to Genera of Plant Parasitic Nematodes, 4th edition. Comstock Publishing Association, Cornell University Press, Ithaca, USA.
2. Whitehead, a.D. 1998. Plant Nematode control. CAB International, Ferry Lane, Kew, Surrey, England.
3. Trivedi, P.C. 1998. Plant Nematode management: A Biological Approach. CAB International, Ferry Lane, Kew, Surrey, England.

PP-505 INTRODUCTION TO PROKARYOTES

3(2-2)

Theory:

Introduction, history, taxonomy, morphology, structure, cultivation, growth, reproduction, metabolism, cultural characteristics, mode of infection and transmission of bacteria and mollecutes (phytoplasmas & spiroplasmas) and their management.

Practicals:

Isolation, purification, staining and preservation of plant pathogenic prokaryotes. Morphological, cultural and biochemical characteristics for identification of plant pathogenic prokaryotes.

Books Recommended:

Text:

1. Singh, R.S. 1989. Plant Pathogens: The Prokaryotes. Oxford and IBH Publishing Company, New Delhi, India.

Reference

1. Agrios, G.N.1996. Plant Pathology. 4th edition. Academic Press, New York, USA.

2. Bradbury, J.F. 1986. Guide to Plant Pathogenic Bacteria, CAB International Mycological Instt., Kew, Surrey, UK.
3. Lelliott, R.A. and Stead, D.E. 1987. Methods for the diagnosis of bacterial diseases of plants. BSPP, Blackwell Scientific Publications, London, UK.
4. Schaad, M.W. 1988. Guide for Identification of Plant Pathogenic Bacteria, 2nd edition. American Phytopathological Society. Saint Paul, Minnesota, USA.
5. Johnson, R. 1999. Plant Pathology. Blackwell Scientific Publications, Oxford, U.K.

PP-507: INTRODUCTION TO PLANT VIRUSES

3(2-2)

Theory:

Introduction, virus symptomatology; study of virus composition; morphology and structure; physiology of virus infected plants; virus transmission and movement; serology and serological methods, ecology, and management; study of specific virus diseases in Pakistan .

Practicals:

Study of symptoms and methods of transmission of important virus diseases. Identification of plant viruses by symptomatology, serology, indicator plants and host range.

Books Recommended:

Text:

1. Mathews. R. E. F. 1992. Fundamentals of Plant Virology. Academic Press, New York, USA.

Reference

1. Boss, L. 1983. Introduction to Plant Virology. Longman, London, UK.
2. Walky, D.G.A., 1985. Applied Plant Virology. Longman, London, UK

3. Bashir, M. and S. Hassan. 1998. Diagnostic Methods for Plant Viruses. Pakistan Agricultural Research Council, Islamabad, Pakistan.

PP-509: BENEFICIAL MICROORGANISMS 3(2-2)

Theory:

Morphology, classification and cultivation of edible fungi. Useful microorganisms of industrial importance; role of microorganisms in degradation of industrial products; production of industrial products; microorganisms as biological agents; mycorrhizae and their role in soil fertility and plant disease management.

Practicals:

Spawn production and cultivation of edible mushrooms. Identification of edible and poisonous mushrooms, isolation and identification of microorganisms from different agricultural and industrial wastes. Isolation and identification of mycorrhizal fungi. Demonstration of antagonism, competition and antibiosis.

Books Recommended:

Text

1. Bahl, N. 1988. Handbook on Mushroom. 2nd edition. Oxford and IBH Publishing Company New Delhi, India.
2. Gopi, K., D. David and K. Douds.- Current Advances in Mycorrhizae Research. American Phytopathological Society, St. Paul, Minnesota, USA.

Reference:

1. Atkins, P.C. 1972. Mushroom Growing Today. Faher and Faher Ltd. London, UK.
2. Aneja, K.R.1996. Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom. Wiley Publishing Company, U.K.

PP-502: INTRODUCTION TO MOLECULAR PLANT PATHOLOGY 3(2-2)

Theory:

Introduction to molecular biology; Molecular biology and plant pathology; Macromolecules in Plant pathology, Proteins, Carbohydrates, Lipids, Terpenoids, Nucleotides, Nucleosides and their role; Structure of DNA, RNA; Genes and Gene expression, Protein synthesis, Chromosomes, Mitotic and meiotic behaviour of genes, DNA replication & repair mechanism. Mutagenesis and sequences.

Practical:

DNA isolation and amplification. Isolation of Protein; Visits to research labs with related facilities.

Books Recommended:

Text:

1. Devi, P. 2005. Principles and Methods of Plant Molecular Biology, Biochemistry, Biotechnology and Genetics. Student Edition, India.
2. Pena, L. 2005. Transgenic Plants. Methods and Protocol. HUMANA, JN, USA.
3. Mathew, J. D., 2003. Molecular plant pathology. Bios Scientific Publishers, LTD., UK.
4. De Robertis, E.D.P. and DeRobertis, E.M.T. Jr. 1992. Cell and Molecular Biology. 8th ed. John Wiley & Sons, USA.

Reference:

1. Hafeez, F.Y, Zafar, Y and Khalid, A. M. 2005. Modern techniques in Biotechnology. A theoretical Manual, NIBGE, Faisalabad.
2. Albert, B., Bray. D and Lewis Raff, M. Robert K. and Watson J.D. 1994. Molecular biology of cells 3rd ed. Garland Publications, N.York
3. Gardner, Simmons, Snusted 1991, Principles of genetics, 5th Edition, John Wiley & Sons Inc., Canada.

PP-504: DISEASES OF FIELD CROPS 3(2-2)

Theory:

Detailed study of symptoms, etiology, nature and extent of losses, disease cycle, methods of perpetuation, epidemiology and control of major diseases of field crops particularly those prevalent in Pakistan such as:

Wheat (rusts and smuts, bunts, powdery mildew, ear cockle, etc.)

Maize (fungal and bacterial blights, stalk rot, smuts, etc.)

Rice (blast, bakanae, blight)

Cotton (boll rot, root rot, leaf curl, bacterial blights etc.)

Sugarcane (red rot, whip smut, ratoon stunt etc.)

Sorghum (smuts, blights)

Tobacco (black shank, tobacco mosaic etc.)

Oil Seed Crops for example Sunflower, Canola (charcoal rot, Alternaria blight, downy mildew)

Chickpea (blight, wilt)

Lentil (rust, blight, wilt and mosaic)

Peanut (Cercospora, Alternaria leaf spots rust and wilt)

Practicals:

Field visits and identification of diseases on the basis of symptoms and isolation of the pathogens. Collection and preservation of diseased specimens; preparation of permanent mounts; crop loss assessment.

Books Recommended:

Text:

1. Nyal. R.F. 1989. Field Crops Disease Handbook. AVI Publishing Company Inc. Westport, Connecticut, USA.

Reference:

1. Hafiz A. 1986. Plant Diseases. Pakistan Agricultural Research Council, Islamabad, Pakistan.
2. Kenaga, C.B., E.B. Williams, and R.J. Green. 1971. Plant Disease Syllabus. Balt Publishers, West Lafayette, Indiana, USA.

3. Singh, R.S. 1988. Plant Diseases. 6th edition, Oxford and IHB Publishing Company (Pvt.) Ltd. New Delhi, India.
4. Compendia of wheat, rice, maize, cotton, sorghum, pea, peanut diseases. American Phytopathological Society, St. Paul, Minnesota, USA.
5. Rao, G.P. 1994. Current Trends in Sugarcane Pathology. TTPP Publishers, New Dheldi, India.
6. Thind, T.S. 1998. Diseases of Field Crops and their Management. VBS Publishers, India.
7. Gangopadhyay, S. 1992. Current Concepts on Fungal Diseases of Rice. 1998. TTPP Publishers, New Dhelhi, India.

PP-506: DISEASES OF HORTICULTURAL CROPS 3(2-2)

Theory:

Nature and extent of losses, disease cycle, methods of perpetuation and control of major diseases of fruits and vegetable crops such as:

Pome fruits - scab, root rot, powdery mildew and fire blight

Stone fruits - shot hole, brown rot, leaf curl, root rot, die-back and crown gall

Citrus - withertip, root rot, Tristeza, citrus greening, canker

Mango - malformation, anthracnose, powdery mildew, bacterial leaf spot, fruit rot, dieback and quick decline.

Banana - finger tip rot and banana bunchy top.

Grapes - downy and powdery mildew, fanleaf.

Solanaceous Vegetables Blights, wilts, scabs, black scurf, orobanche, collar rot, powdery mildew, golden cyst, root knot and virus diseases.

Cucurbits Downy and powdery mildew, mosaics, fruit rots and wilts

Crucifers White rust, head rots and mosaics.

Legumes Powdery mildew, mosaics and blights.

Onion Downy mildew, purple blotch and root rots.

Garlic Rust and charcoal rot.

Practicals:

Identification of diseases on the basis of symptoms and isolation of pathogens. Field visits, collection and preservation of diseased specimens; preparation of permanent mounts, crop loss assessment.

Books Recommended:

Text:

1. Pathak, V.N. 1981. Diseases of Fruit Crops. Oxford and IBH Publishing Company, New Delhi, India.
2. Sherf, A.F., and A.A. Macnab. 1986. Vegetable Diseases and Their Control. John Wiley and Sons, Inc., New York, USA.

Reference

1. Dixon, D.R. 1981. Vegetable Crop Diseases. McMillan Press, London, UK.
2. Compendia of cucurbits, onion and garlic, potato, tomato and pea diseases. American Phytopathological Society, St. Paul, Minnesota, USA.
3. Horst, R.K. 1997. Compendium of Chrysanthemum Diseases. APS Press, Saint Paul, MN, USA.

PP-508 CLINICAL PLANT PATHOLOGY 3(1-4)

Theory:

Plant disease clinic; the concept and farmers expectations. Dealing with the clients – how to interact. Collection of specimens, their transport, handling in the laboratory and labeling, formulating and filling in proformas for record keeping and history. Equipment, glassware, chemicals and reagents for an ideal plant disease clinic. Diagnosis protocols. Additional knowledge of allied sciences required for plant pathologists working in plant disease clinic.

Practicals:

Collection of plant disease specimens and their identification. Developing recommendations and report preparation for the clients.

Books Recommended:

Text:

1. Fox, R.T.V. 1994. Principles of Diagnostic Techniques in Plant Pathology. CAB International, UK.

Reference:

1. Gangopadhyay, S. 1984. Clinical Plant Pathology. Kalyani Publishing Company, New Delhi, India.
2. Ahmad, I., M. Aslam and A. Munir. 1992. Phytopathological Diagnostic Techniques,. Pakistan Agricultural Research Council, Islamabad, Pakistan.
3. Schots, A., F.M. Dewey and F. Oliver. 1994. Modern Detection Assays for Plant Pathogenic Fungi. CAB International, UK.
4. Waller, J.M. 1998. Plant Clinic Handbook. CAB International, Ferry Lane, Kew, Surrey, England.

PP-510 PLANT RESISTANCE TO DISEASES 3(2-2)

Theory:

Importance of disease resistance in plants; resistance vs. susceptibility; Kinds & mechanisms of resistance; transgenic approaches for crop protection. Induced systemic resistance through biocontrol options. Screening of germplasm for resistance by using different rating scales/parameters.

Practicals:

Preparation of inocula, inoculation techniques for various plant pathogens; demonstration of hypersensitive reaction, resistance and susceptibility: screening of germplasm in field and green house against major plant pathogens disease assessment parameters.

Books Recommended:

Text:

1. Agrios, G. N, 2005. Plant Pathology, 5th edition, Academic Press, New York, USA.
2. Sadasivan, S and Thayumanavan, B. 2003. Molecular Host Plant Resistance to Pest. Marcel Dekker, USA.

3. Singh, D. P., 2002. Breeding for Resistance to Biotic Stress, International Books Distribution Co. India.
3. Staples, C. R., and G. H. Toenniessen. 1981. Plant Disease Control
4. Resistances and Susceptibility. John Wiley and Sons, Inc. New York, USA.

Reference:

1. Moore, D. and Frazer, L. A. N., 2002. Essential Fungal Genetics. Springer Verlag, New York, USA.
2. Boland, G. J., David, L., and Kuykendall 1998. Plant Microbe Interactions and Biological Control. Marcel Dekker, Inc, USA.
3. Stubbs, R.W., J. M. Prescott, E. E. Sarri and H. J. Dubin. 1986. Cereal Disease Methodology Manual. CIMMYT, Mexico.
5. Russel, G. C. 1981. Plant Breeding for Pest and Disease Resistance. butterworths and Company, Ltd., London, UK.

**PP-601 PRINCIPLES AND METHODS OF PLANT 3(2-2)
DISEASE MANAGEMENT**

Theory:

Understanding principles of avoidance, exclusion, eradication, protection, and immunization. Management of plant diseases by regulatory (quarantine and inspection), cultural (host eradiction, crop rotation, sanitation, tissue culture etc), biological (host resistance, cross protection, interference, hyperparasitism etc), physical (heat treatment, sterilization, refrigeration and radiation etc.) and chemical (soil and seed treatment, foliar spray and post harvest application) methods; integrated disease management.

Practicals:

Acquaintance with equipment and machinery used for disease management. Calibration of equipment. Safety measures for disease managing chemicals;

handling and application procedures; In vitro management of pathogens through biological, chemical and physical means.

Books Recommended:

Text:

1. Fry, W. E. 1982. Principles of Plant Disease Management. Academic Press, New York, USA.

Reference:

1. Chattopadhyay, S.B. 1989. Principles and Procedures of Plant Protection, 2nd edition, Oxford and IBH Publishing Company, New Delhi, India.
2. Lucas, C.B., C.L. Campbell and L.T. Lucas. 1985. Introduction to Plant Diseases: Identification and Management. The AVI Publishing Company Inc., USA.
3. Stakman, E. C., and J. G. Harrar. 1957. Principles of Plant Pathology. The Ronald Press Co., New York, USA.
4. Trivedi, P.C. 2000. Plant Diseases. CAB International, Ferry Lane, Kew, Surrey, England.

PP-603 RANGE AND FOREST PATHOLOGY 2(1-2)

Theory:

General introduction to forest and range ecosystem. damage to forest plants due to abiotic factors. specific fungi causing different diseases such as wood decay, discoloration, cankers and foliage diseases etc. study of bacteria, viruses, nematodes and parasitic higher plants causing diseases of forest plants and their control

Practicals:

Visits to different forest and range plantations of the country. study of specific diseases of forest and shade trees based on symptoms and their control.

Books Recommended:

Text:

1. Agrios, G.N. 2005. Plant Pathology, 4th edition, Academic Press, New York, USA.

Reference:

- 1 Smith, W.H. 1970. Tree Pathology. Academic Press, London.
- 2 Blanchard, R.O. and T.A. Tattar. 1981. Field and laboratory Guide to Tree Pathology. Academic Press, London.
3. Boyee, J.S. 1961. Forest Pathology. McGraw Hill Book Company, New York.
4. Chase, A.R. 1997. Foliage Plant Diseases: Diagnosis and control. APS Press, Saint Paul , MN, USA.

PP-605 SEED & POST HARVEST PATHOLOGY 3(2-2)

Theory:

Morphology and anatomy of healthy and infected seed. Seed-borne diseases and their effect on seed germination. Histopathology of infected seed, seed transmission of pathogen, mechanism of infection. Effect of biotic & abiotic stresses and storage/transit conditions on shelf life of seed and perishables. Loss estimation and Seed health testing. Mycotoxins, their hazards. Management of seed and post harvest diseases.

Practicals:

Seed health testing, different techniques of isolation and identification of microorganisms associated with seeds and their effect on germination. Collection and identification of biotic and abiotic diseases of perishables. Use of safe chemicals for management of seed and postharvest diseases.

Books Recommended:

Text:

1. Bhutta, A.R., Hussain, A. and Rahman, M.R., 2004. Hand book on Seed Processing and Storage. Published by Federal Seed Certification and Registration Department, Islamabad, Pakistan.

2. Agarwal, V.K. and Sinclair, J.B. 1993. Principles of Seed Pathology. Vol. 1 & 11. CBS Publs. New Delhi.
3. Neergaard, P., 1979. Seed Pathology. Rev. ed. Mc Millan Press London.

Reference:

1. Chakraverty, A, Mujumdar, A.S.Raghavan, G.S.V and Ramaswamy, H.S, 2003. Hand book of Post harvest Technology, Publ. By Marcel Dekker. INC, New York, USA.
2. Bhutta, A.R. and Ahmad, I, 2001. Seed Pathological Techniques and their Application. Published by National Book Foundation, Islamabad, Pakistan
3. Dasgupta, M.K. and Mandal, N.C., 1986. Postharvest Pathology of perishables. Oxford & IBH Publs. Co., New Delhi.
4. Dennis, C.1983. Postharvest Pathology of Fruits and Vegetables. Academic Press. New York, USA.

PP-609 PROJECT PLANNING & SCIENTIFIC WRITING 2(1-2)

A workable project on one of the area of Plant Pathology in consultation of students will be designed. The students will be taught how to design a good research project. It will cover introduction, importance, objectives, materials and methods & results and discussions. The students will also be directed how to consult the various journals to collect and finally complete the literature.

Annexure 14

Detailed Course Contents of Post Graduate Scheme of Studies Plant Pathology

PP-701 MYCOLOGY-I (Lower Fungi and Basidiomycetes) 3(2-2)

Theory:

Morphology, biology, taxonomy and nomenclature of lower fungi. Types of Zoospores. General characteristics and systematic position of different phyla of cellular, endoparasitic and true slime molds. Introduction to Basidiomycetes; somatic structure, reproduction, basidiocarp developmental patterns, types of basidia and basidiospores. Classification of taxa of agricultural importance. Basidiolichens and their taxonomy.

Practicals:

Collection, preservation, culturing and identification of mycological specimens with special reference to taxa of agricultural importance. Use of keys for identification.

Books Recommended:

1. Alexopoulos, C.J., C.W.Mims. and M. Blackwell.1996. Introductory Mycology. 4th edition, John Wiley and Sons. Inc., New York, USA.
2. Sharma, P.D.1991. The Fungi. 2nd edition, Rastogi and Co.,Meerut, India.
3. Singer, R.1983. The Agaricales in Modern Taxonomy, J.Cramer, Lehre,Germany.
4. Wells, R., and K. Wells. 1982. Basidium and Basidiocarp. Evolution, Cytology, Function and Development. Springer Verlag, New York, USA.
5. Mirza, J.H., S.M. Khan., S. Begum and S. Shagufta. 1979. Mucorales of Pakistan, University of Agriculture, Faisalabad, Pakistan.
6. Mirza, J.H. and M.S.A. Qureshi. 1978. Fungi of Pakistan. University of Agriculture, Faisalabad, Pakistan.
7. Ainsworth, G.C., S.K. Sparrow. and S.A. Sussman. 1973. The Fungi. An Advanced Treatise. Vol.IVB. Academic Press, New York, USA.
8. Cummins, E.A. 1971. The Rust Fungi of Cereals, Grasses and bamboo. Springer-Verlag. Berlin, Germany.

Theory:

Morphology, reproduction, life cycle patterns, sexual compatibility and parasexuality. Types of asci, centra and ascocarps. Ascosporogenesis and conidiosporogenesis. Principles and systems of classification of Ascomycetes and Deuteromycetes. Classification of Ascomycetes up to order level with special reference to plant pathogenic species of agricultural importance in Pakistan. Ascolichens, general characters, anatomy and distribution in Pakistan.

Practicals:

Collection, preservation, culturing and identification of mycological specimens with special reference to taxa of agricultural importance. Use of keys for identification.

Books Recommended:

1. Alexopoulos, C.J., C.W.Mims. M. Blackwell. 1996. Introductory Mycology. 4th edition, John Wiley and Sons. Inc., New York, USA.
2. Barnett, H. L. and B.B. Hunter. 1996. Illustrated Genera of Imperfect Fungi, 4th edition, American Phytopathological Society Press, St. Paul, Minnesota, USA.
3. Moore-Landecker, E. 1996. Fundamentals fungi. 4th ed. Prentice Hall Inc., New Jersey USA.
4. Hawksworth, D.I., Kirk, P.M., Sutton., B.C. and Pegler D.M. 1995. Anisworth and Bishby's Dictionary of fungi. 8th ed. IMI Egham. UK.
5. Reynolds, D.R. 1993. The Fungal Holomorph: Mitotic, Meiotic and Pleomorphic Speciation in Fungal Systematic. CMI, Kew, UK.
6. Sharma, P.D. 1991. The Fungi, 2nd edition, Rastogi and Co., Meerut, India. Illustrated Genera of Ascomycetes.
7. Arx, V. 1981. The Genera of Fungi-Sporulating in Pure Culture. 2nd edition, J.Cramer, Lehre, Germany.
8. Cole, G.T. and B.Kendrick. 1981. Biology of Conidial Fungi. Vol-II. Academic Press, New York, USA.

9. Ahmad, S. 1978. Ascomycetes of Pakistan Vol.1 and II. Biological Society of Pakistan, Lahore, Pakistan.
10. Ainsworth, G.F., F.K. Sparrow and A.S. Susman. 1973. The Fungi: An Advance Treatise. Vol.4.A. Academic Press, London.UK.
11. White J. F. 2003.Claviciptalean fungi, Evolution, biologychemistry, bio and cultural control.

PP-703 PLANT BACTERIOLOGY 3(2-2)

Theory:

Economic importance and characteristics of plant pathogenic bacteria and mollicutes, taxonomy and nomenclature, morphology, nutrition, growth and reproduction. Bacterial and mollicute pathogenesis and symptomology, hypersensitive reaction and host-specificity. Ecology and spread of plant pathogenic bacteria and mollicutes. Symptomology, disease cycle and management of significant diseases. Transmission, modes of infection and management of important diseases caused by fastidious bacteria and mollicutes.

Practicals:

Isolation, purification and identification of plant pathogenic bacteria on the basis of morphological, cultural, biochemical and molecular techniques. Inoculation techniques and pathogenicity tests. Demonstration of plant disease symptoms exhibited by fastidious bacteria and mollicutes. Population and growth curves; Sensitivity tests; Characterization of bacteria using phages.

Books Recommended:

1. Misra, R.S. 2003. Bacterial Plant Diseases. Discovery Publishers and Distributors, India.
2. Jayarman, J. and Verma, J.P. 2002. Fundamentals of Plant Bacteriaology. Kalyani Publishers, Ludhiana, India.
3. Goto, M. 1992. Fundamentals of Bacterial Plant Pathology. Academic Press, San Diego, California, USA.
4. Klement, Z., K. Rudolph and D. C. Sands. 1990. Methods in Phytobacteriology. Akademiai Kiado, Budapest, Hungary.

5. Hampton, R., Ball, E. and DeBoer, S. 1990. Serological Methods for Detection and Identification of viral and bacterial plant pathogens. A Laboratory Manual. American Phytopathological Society Press, Saint Paul, Minnesota, USA.
6. Sigee, D.C. 1992. Bacterial Plant Pathology. Cell and Molecular Aspects. Cambridge University Press New York, USA.
7. Schaad. M.W. 1988. Laboratory Guide for Identification of Plant Pathogenic Bacteria, 2nd edition. American Phytopathological Society. Minnesota, USA.
8. Lelliott R. A. and D.E. Stead. 1987. Methods for the Diagnosis of Bacterial Diseases of Plants Vol-II, Blackwill Scientific Publication, Oxford, UK.
9. Fahy, P.C. and G.J. Persley. (edi). 1983. Plant Bacterial Diseases: A Diagnostic Guide. Academic Press, New York, USA.

PP-704 PLANT NEMATOLOGY 3(3-2)

Theory :

Importance of plant parasitic nematodes and threat to agriculture. Plant response to nematode. Environmental factors effecting survival and pathogenicity. Morphology, anatomy, and reproduction. Mode and mechanism of infection. Concepts and principles of population dynamics, genetics and estimation of crop losses. Nematodemicrobe interactions. Control of plant parasitic nematodes (breeding, physical, chemical, biological and cultural practices) and integrated management.

Practicals:

Isolation, identification and permanent mounting of important plant parasitic nematodes. Pathogenicity tests. Field trips, Collection handling and diagnosis of diseased plants by symptomology. Use of nematicides for nematode management

Recommended Books:

1. Alam, M.M. and Sharma, N. 2002. Nematode Control in Crops. International Book Distributors, India.
2. Trivedi, P.C. 1998. Recent Advances in Plant Nematology CGS Publishers and Distributors, India

3. Dropkin, V. H. 1989. Introduction to Plant Nematology. John Wiley and Sons, Inc., New York, USA
4. Perry, R.N. and Wright, D.T. 1998. The Physiology and biotechnology of free living and plant parasitic nematode. Willingford, CAB, Inc. UK. Alden, A. 1973. Nematode Ecology and Plant Diseases. Mowbray Ltd, Alden Press Oxord, UK.
5. Barker, K. R., Pederson, G.A. and Windham, G.L. 1985. An advanced treatise on Meloidogyne Vol. 1 & 11 Department of Plant Pathology, United State Agency for International Development, North Carolina State University, USA.
6. Siddiqi, M.R. 1986. Tylenchida: Parasites of plants and insects, CAB, UK.
7. Taylor, A. L. and Sasser, J. N. 1978. Biology, identification and control of root knot nematodes. Department of Plant Pathology, United State Agency for International Development, North Carolina State University, USA.

PP-705 MORPHOLOGY & TAXONOMY OF PLANT PARASITIC NEMATODES

3(2-2)

Theory:

History of plant nematology. Detailed morphology of plant parasitic nematodes. Importance of taxonomy in agriculture. Taxonomy of Tylenchida and Dorylaimida. Phylogentic relationship among genera of Tylecnchida and Dorylaimida..

Practicals:

Detailed study of morphology of nematode genera & species representing different orders, classes and families. Preparation of permanent slides of plant parasitic nematodes and their identification.

Books Recommended:

1. Siddiqi, M.R. 1986. Tylenchida. Parasites of Plant and Insects. C.A.B. International Inst. of Parasitol., London.
2. Jepson, S.B. 1987. Identification of Root-knot Nematodes (Meloidogyne sp) C.A.B. International Inst. of Parasitol., London.

PP-706 PLANT VIROLOGY 3(2-2)

Theory:

History, scope, morphology, taxonomy and biology of plant viruses; Genome structure, replication and purification; Physical properties Virus-insects relationship; Physiology of virus infected plants. Movement of virus in plants; Resistance to infection; economically important viral diseases of Pakistan. Management of plant viruses.

Practicals:

Study of symptoms, isolation and purification of plant viruses. Basic virus characterization. Transmission tests (sap, graft & vector). Serological techniques: Electron microscopy. Visits to relevant public institutions.

Books Recommended:

1. Francki, R. I. B., Robert, G. M. and Hatta, T. 1993. Atlas of Plant Virus Vol. I & II CBS. Publishers and Distributors, New Dehli, India.
2. Bashir, M. and S. Hassan, 1998. Diagnostic Methods for Plant Viruses. Pakistan Agricultural Research Council, Islamabad, Pakistan.
3. Boss, L.. 1999. Plant viruses: Unique and intriguing pathogens. Backhuys publishers Leiden.
4. Brunt, A., Crebtree, K. and Gibbs, A (eds). 1990. Viruses of Tropical Plants, CAB International, UK.
5. Hampton, R., Ball, E. and DeBoer, S. 1990. Serological Methods for Detection and Identification of viral and bacterial plant pathogens. A Laboratory Manual. American Phytopathological Society Press, Saint Paul, Minnesota, USA.
6. Khalid, S. 1999. Plant Virology Research in Pakistan. Pakistan Agricultural Research Council, Islamabad, Pakistan.
7. Khan, A. J and Dijkstra, J. 2002. Plant Viruses as Molecular Pathogen. CBS Publishers and Distributors, India.
8. Misra, R. S. 2004. Virus and Plant Diseases, CBS Publishers and Distributors, India.
9. Rager Hull.2002. Matthew's Plant Virology. (4th edition,). Academic Press, New York, USA

10. Saitic. D.D. Ford R. E. and Tosie, M.T. 1999. Hand Book of Plant Virus Diseases CRC Press Boca Raton London
11. Verma, H. N. 2003. Basics of plant virology. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
12. Walkey, D.G.A. 1991. Applied Plant Virology. Chapman and Hall. 2nd edition.
13. Smith K.M, 1990. Plant viruses 6th ed, Universal book stall, New Delhi.
14. Sreenivasulu, P; Naidu R.A and M.V. Nayudu. 1989. Physiology of virus infected plants. South Asian Publishers, New Delhi.

PP-707 PHYSIOLOGY OF DISEASED PLANTS 3(2-2)

Theory:

Infection process of fungi, bacteria, viruses and nematodes. Comparative analysis of disease physiology, influence of plant pathogens on photosynthesis, respiration, translocation, transpiration, cell wall composition and metabolism, nucleic acid and protein metabolism by biotic and abiotic factors. Changes on secondary metabolites, growth regulators and toxins. Effect of pathogens on trans-cellular and vascular transport. Nature of morphological and biochemical resistance in host plants.

Practicals:

Experiments to illustrate infection processes of plant pathogens, histopathology of infected plant tissue. Biochemical analysis to demonstrate changes induced by biotic and abiotic factors.

Books Recommended:

1. Misra, J.R. 2004. Photosynthesis in Plants DPH. India.
2. Lawlor, W. D. 2001. Photosynthesis 3rd Ed. Viva Books (Pvt) Ltd. India
3. Petrini, O. and Ouellette. G.B. 1994. Host Wall Alterations by Parasitic Fungi. American Phytopathology Society Press, St., Paul. Minnesota, USA.
4. Fritig, B. and M. LeGrand. 1993. Mechanisms of Plant Defense Responses. Kluwer, Dordrecht, The Netherlands.

5. Goodman. R.N., Z. Kiraly, and K.R. Wood. 1986. The Biochemistry and Physiology of Plant Disease. Univ. of Missouri Press, Columbia, USA
6. Baily, J.A., and B.J. Deverall. 1983. The Dynamics of Host Defence. Academic Press, New York, USA.
7. Asada, Y., W.R. Bushnell, S. Duchi, and P. Vance, 1982. Plant Infection: The Physiological and Biochemical Bases. Springer-Verlag. Berlin and New York.
8. Misaghi, I.J. 1982. Physiology and Biochemistry of Plant Pathogen Interactions. Plenum, New York, USA.

PP-708 GENETICS OF HOST-PARASITIC INTERACTION 2(1-2)

Theory:

Study of sexuality and sexual compatibility in various groups of plant pathogens. Mechanisms of variability and physiologic specialization. Virulence Vs host resistance, types of host resistance. Study of gene for gene concept and genetics of virulence in the pathogen and resistance in the host for important plant diseases. Gene functions in host parasite interactions. Effect of chemicals (fungicides etc.) on the virulence of pathogen and resistance of the host. Genetics of epidemics.

Practicals:

Isolation and identification of microorganisms from diseased seeds and perishables; estimation of losses and their management by chemical and physical means.

Books Recommended:

1. Day, P.R. 1974. Genetics of host parasite interaction. Freeman and Co. San Francisco.
2. Day, P.R. and G.J. Jellis. 1987. Genetics and Plant Pathogenesis. Black Well Scientific Pub., Palo Alto, C.Z.
3. Vanderplank, J.E. 1982. Host Pathogen Interaction in Plant Diseases. Academic Press, NewYork.
4. Vidhyasekran, P. 1997. Fungal Pathogenesis in Plants and Crops: Molecular Biology & Host Defense Mech. Dekker Press, India.

5. Crute, I.R. Gene-For Gene relationship in Plant-Parasite Interactions. CAB International, Ferry Lane, Kew, Surrey, England.

PP-709 POST HARVEST PATHOLOGY 3(2-2)

Theory:

Microorganisms and abiotic factors associated with grains and perishables (fruits, vegetables and others) in storage and transit. Extent and estimation of losses (harvesting, threshing, drying, grain storage and handling environmental factors, influencing, grain quality). Physiological and biochemical changes due to postharvest pathological problems in transit and storage; role of mycotoxins on human and animal health, hazards and possible solution; management of post harvest losses.

Practicals:

Isolation and identification of microorganisms from diseased seeds and perishables; estimation of losses and their management by chemical and physical means i.e. fungicide, waxing treatment, radiation and temperature.

Books Recommended:

1. Bhutta, A. R, Hussain, A and Rehman, M. R. 2004. Handbook on Seed Processing and Storage, Federal Seed Certification and Registration Department, Islamabad. Pakistan.
2. Bhutani, R.C. 2003. Fruits and Vegetables Preservation, Biotech Books, India.
3. Chakraverty, A., Mujundar, A.S., Raghavan, G.S. and Ramaswamy, H.S. 2003. Handbook of Post harvest Technology. Publ. by Marcel. Dekker/NC. New York, USA. P-864.
4. Dasgupta, M.K. and N.C. Mandal. 1986. Post Harvest Pathology of Perishables. Oxford and IBH Publ. Co. New Delhi, India
5. Neergaard, P. 1986. Seed Pathology. (Abridged Edition,) Chand and Co, New Delhi, India.
6. Dennis, C. 1983. Postharvest pathology of fruits and vegetables, Academic Press, New York, USA

7. Naard, N.F. and D.K. Salunkhe. 1980. Postharvest Biology and Handling of Fruits and Vegetables. The AVI Publ. Co., Inc., Connecticut, USA.

PP-710 PRINCIPLES OF PLANT PATHOLOGY 3(3-0)

Theory:

Disease: Definition, disease triangle [DT], and role of each DT component in disease development. The processes of disease development include production of inoculum and its dispersal, penetration, infection and symptom development.

Mechanisms: Mechanisms of attack of pathogen and defense mechanisms of host.

Physiological response of host to disease: Effects of pathogen infection on physiological process of host plants.

Epidemiology: Impact of environmental factors on disease epidemics. Disease monitoring and forecast.

Disease assesement: Disease incidence, its severity and loss caused.

Disease management: Use of various disease management strategies.

Recommended books:

1. Horsefall, J. G., and E. B. Cowling (eds). 1980. Plant Disease. An advanced treatise. Vol. I, II, III, IV, and V. New York: Academic press.
2. Roberts, D. A., and C. W. Boothroyd. 1984. Fundamentals of Plant Pathology. 2nd. edition. New York: Freeman and Company.
3. Agrios, G. N. 1988/1996. Plant pathology 3rd/4th edition. New York: Academic press.
4. Carlile, M.J. 1994. Fungi. Academic Press, INC. London, New York.
5. Singhal, G.S. 1999. Concepts in Phytobiology: Photosynthesis and Photomorphogenesis. APS Press, Saint Paul , MN, USA.
6. Bridge, P.D. 1998. Molecular Variability of Fungal Pathogens. CAB International, Ferry Lane, Kew, Surrey, England.

Theory:

Impact of ecology on plant pathogens; temporal and spatial attributes of pathogens in plant populations. Population statistics, compensation and carrying capacity. Concepts of host-pathosystems, ecological patterns, and approaches for pathosystem management.

Detailed study of environmental and nutritional factors in relation to pathogens and plant diseases.

Practicals:

Ecological Study of the important plant pathogens of Pakistan. Ecological factors influencing the growth and development of pathogens (gram blight, apple scab, wheat rust, cotton leaf curl virus) in plant populations. Detailed study of ecological patterns of pathogen-host ecosystems in relation to agro-ecosystems of Pakistan.

Books Recommended:

1. Kormondy, E.J. 2004. Concepts of Ecology 4th Ed. Prentic Hall, India.
2. Karishna, K. R. 2003. Agro-sphere, Nutrient Dynamics, Ecology and Productivity. IBH & Oxford, UK/India.
3. Carroll, G.C. and P. Tudzynski. 1997. Plant Relationships. Volume V.A. Springer-Verlag, Germany.
4. Wicklow, D.T. and B.E. Soderstrom. 1997. Environmental and Microbial Relationships. Volume IV. Springer-Verlag, Germany.
5. Hall, R. 1996. Principles and Practices of Managing Soil-borne Plant Pathogens. American Phytopathological Society Press St. Paul, Minnesota, USA.
6. MacHardy, W.E. 1996. Biology, Epidemiology and Management. American Phytopathological Society Press, St. Paul, Minnesota, USA.
7. Ecology of plant pathogens.

PP-712 PLANT DISEASE EPIDEMIOLOGY 3(2-2)

Theory:

History and development of epidemiology. Principles and components of epidemics; influence of meteorological factors, host resistance and human interventions on development of epidemics; mapping of growth rate and growth curves. Geographic Information System (GIS) Analysis of epidemic growth curve and calculation of growth rate. Forecasting of epidemics and their modelling; computer simulation programmes for epidemic. Disease warning systems.

Practicals:

Use of different techniques to create artificial epidemics in greenhouse or growth chamber; calculation of severity of disease by different procedures to monitor epidemics: plotting growth curve by using different transformation procedures. Establishing prediction systems and executing management measures. Computer simulation programmes

Books Recommended:

1. Agrios, G. N. 2005. Plant Pathology. 5th edition, Academic Press, New York, USA.
2. Leonard, J. F. and D. A. Neher. 1997. Exercises in Plant Disease Epidemiology. American Phytopathological Society Press, Saint Paul, Minnesota, USA.
3. Camphill, C.L. and L.V. Madden. 1990. Introduction to Plant Disease Epidemiology. John Wiley and Sons, Inc., New York, USA.
4. Kranz, J. 1990. Epidemics of Plant Diseases: Mathematical Analysis and Modeling. Springer Verlag, New York, USA.
5. Zadoks, J.C., and R.D. Schein. 1979. Epidemiology and Plant Disease Management. Oxford Univ. Press, London and New York, USA.
6. Vanderplank, J.E. 1963. Plant Diseases: Epidemics and Control. Academic Press, New York, USA.

PP-713 PLANT DISEASE MANAGEMENT-I (Chemical Methods) 3(2-2)

Theory:

History of fungicides, nematicides and bactericides, their classification and development; application of chemicals for the management of foliar seed and soilborne, vascular and postharvest diseases and their modes of action. Problems and prospects of chemicals. Chemical compatibility. Uptake and translocation of chemicals in plants. Development of resistance in fungi, bacteria and nematodes to chemicals. Use of chemicals based on disease tolerance limit.

Practical:

Use of chemicals for seed, foliar and soil application. Use of equipment and machinery for dispensing of chemicals. Sensitivity tests against different chemicals in fungi, bacteria and nematodes.

Books Recommended:

1. Alford, D. 2000. Pest and Disease Management, BCPC, UK.
2. Upadhyay, R.K. 1999. Integrated Pest and Disease Management, CAB, Kew, UK.
3. Lyr, D. (ed.). 1987. Modern Selective Fungicides: Properties, Applications, and Mechanisms of Actions. New York: John Wiley and Sons. Inc. USA.
4. Green, M. B. and D. A. Spilker. (eds). 1986. Fungicide Chemistry: Advances and Practical Applications. American Chemical Society, Washington D.C. USA.
6. Siegel, M. R and H. D. Sisler. (eds). 1977. Antifungal compounds Vol 1 and II.

PP-714 PLANT DISEASE MANAGEMENT-II 3(2-2) **(Biological, Physical, Cultural and Regulatory Methods)**

Theory:

Management of plant diseases by biological methods vis host resistance, cross protection, interference, hyperparasitism, tissue culture and genetic engineering, physical vis heat treatment, sterilization, refrigeration and radiation etc., Cultural vis host eradication, crop rotation, sanitation, etc., and regulatory (quarantine and

inspection/certification) methods. Use of fungal and bacterial microbes as antagonists to plant pathogens (biotech crops such as Bt cotton and Bt corn).

Practicals:

Demonstration for the management of diseases through biological, physical, cultural and regulatory methods.

Books Recommended:

1. Nehra, S. 2005. Plant Microbes and Biotechnology, Pointer Publication, India.
2. Leonard, G.C. 2004. The Manual of Bio Control Agents, BCPC, UK.
3. Sadasivam, S. and Thayumanavan, B. 2003. Molecular biology of the biological control of pests and diseases of plants. Marcel Dekker.
4. Hajek, A. 2003. Natural Enemies, An Introduction to Biological Control, Cambridge University Press, UK.
5. Samuel, S.G. 2002. Biological Control of Crop Diseases, Dekker, USA.
6. Gupta, V.K. and R.C. Sharma. 1995. Integrated Disease Management and Plant Health. Scientific Publ. Jodhpur, India.
7. Alford, D. 2000. Pest and Disease Management Handbook, BCPC, Publication UK.
8. Johnson, R. and G.J. Jellis. 1993. Breeding for Disease Resistance. Kluwer, Hingham, Massachusetts, USA.
9. Jarris, W.R. 1992. Managing Diseases of Green House Crops, American Phytopathological Society Press, St. Paul, Minnesota, USA.
10. Thurston, H. D. 1991. Sustainable Practice for Plant Disease Management in Traditional Farming Systems. West View, Boulder, Colorado, USA.
11. Hornby, E. 1990. Biological Control of Plant Pathogens, CAB International. Oxon, UK.

PP-715 INTEGRATED DISEASE MANAGEMENT 3(2-2)

Theory:

Definition and concepts of integrated disease management (IDM). Various approaches for implementations of IDM. History and components of IDM. Biological and environmental monitoring. IDM and agricultural sustainability. Formal vs nonformal

education, empowerment of farmers for decision making. Master trainers; training of trainers (TOT's) and Farmer Field Schools (FFS), Community Education, Curriculum development for FFS.

Practical:

Working knowledge of climatological procedures and working out economic threshold levels. Demonstration of nonformal education methods; curriculum development examples and exercises for FFS; familiarization in conducting TOT's and FFS's.

Books Recommended:

1. Fadeev, W.N. and K.V. Novozhilov (eds). 1988. Integrated Plant Protection. Published by A.A. Balkema, Rotterdam, Netherlands.
2. Upadhyay, R.K. K.G. Mukerji, B.P. Chamola and O.P. Dubey (eds.). 1998. Integrated Pest and Disease Management. A.P.H. Publishing Corporation, New Delhi, India.
3. Montague, Yudelman., Annu, Ratta., and D. Nygaard. 1998. Pest Management and Food Production, Looking to the Future. International Food Policy Research Institute, Washington DC, USA.
4. Soejitno. 1999. Integrated Pest Management in Rice in Indonesia. Asia Pacific Association of Agricultural Research Institutions, FAO, Regional Office for Asia and the Pacific Bangkok, Thailand.
5. A training Manual for farmers Field School. 2000. International Integrated pest Management Programme, Katmandu, Nepal.
6. George G. K. and S.B.Turner. 2000. Emerging Technologies for Integrated Pest Management Concepts Research and Implementation.
7. Upadhyay, R.K. 1999. Integrated Pest and disease management. CAB International, Ferry Lane, Kew, Surrey, England.

PP-716 Molecular Plant-Microbe Interaction

3(3-2)

Types of Interactions

1. Interaction with
 - i. Viruses RNA/DNA viruses
 - ii. Bacteria Toxins;Enzymatic degradation; Genetic transformation; Symbiosis

- iii. Fungi Toxins; Enzymatic degradation; Symbiosis
- 2. Molecular Diagnostics/ Characterization
 - i. ELISA ii. Nucleic Acid/ Protein Hybridization
 - iii. PCR iv. Molecular Markers (isozymes, RFLPs, RAPD)
- 3. Disease control at molecular level, gene manipulation for disease resistance.
 - i. HR ii. SAR (Systemic acquired resistance)
 - iii. LAR (Local acquired resistance) iv. Genetic basis signal transduction.
 - v. Identification, cloning strategy vi. Plant growth regulator and structural analysis of resistant genes.

Books Recommended:

1. Kosuge, T. and Nester, E.W. (ed.). 1984. Plant Microbe Interactions. Molecular and Genetic Perspectives volume 1 & 2. 1984. New York: Macmillan Publishing Company.
2. Tomiyama, K., J. M. Daly, Vritani, I., Oku, H. and Ouchi, S. (ed.). 1976. Biochemistry and Cytology of Plant Parasite Interaction. Tokyo: Kodansha Ltd.
3. Davis, Hammerschmi 1993. Arabidopsis Thaliana as a Model for Plant-Pathogen Interactions. APS Press, Saint Paul , MN, USA.
4. Purkayastha, R.P. Economic Plants and Microbes. TTPP Publishers, NewDheldi, India
5. Bridge, P.D. 1998. Molecular Variability of Fungal Pathogens. CAB International, Ferry Lane, Kew, Surrey, England.

PP-717 FOREST AND SHADE TREE PATHOLOGY 3(2-2)

Theory:

Introduction and economic importance of forest and shade tree diseases. Principles of forest disease management. Study of the development, epidemiology and management of important forest and shade tree diseases caused by biotic and abiotic agents. Mycorrhiza and its significance in forestry. Deterioration of dead timber and forest products and their management.

Practicals:

Study of symptoms and identification of causal agents of important diseases and different types of mycorrhizae. Identification and preservation of various fungi associated with forest and shade trees. Management of various diseases through chemical and cultural practices.

Books Recommended:

1. Bukhshi, E.K. 1976. Forest Pathology. Forest Institute, Dehradun, India.
2. Khan A. H. 1989. Pathology of Trees Vol-II, University of Agriculture, Faisalabad, Pakistan.
3. Manion, P. D. 1991. Tree Disease Concepts. 2nd Edition, Prentice Hall Englewood Cliffs, New Jersey, USA.
4. Strouts, R. G. and T. G. Winter. 1994. Diagnosis of Ill-Health in Trees. Her Majesty's Stationary Office Publishers, London, U.K.
6. Zabel, R. A. and J.J. Morell. 1992. Wood Microbiology: Decay and its Prevention. Academic Press, San Diego, California, USA.
7. Chase, A.R. 1997. Foliage Plant Diseases: Diagnosis and control. APS Press, Saint Paul, MN, SA.
8. Sharma, R. 2000. Plant Diseases. Campus Books.

PP-721 GENERAL PLANT PATHOLOGY 3(2-2)**Theory:**

Introduction and history of plant pathology with special reference to description of epidemics of plant diseases. Classification and causes of plant diseases with emphasis on potential plant pathogens. Characteristics of plant pathogenic fungi, bacteria, nematodes and viruses, their morphology, nutrition, reproduction, ecology and spread. Classification of plant pathogenic fungi and bacteria with examples of representative genera and organisms of economic importance. Symptoms of plant diseases caused by plant pathogens. Etiology, symptoms, disease cycle, epidemiology and management of various diseases of plants. Principles of plant disease management.

Practicals:

General acquaintance with fungus, bacterium, nematode and virus as plant pathogens. Isolation and purification of cultures of plant pathogens. Identification of plant pathogens. Reproduction of plant diseases (Demonstration of Koch's postulates). Collection and preservation of disease specimens and plant pathogens. Chemotherapeutic control of plant diseases.

Books Recommended:

1. Agrios, G.N. 2005. Plant Pathology, 5th edition, Academic Press, New York, USA.
2. Ahmad I, and Bhutta A. R. 2005. A text Book of introductory plant pathology. National Book Foundation Islamabad.
3. Alexopoulos, C. J., C.W. Mims and M. Blackwell. 1996. Introductory Mycology. 4th edition, John Wiley and Sons, Inc., New York, USA
4. Singh, R.S. 1982. Plant Pathogens: The Fungi. Oxford and IBH Publishing Company, New Delhi, India
5. Singh, R.S. 1989. Plant Pathogens: The Prokaryotes. Oxford and IBH Publ. Company, New Delhi, India.
