Pir Mehr Ali Shah

ARID AGRICULTURE UNIVERSITY

RAWALPINDI

DEPARTMENT OF SOIL SCIENCE & SWC

Self Assessment Report

Year – 2007

PREPARED BY:

Prof. Dr. Safdar Ali	**(Chairman/Coordinator)**
Dr. M. Tariq Siddique	**(Member)**
Dr. Rifat Hayat	**(Member)**

REVIEWED AND EDITEDBY:

Prof. Dr. Riaz Ahmed	**(Director Quality Control)**
Dr Muhammad Shoaib Ahmedani	**(Deputy Director Quaality Control)**

CONTENTS

INTRODUCTION:

The Department of Soil Science and Soil & Water Conservation in the Faculty of Crop & Food Sciences at Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi is a multidisciplinary academic unit having teaching and research. The Department began as separate soil science and Soil & Water Conservation entities in 1979, which was transformed in 1995 but have always maintained broad array of programs that deals with Soil & Water Conservation, Soil Fertility & Cropping Systems and issues of importance to pothwar region. The department's strength is its ability to seek solutions to problems that require the integration of disciplines and collaboration of researchers and educators.

The Department have twelve faculty members; 4 Professors, 3 Associate Professors, 2 Assistant Professors and 3 Lecturers. Ten out of twelve faculty members are Ph. D.

The Department offers undergraduate and post-graduate studies. Till now, 190 students have graduated as B. Sc. (Hons.) Agri., 73 students have been awarded M. Sc. (Hons.) Soil Science degree and 5 students got Ph. D. degree. At present 18 Ph. D. and 27 M. Sc. (Hons.) students are working for their degrees.

Fourteen Research Projects have been completed and eleven research projects are on–going. The deparmental faculty has published 350 research papers in national and international journals including 72 in impact factor journals. It holds national and international seminars to exchange knowledge and views.

MISSION:

The Department of Soil Science & SWC supports the missions of PMAS-Arid Agriculture University, Rawalpindi through its commitment to acquire, integrate and disseminate basic and applied knowledge about soil & water conservation, legume-cereal cropping systems, watershed management issues in an ever changing world. We educate undergraduate and graduate students and work to help solve problems related to soil & water conservation, legume-cereal cropping systems, soil mineralogy and soil biology.

A more specific mission of Department of Soil Science is to deliver quality teaching, conduct superior research and extend knowledge for the amelioration of agriculture, the environment and human health and well being leading to self-sufficiency in quality food by reducing losses in crop yields due to soil health problems and develop a sustainable and substantially profitable production system and make the future of Pakistan bright.

VISION:

The department of Soil Science & SWC will be recognized regionally, nationally and internationally for our scholarly work, effective student training. We plan to be among the top ten soil science departments in the nation measured by scholarly works per faculty, grant rupees per research faculty, student placement success and other measures.

VALUES:

- Credibility as a source of reliable, research–based information and education.
- Responsiveness to the needs of those we serve.
- Effective communication within the department, the university.
- Effective teamwork and coordination within our department and with colleagues.
- Accountability for the wise use of human, fiscal and physical resources entrusted to us.
- Ability to learn from past experience and to develop innovative solutions to problems.
- Recognition of diversity in all its forms and a commitment to create an environment of mutual understanding and respect.

Goals and Strategies

Three areas of planning and organizational activity will be emphasized over the next 3 to 5 years: 1) Curriculum development 2) Research projects and 3) Faculty and Staff Enrichment.

Goal 1: Curriculum Development

Rationale: Natural resource issues are at the forefront of societal concerns in Punjab, across the Pakistan and around the world. Issues include agricultural sustainability, global warming, soil and water quality, soil erosion, and food security to name but a few. Students trained in soil science discipline can play critical roles in helping society address many of these problems. We must be sure that we have up-to-date curricula at both undergraduate and graduate levels to meet these training needs and to be sure that students are aware of the career opportunities that exist in these areas of study.

***Implementation Strategy*– Maintain up-to-date undergraduate and graduate curricula to prepare students for professional positions in industry, private consulting, government or graduate study.**

Our goal is to strive for excellence in teaching, both in the array of courses available to our students and in the delivery of course materials. At the core of these efforts is our curriculum committee's constant examination and reexamination of the courses and curriculum options we offer to ensure their relevance, eliminate unnecessary duplication, delete courses no longer needed and develop new courses or curricular options as current issues and student interests mandate change. We will ensure that learning objectives are explicitly stated for all of our courses and we will develop means to evaluate the effectiveness of those objectives as the class is being taught and after the class is completed. We recognize the importance of good writing in students' educations and we will look specifically for ways to teach writing skills in all of our classes. We will continue to support teaching excellence through peer evaluation, teaching improvement. We will encourage student involvement in interdisciplinary programs to give students the opportunity to learn to work across disciplinary boundaries.

Goal 2: Research Projects

Rationale: Soil Science & SWC faculty conduct research activities across an array of sciences. Faculty do valuable work at ranges from applied to the most

basic. Most activity has or will have an application in Pothwar natural resource systems but time scales differ significantly. Our best graduate training programs are most often linked to our best research programs.

Implementation Strategy:

Projects are headed by a faculty member and are most often focused on a specific disciplinary area. The types of activities done within each project – applied research, basic research, teaching, public service – will be identified. This information will be presented in both descriptive and diagrammatic form and made available in printed and electronic formats, the latter will be available on our department web site.

Goal 3: Faculty and Staff Enrichment

People are our greatest source. We need to assure that faculty and staff have on-going training and support to make them as productive as possible.

STANDARD 1-1: DOCUMENTED MEASURABLE OBJECTIVES

Strategic objectives of the department are as below:

1. To develop Soil Science & SWC discipline on modern and innovative lines for teaching and research for the graduate and post-graduate students.
2. To impart basic and applied high quality knowledge and skills in the field of Soil Science & SWC applying highly advanced analytical techniques.
3. To guide students and conduct research on soil, crop and water issues.
4. To anticipate new problems in the field.

Main Elements of Strategic Plan to Achieve Mission and Objectives

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

OUTCOMES:

1. Teaching method was revised on modern lines.
2. Revision of curriculum as per requirement.
3. Presentations, seminars, communication skill development.
4. Enhancement of know-ledge and vision.
5. Approval of new curri-culum integrated approaches.

Objectives vs Outcomes Ranking

OBJECTIVES	OUTCOMES				
	1	**2**	**3**	**4**	**5**
1	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆
2	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆
3	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆
4	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆

☆ = Relevant

☆☆ = Relevant & satisfactory

☆☆☆ = Very relevant & satisfactory

☆☆☆☆ = Highly relevant & highly satisfactory

TABLE–A PROGRAM OBJECTIVES ASSSESSMENT

Sr. #	Objective	How Measured	When Measured	Improvement Identified	Improvement made
1	Development & strengthening of Soil Science & SWC discipline at PMAS-AAUR	On the basis of recognition of plant diseases in the area and determining their impact	It is a continuous process as per requirement	Teaching method needed to be improved	Teaching method was revised on modern lines
2	To impart basic and applied knowledge to the graduate and Post-graduate students	Back ground information and status of knowledge of students through entry tests and student 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 up projects	Students to make presentations and reports	Presentations, seminars, communication skill development
4	Integration of related fields	Through entry tests, interviews research own interest	Subject / courses attachment before start	Related subjects to be recommended or studies	Enhancement of know-ledge and vision
5	Anticipation of new teaching / researchable areas	Through surveys, monitoring of soil fertility status and soil & water conservation, assess manpower, farmers field back and potential farmers interaction	Continuous activity	New courses to be included in curricu-lum, research on new problem	Approval of new curri-culum integrated approaches

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

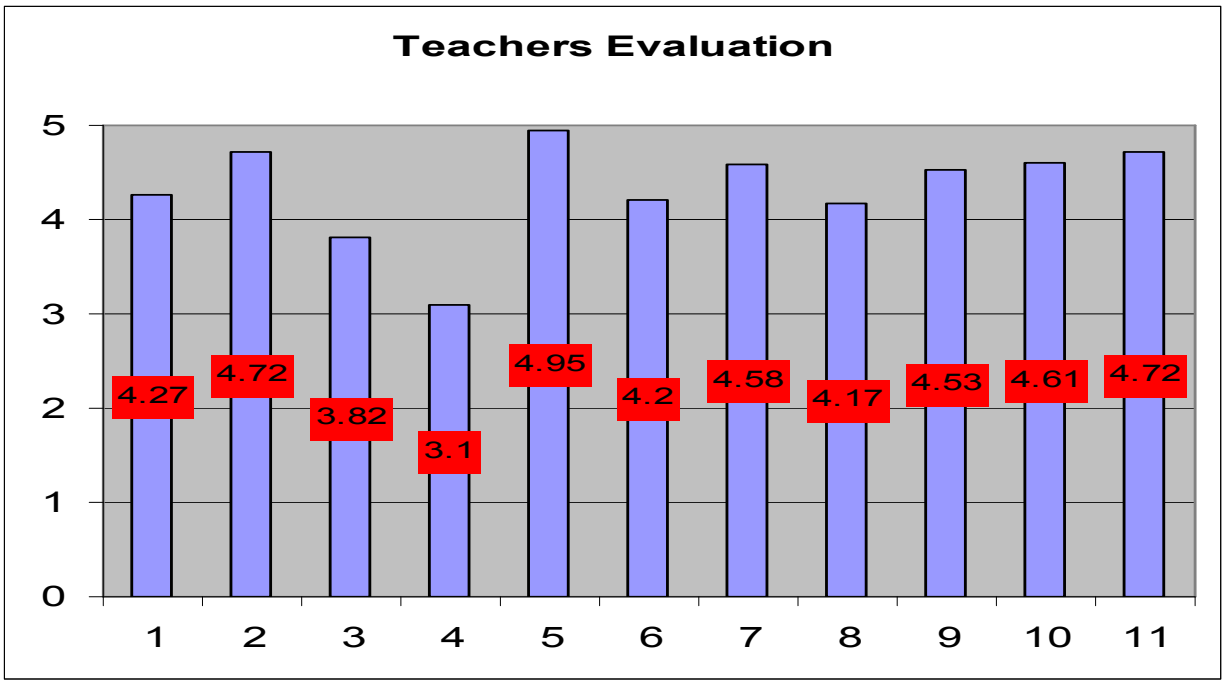
Meeting Standards: Program Outcome Measurement

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

Program Assessment Results:

Teacher's Evaluation

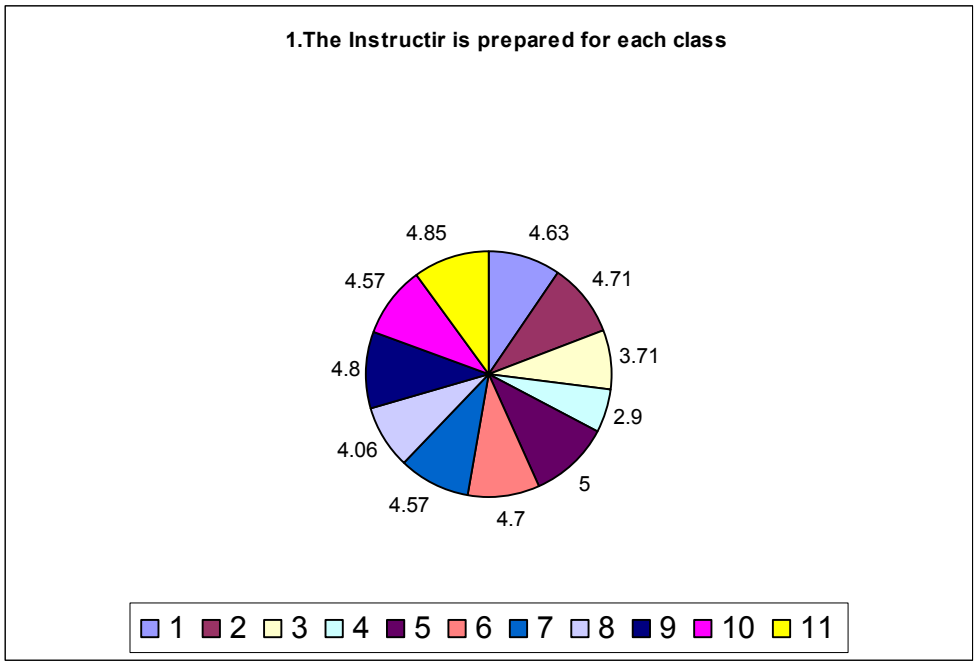
The teachers were evaluated by the students at the end of the semester in accordance with Proforma-10. The results are shown in graph given below. In the graph the teachers are represented as 1, 2, 3…, instead of mentioning their names. The overall compiled results showed that teacher-5 is on the top scoring 4.95 points while teacher 4 is on the bottom securing 3.10 scores. The scores of other teachers can be seen from the graph.

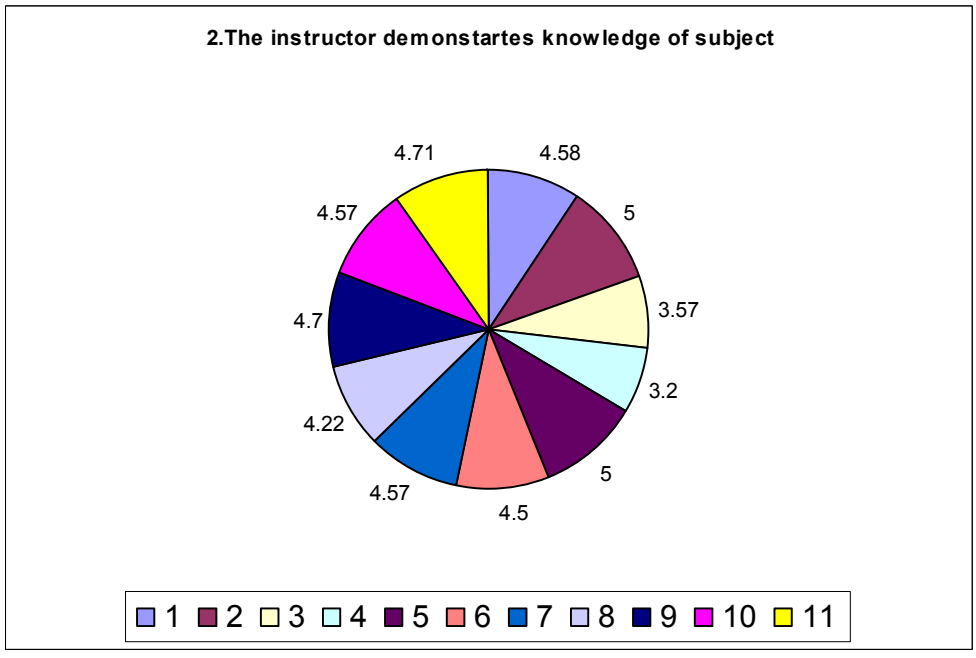


1.	Prof. Dr. M. Iqbal Lone	**2.**	Prof. Dr. Safdar Ali	**3.**	Dr. M. Azhar Naeem
4.	Dr. Ghulam Jillani	**5.**	Dr. Khalid Saifullah Khan	**6.**	Dr. Muhammad Akmal
7.	Dr. Rifat Hayat	**8.**	Mr. Arshad Nawaz	**9.**	Mr. Tanveer Iqbal
10.	Miss Aisa Munir	**11.**	Dr. Muhammad Yousaf		

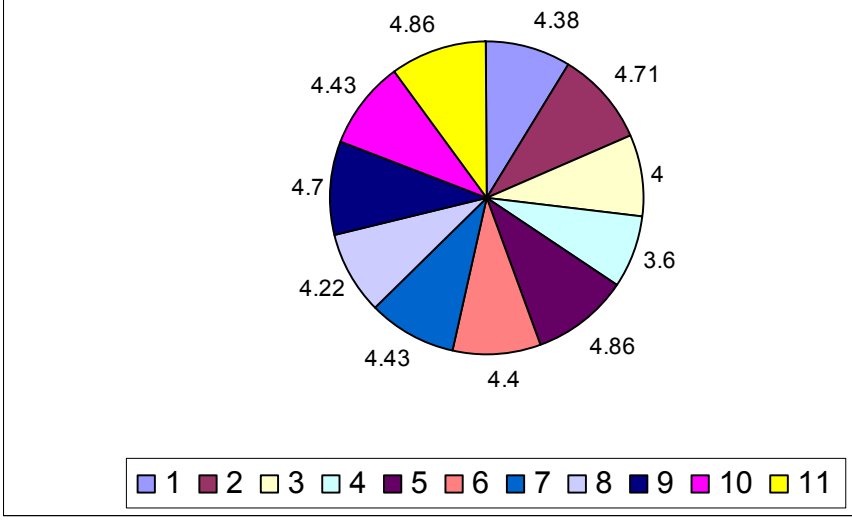
Teacher Evaluation

The courses of the respective teachers were also evaluated as per Proforma 1, The results are shown in graphs below (1-18). The scores of respective teachers can be seen from the graphs.

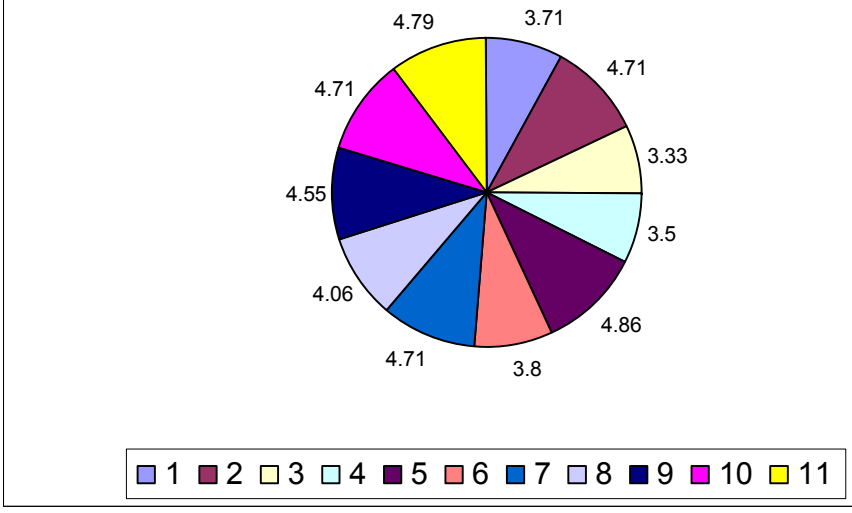




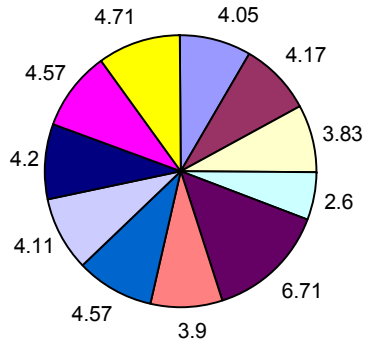
3. The instructor has completed the whole course



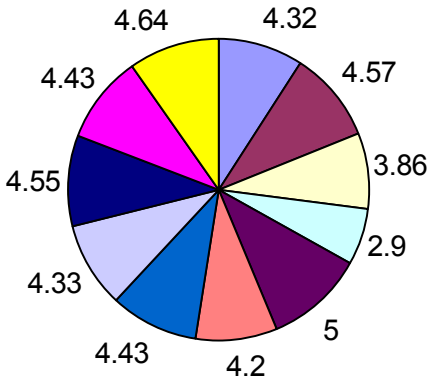
4. The instructor provide additional material apart from text



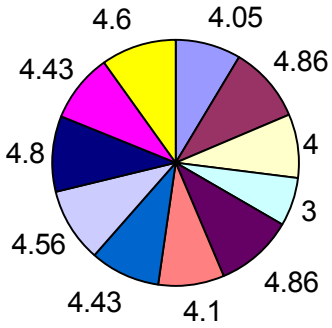
5.The instructor give citation regarding current situations with refernece to Pakistan context



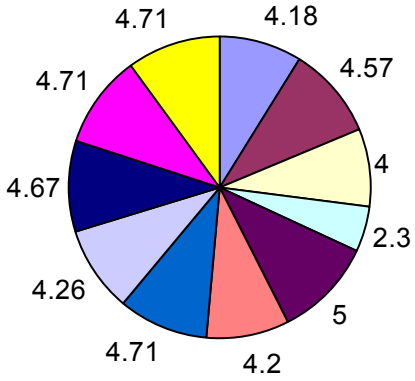
6.The instructor communicates the subject matter effectively

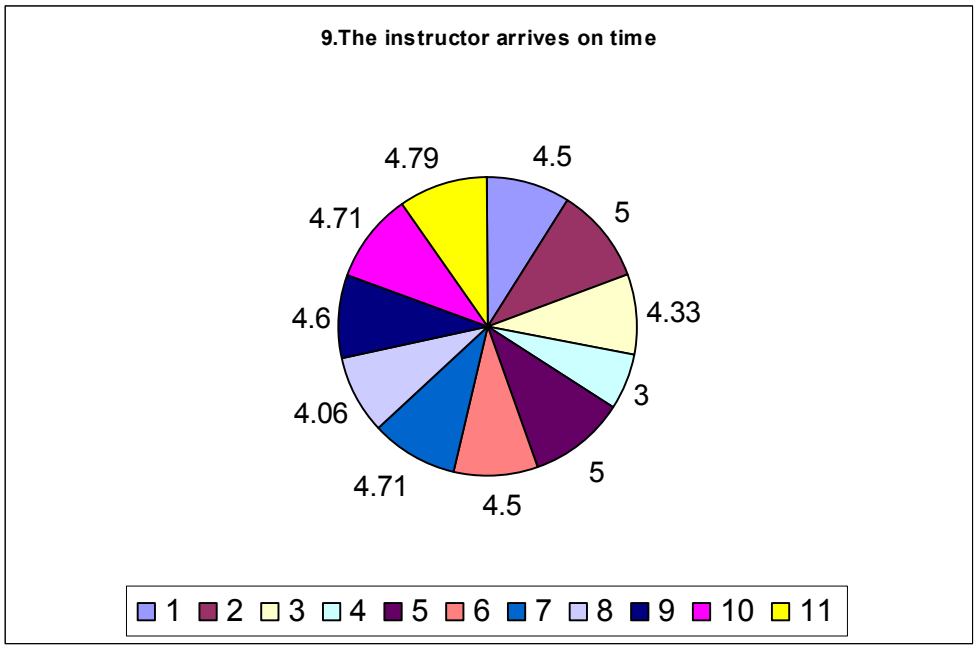


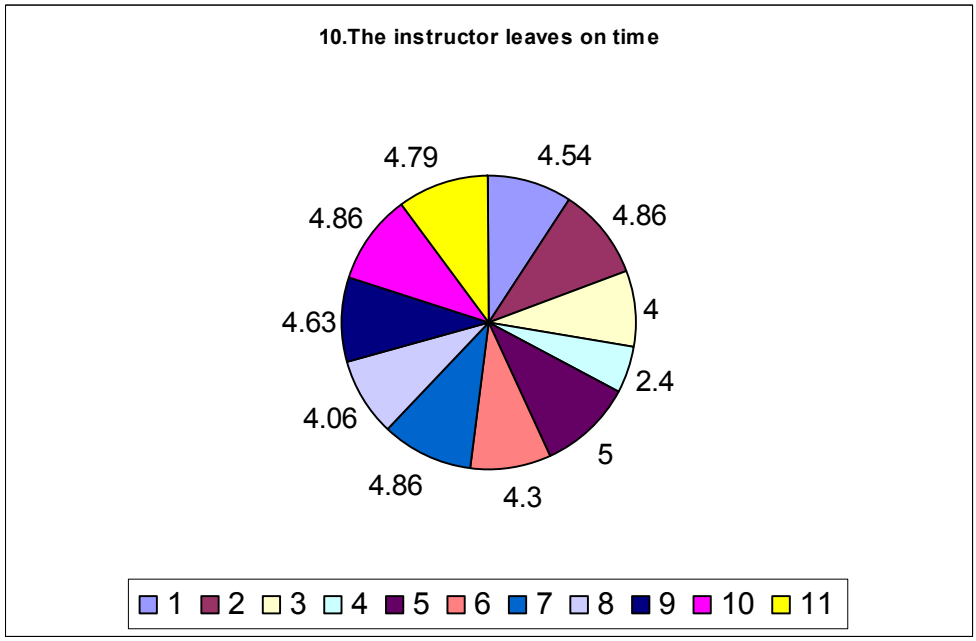
7.The instructor shows respect towards students and encourage class participation



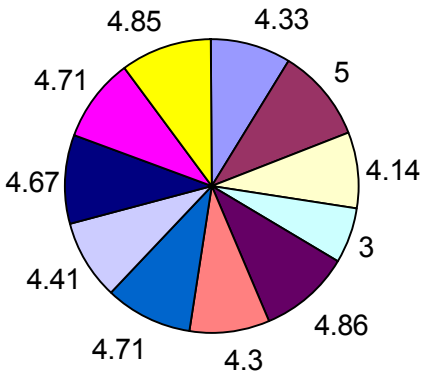
8.The instructor maintain an environment that is condusive to learning



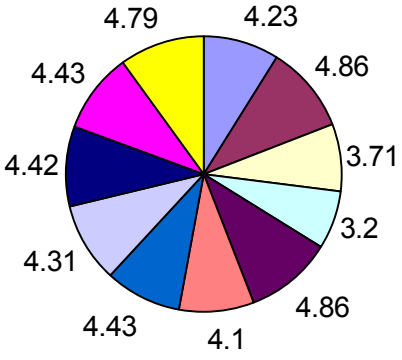

9.The instructor arrives on time
4.79
4.5
4.71
5
4.6
4.33
4.06
3
4.71
5
4.5
1 2 3 4 5 6 7 8 9 10 11


10.The instructor leaves on time
4.79
4.54
4.86
4.86
4
4.63
2.4
4.06
5
4.86
4.3
1 2 3 4 5 6 7 8 9 10 11

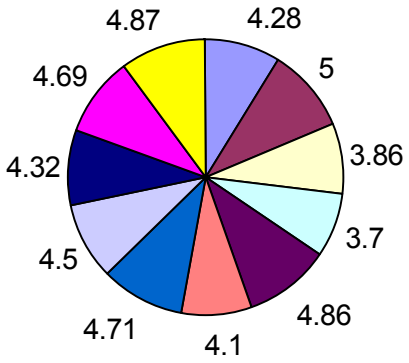
11. The instructor is fair in examination



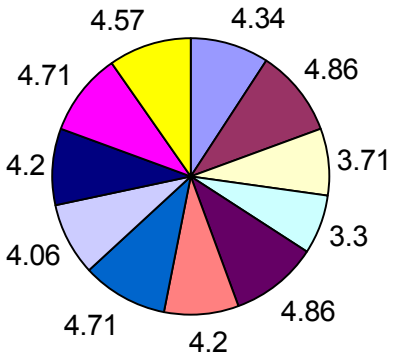
12.The instructor returns the graded scripts, etc in a resonable amount of time



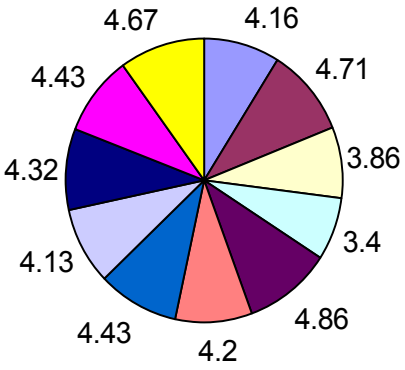
13. The instructor was available during the specified office hours and for after class consultation



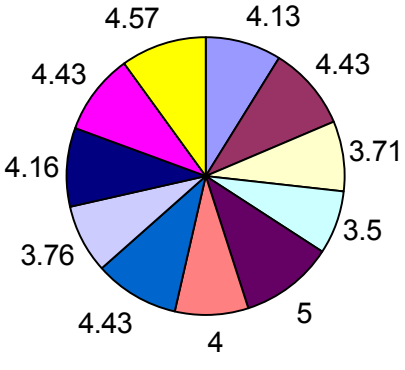
14.The subject matter presented in the course has increased your knowledge of the subject



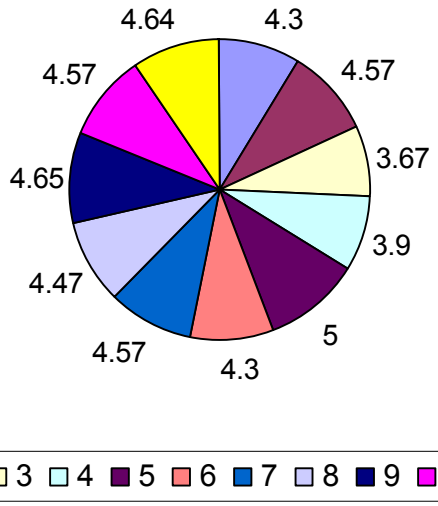
15.The syllabus clearly states course objectives requirements prosedure and grading criteria



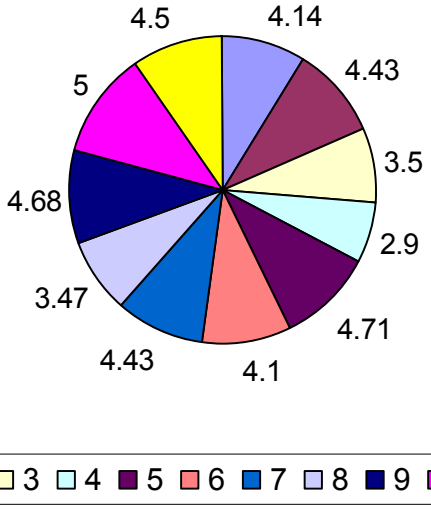
16.The course integrates theoretical course concepts with real word application



17.The assignments and exams covered the material presented in the course

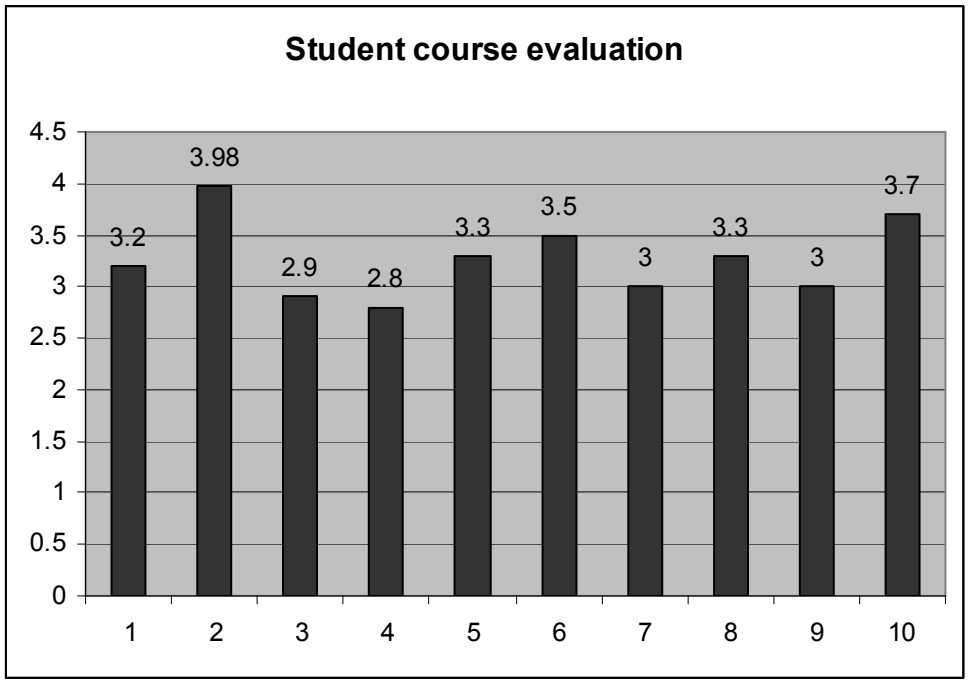


18.The course amterial is modern and updated



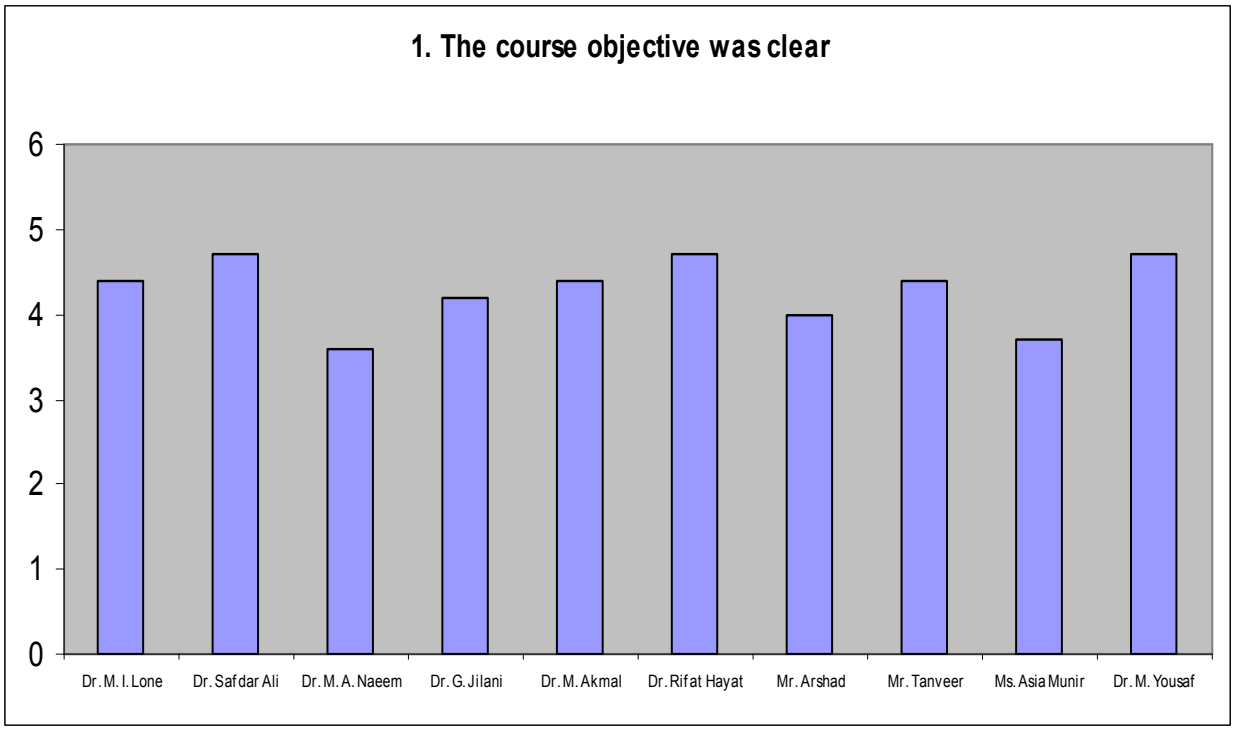
Student Course Evaluation:

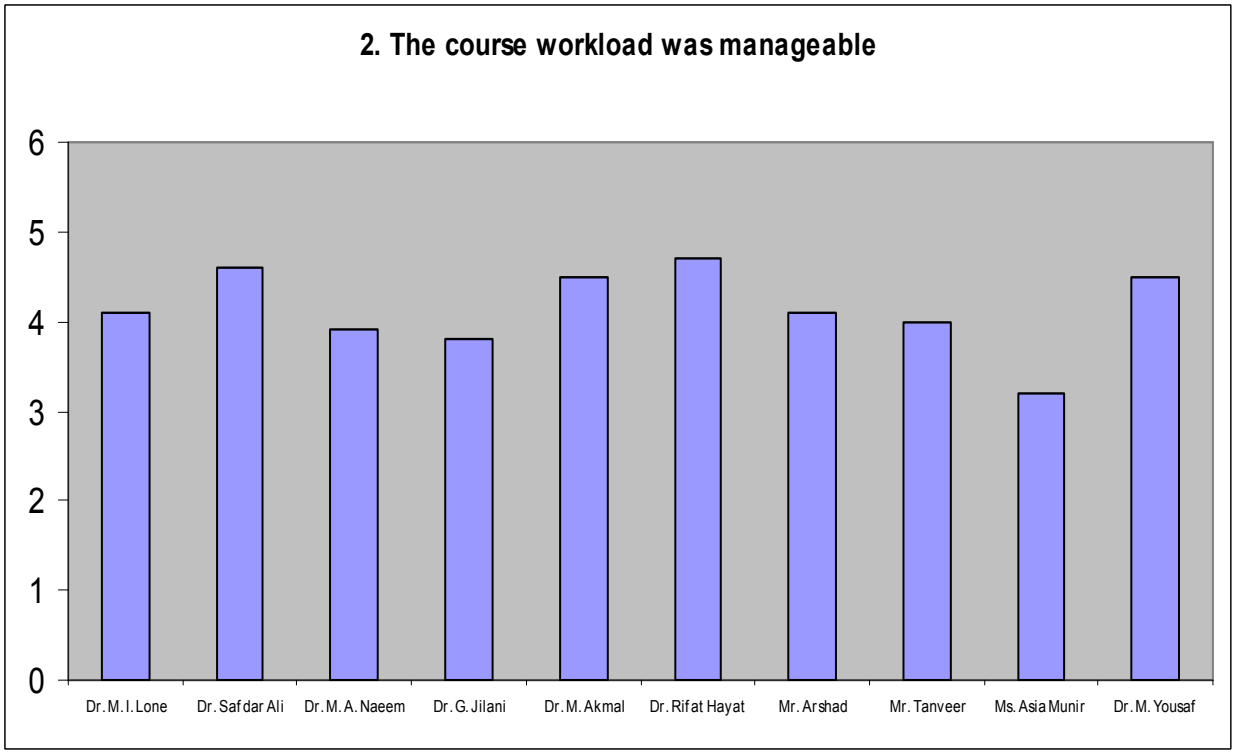
The students also evaluated all the courses (Proforma – 1). The results obtained are summarized in the following Figure. Individual statements of the proforma are also summarized in the subsequent Figures.

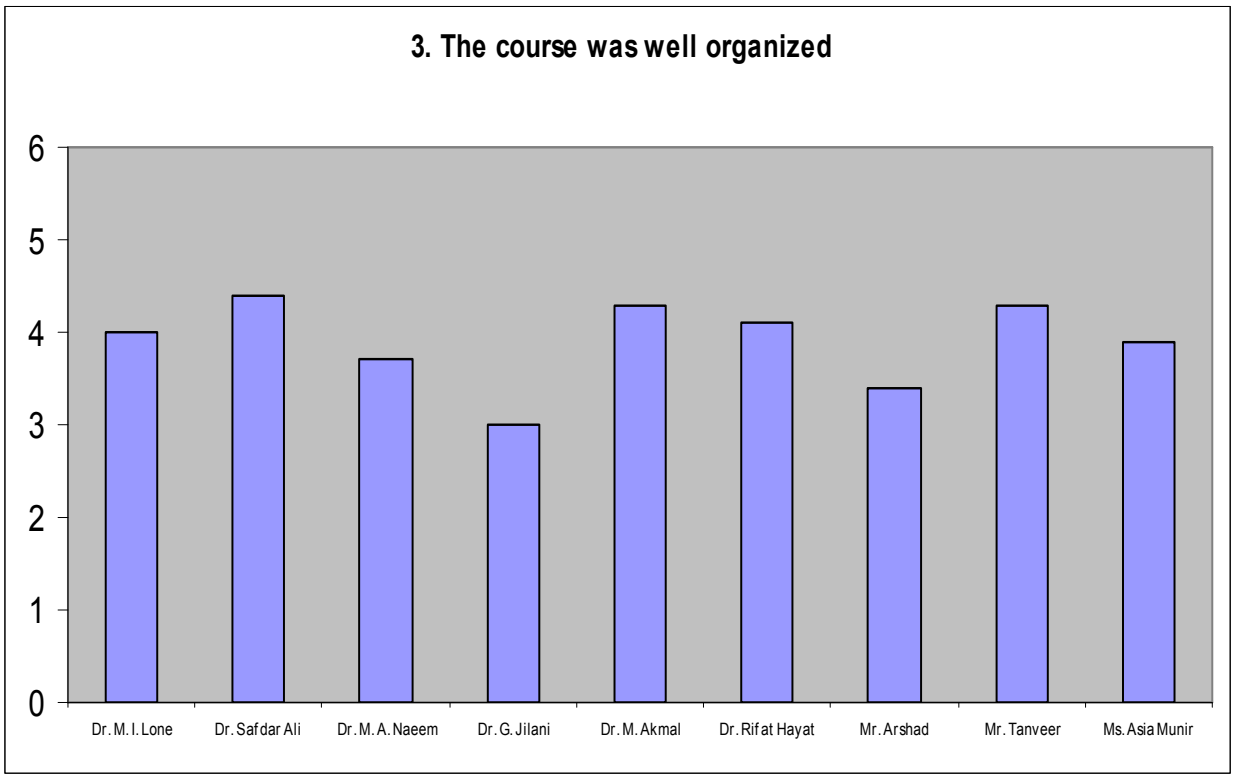


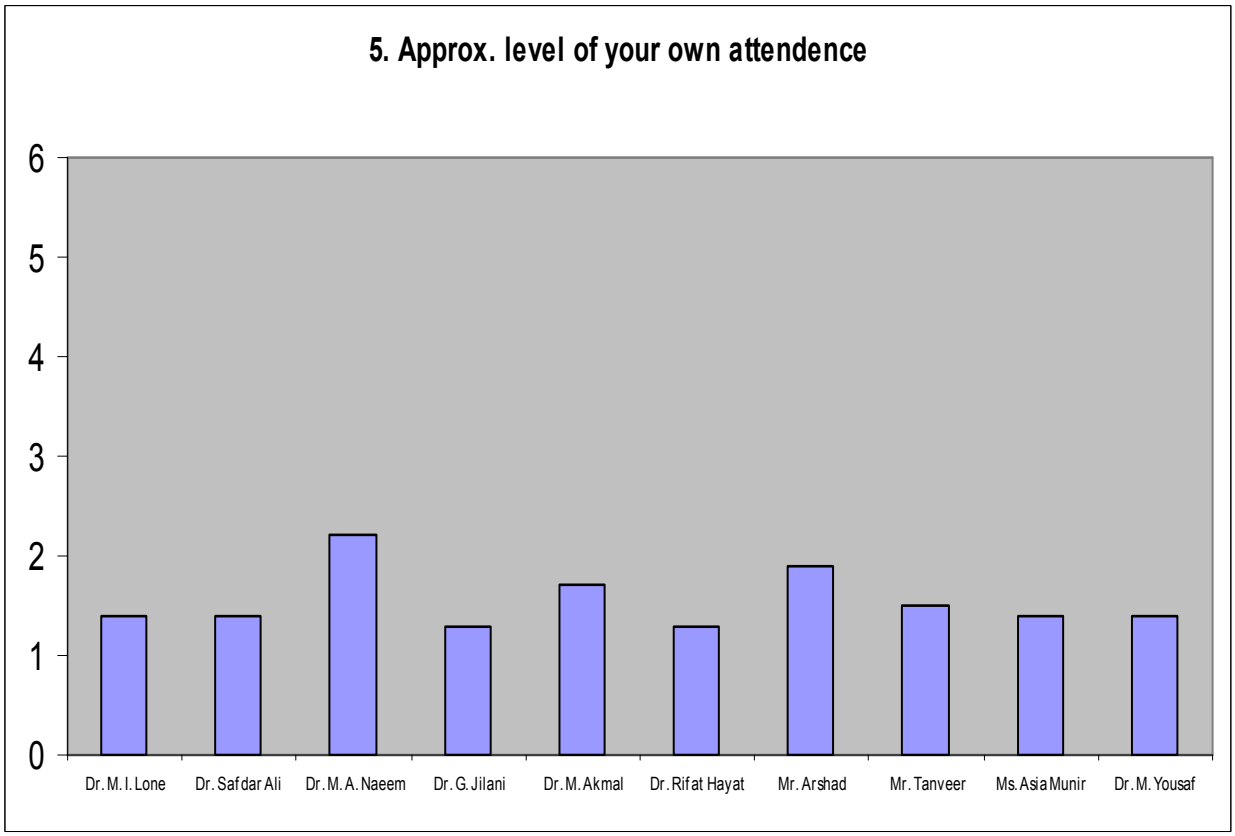
1. Prof Dr. Muhammad Iqbal Lone
2. Prof Dr. safdar Ali
3. Dr. Muhammad Azhar Naeem
4. Dr. Ghulam Jillani
5. Dr. Muhammad Akmal
6. Dr. Rifat Hayat
7. Mr. Arshad Nawaz Ch
8. Mr. Tanveer Iqbal
9. Miss Aisa Munir
10. Dr. Muhammad Yousaf

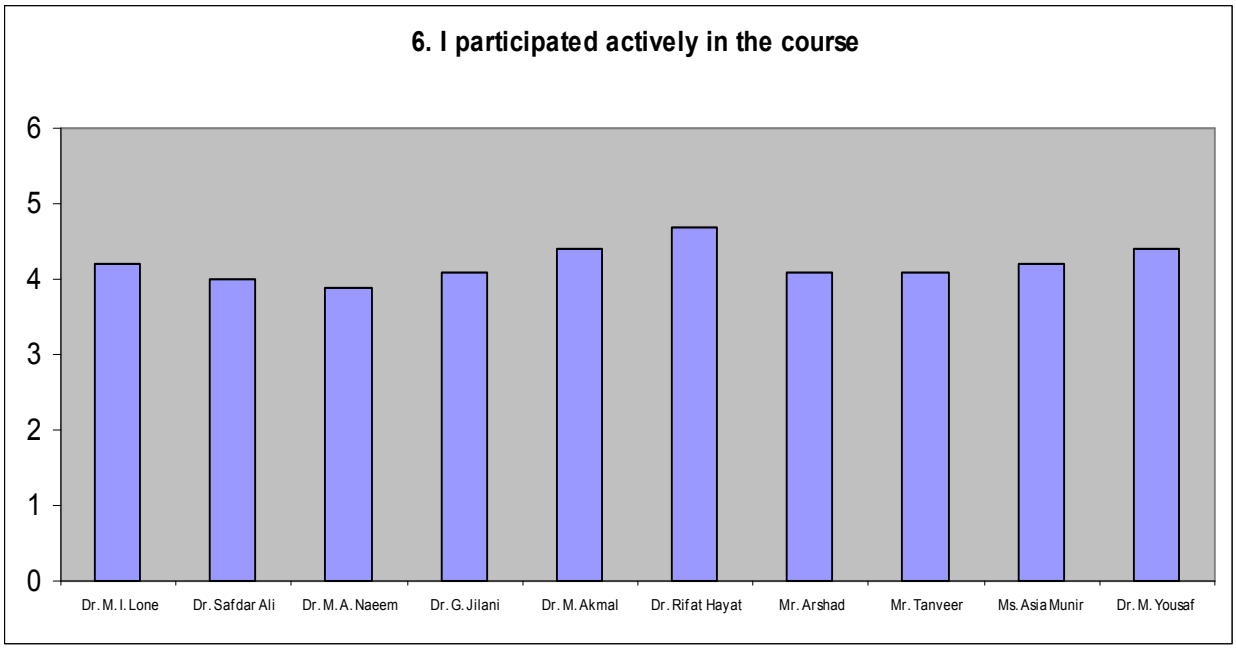
STUDENT COURSE EVALUATION

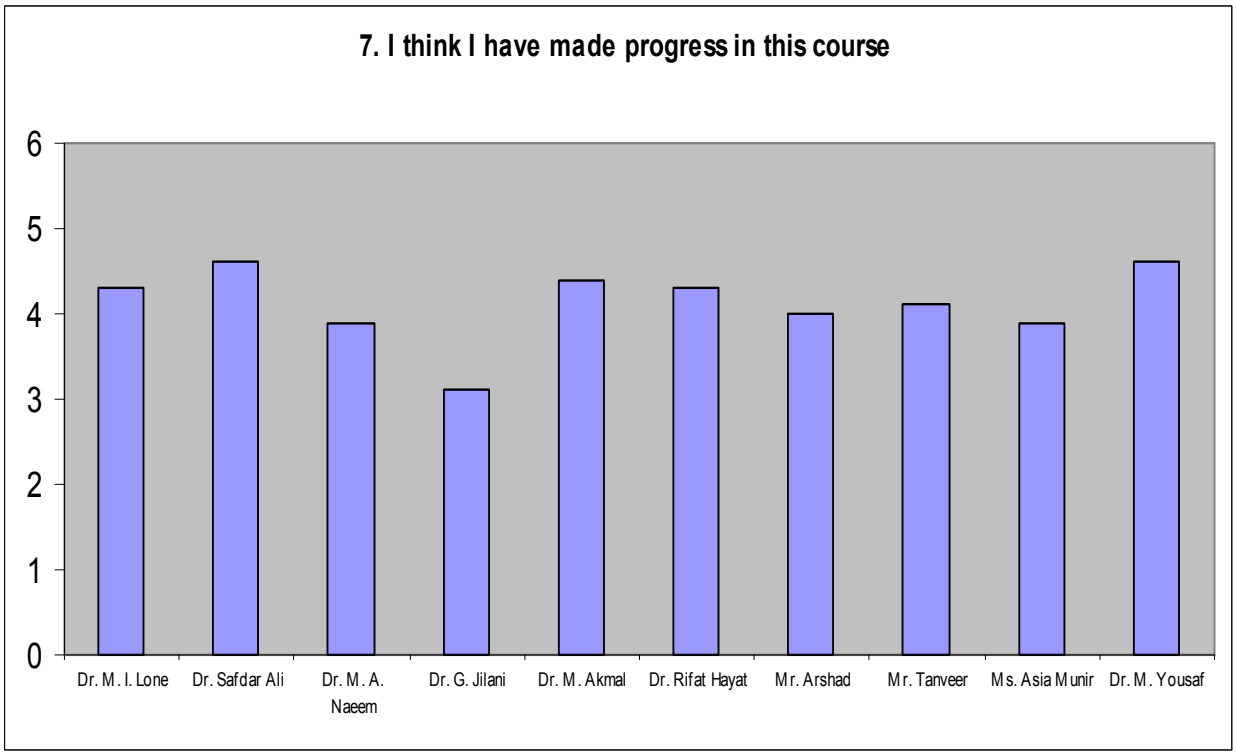


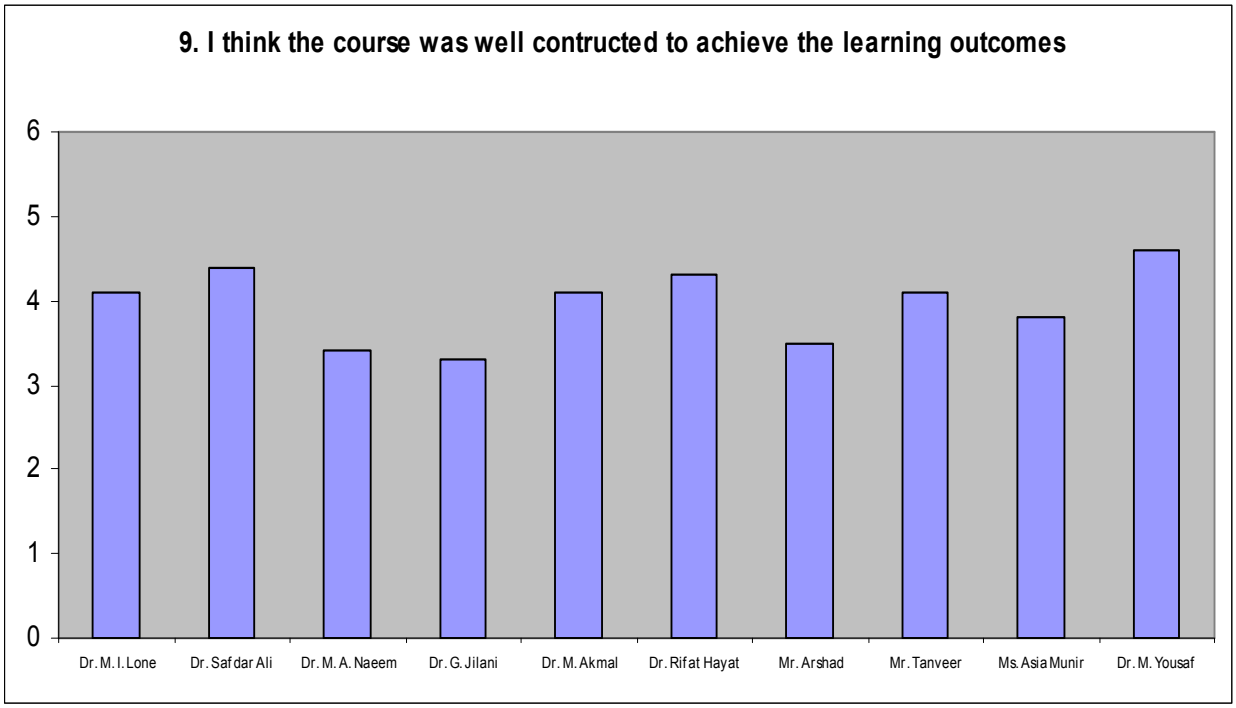


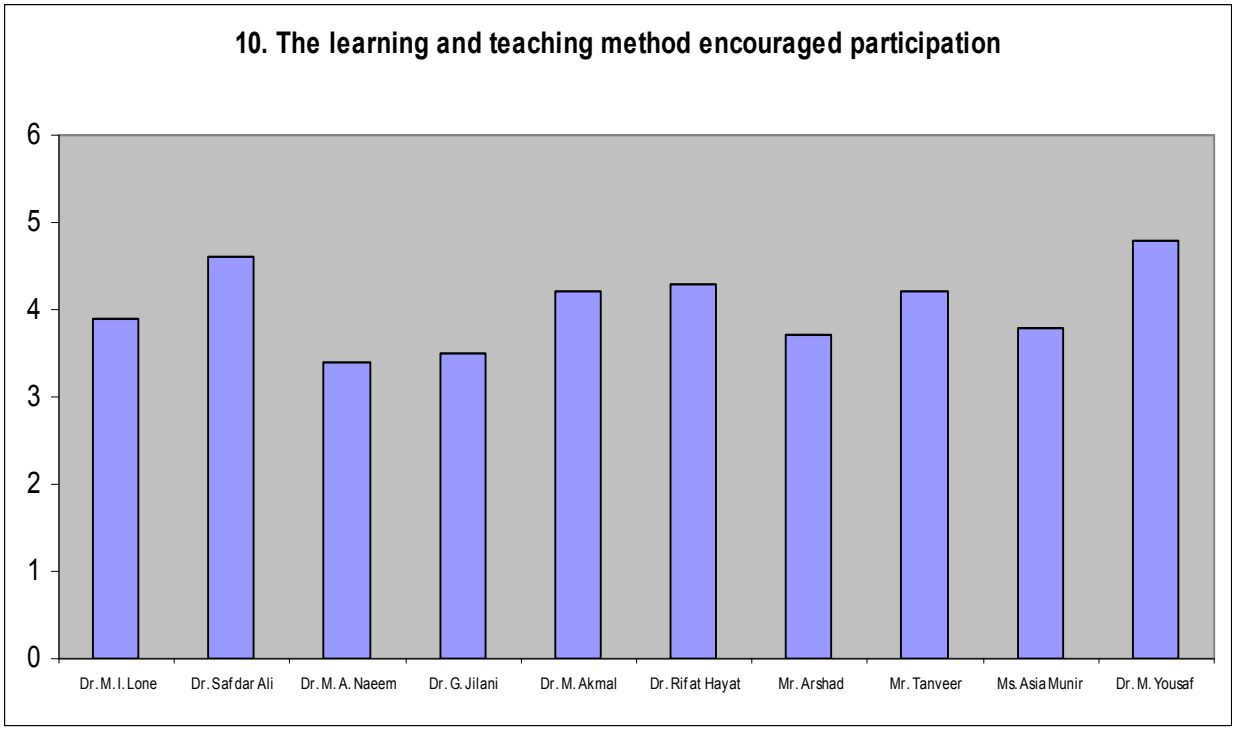

3. The course was well organized
6
5
4
3
2
1
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir

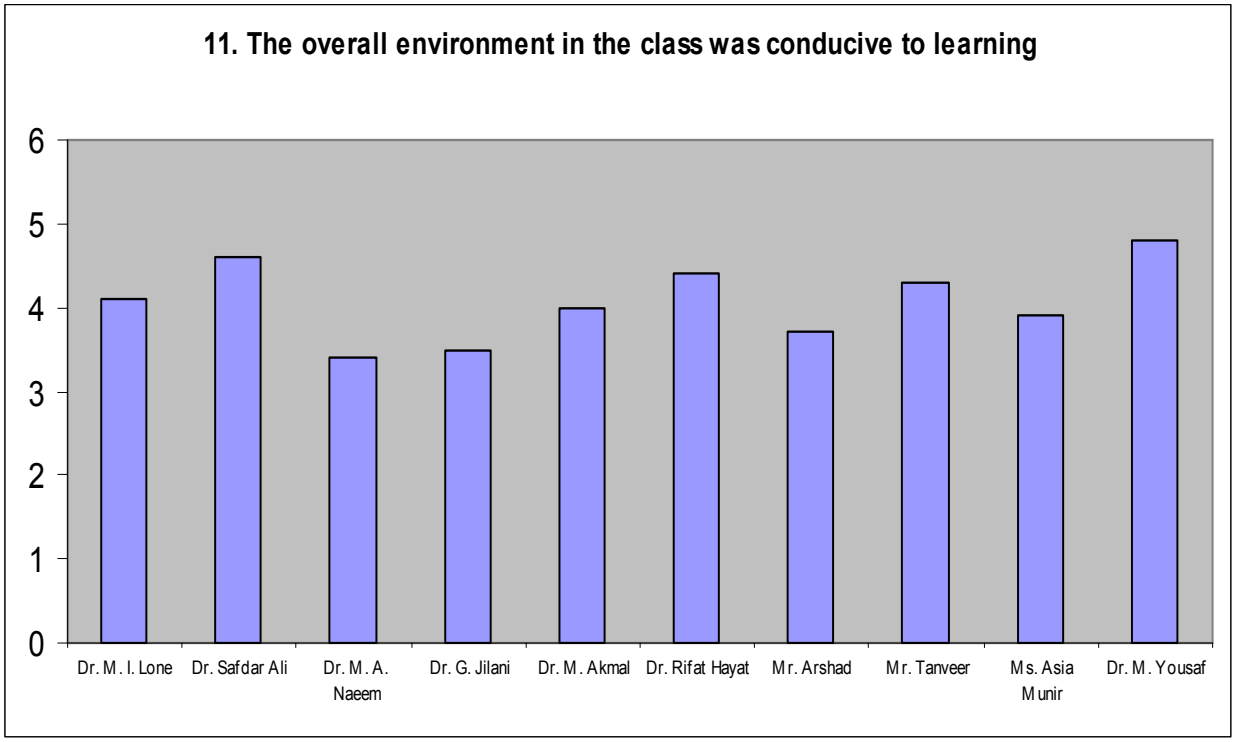

5. Approx. level of your own attendence
6
5
4
3
2
1
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf

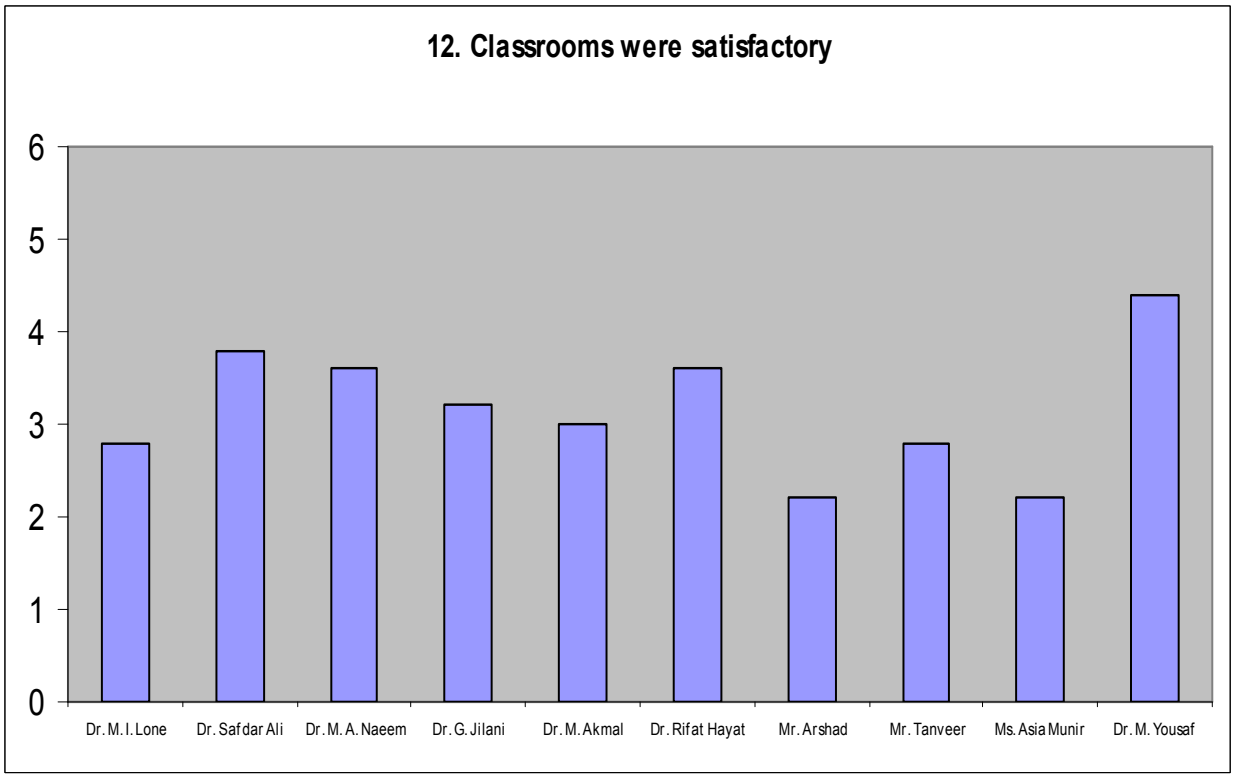

6. I participated actively in the course
6
5
4
3
2
1
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf

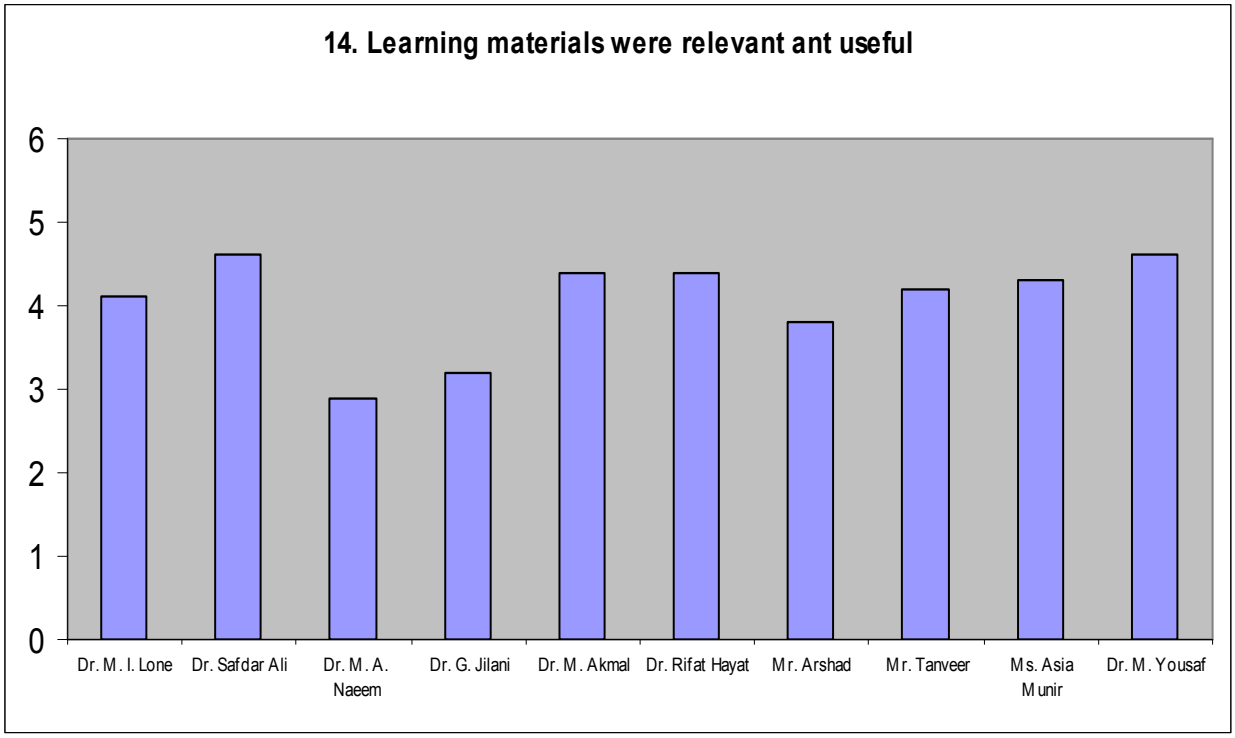

7. I think I have made progress in this course
6
5
4
3
2
1
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


9. I think the course was well contructed to achieve the learning outcomes
6
5
4
3
2
1
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


10. The learning and teaching method encouraged participation
6
5
4
3
2
1
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


11. The overall environment in the class was conducive to learning
6
5
4
3
2
1
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


12. Classrooms were satisfactory
6
5
4
3
2
1
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


14. Learning materials were relevant ant useful
6
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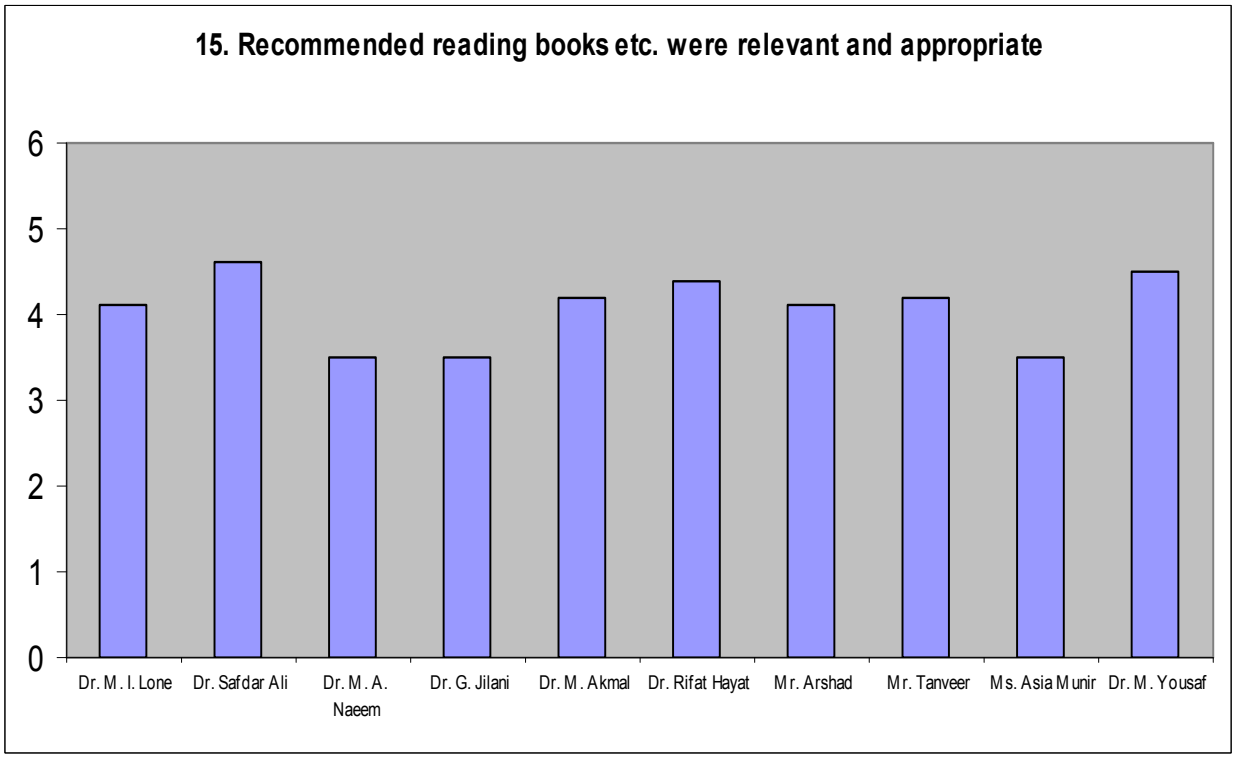
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


15. Recommended reading books etc. were relevant and appropriate
6
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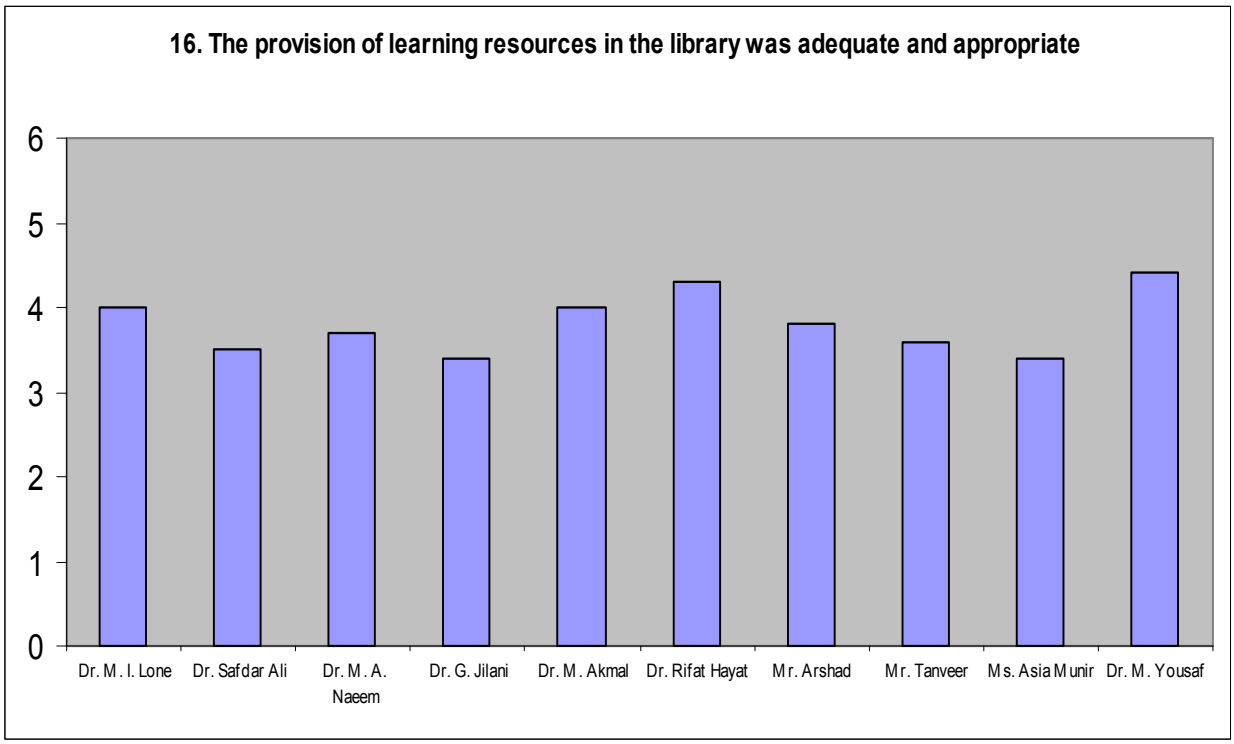
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


16. The provision of learning resources in the library was adequate and appropriate
6
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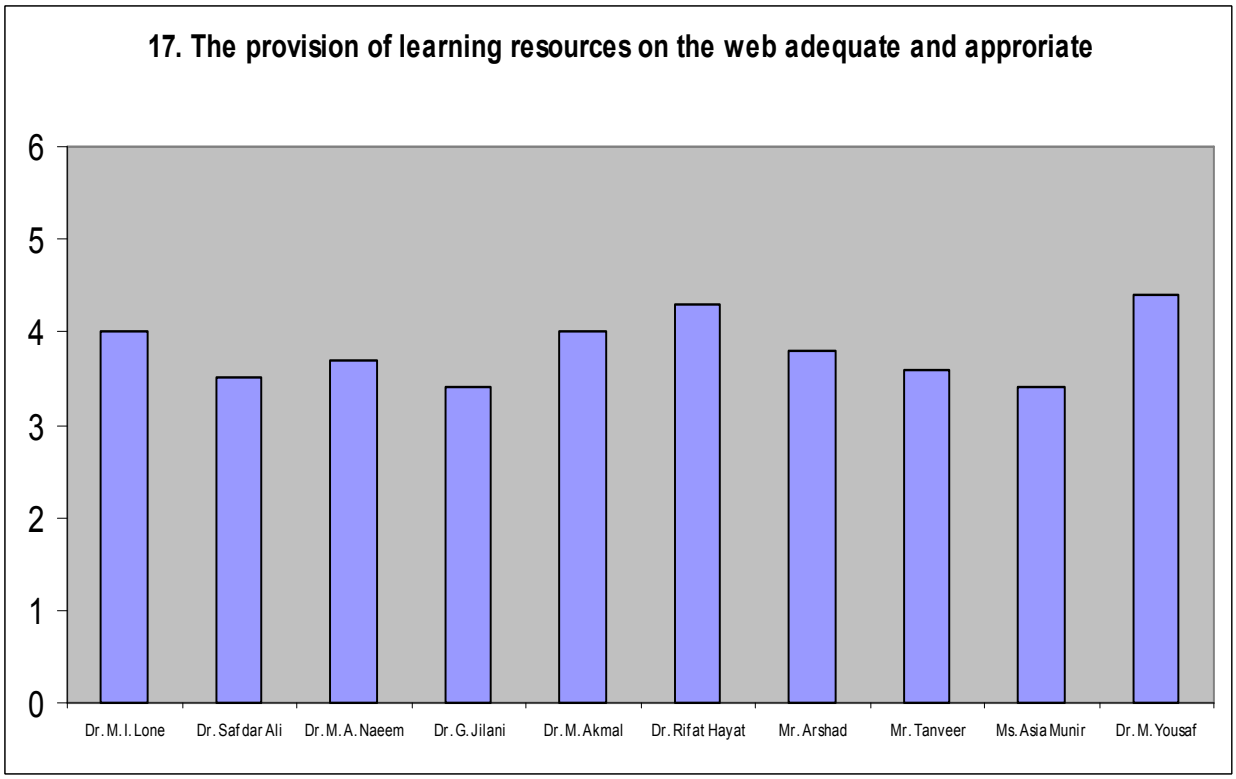
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


17. The provision of learning resources on the web adequate and approriate
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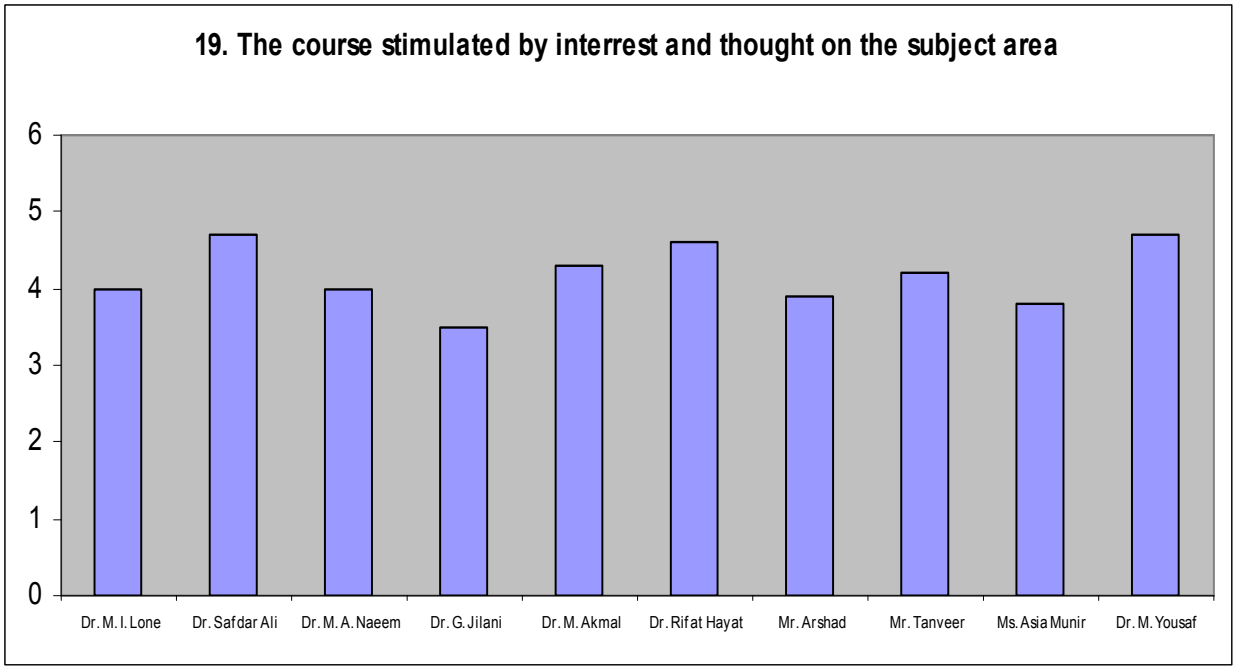
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


19. The course stimulated by interrest and thought on the subject area
6
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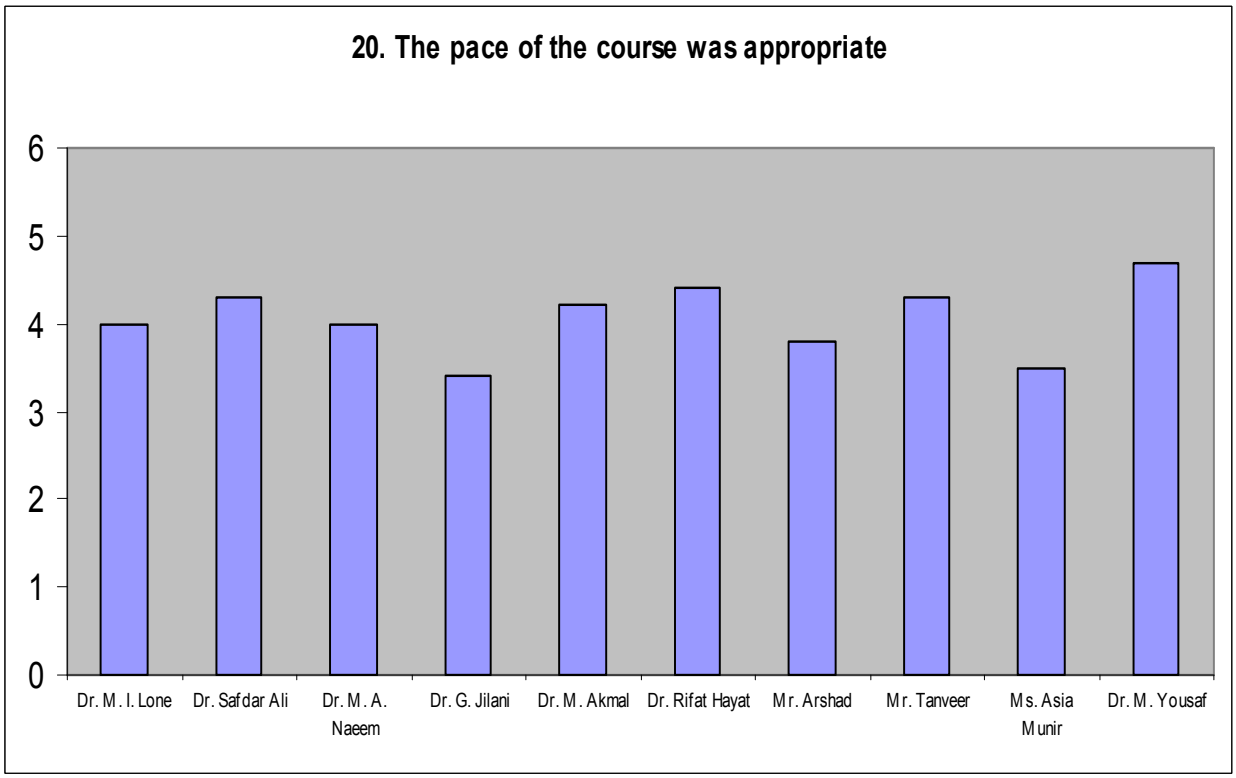
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


20. The pace of the course was appropriate
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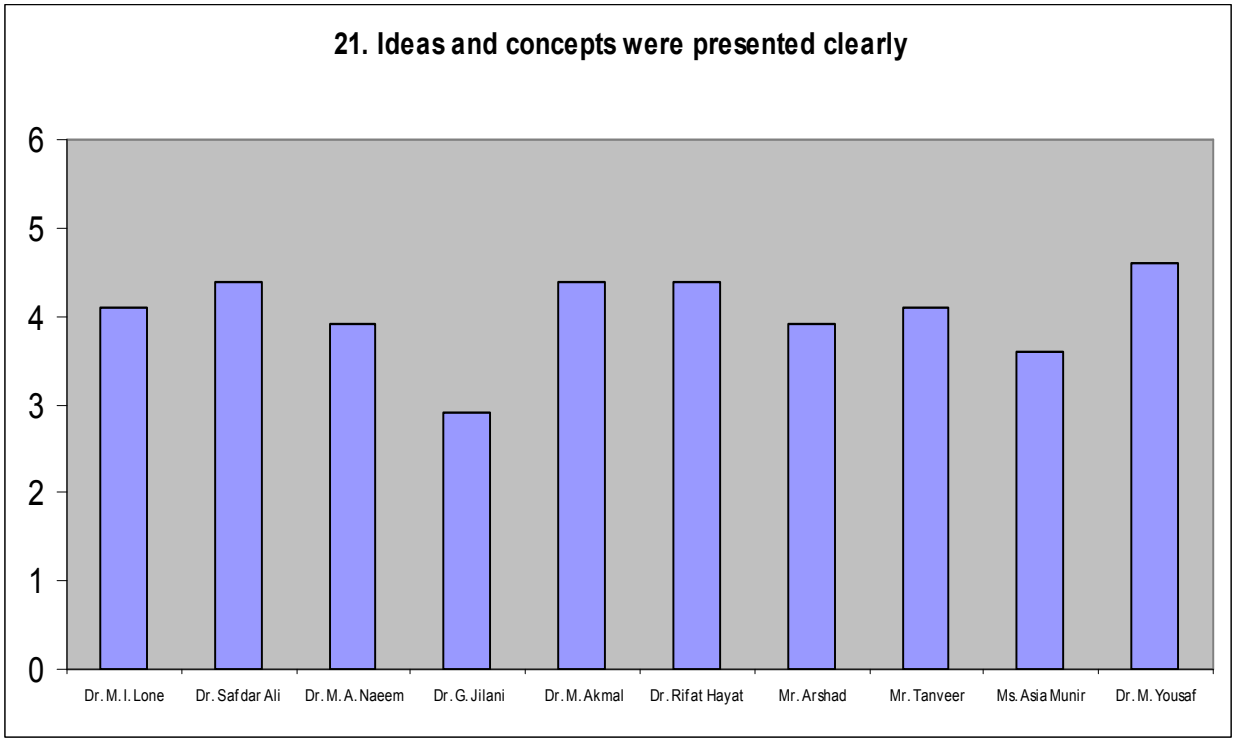
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


21. Ideas and concepts were presented clearly
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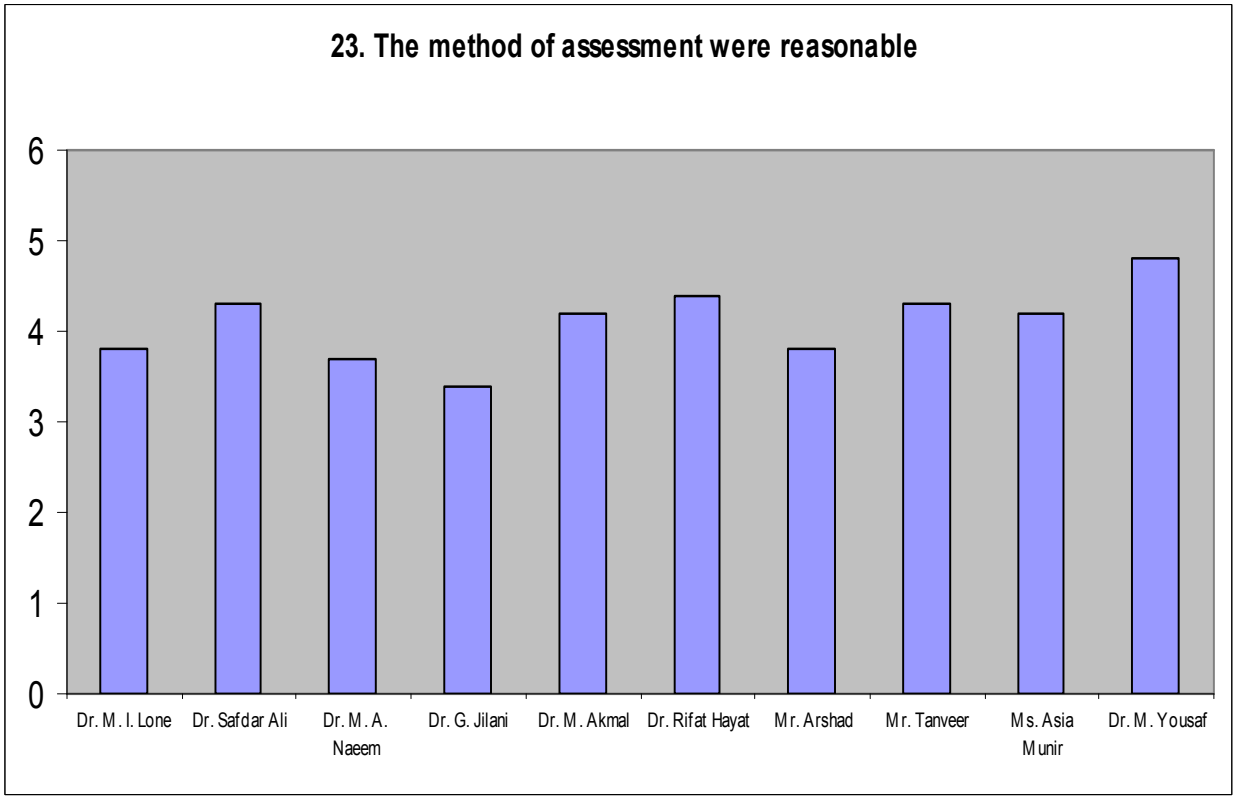
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


23. The method of assessment were reasonable
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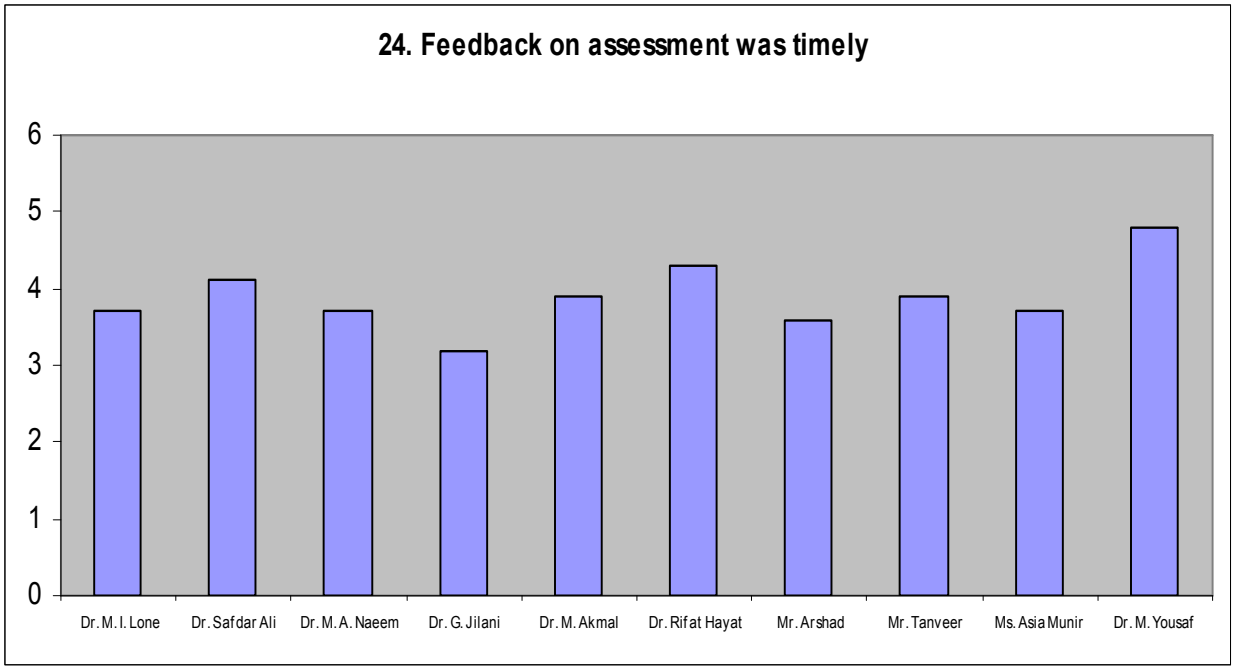
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


24. Feedback on assessment was timely
6
5
4
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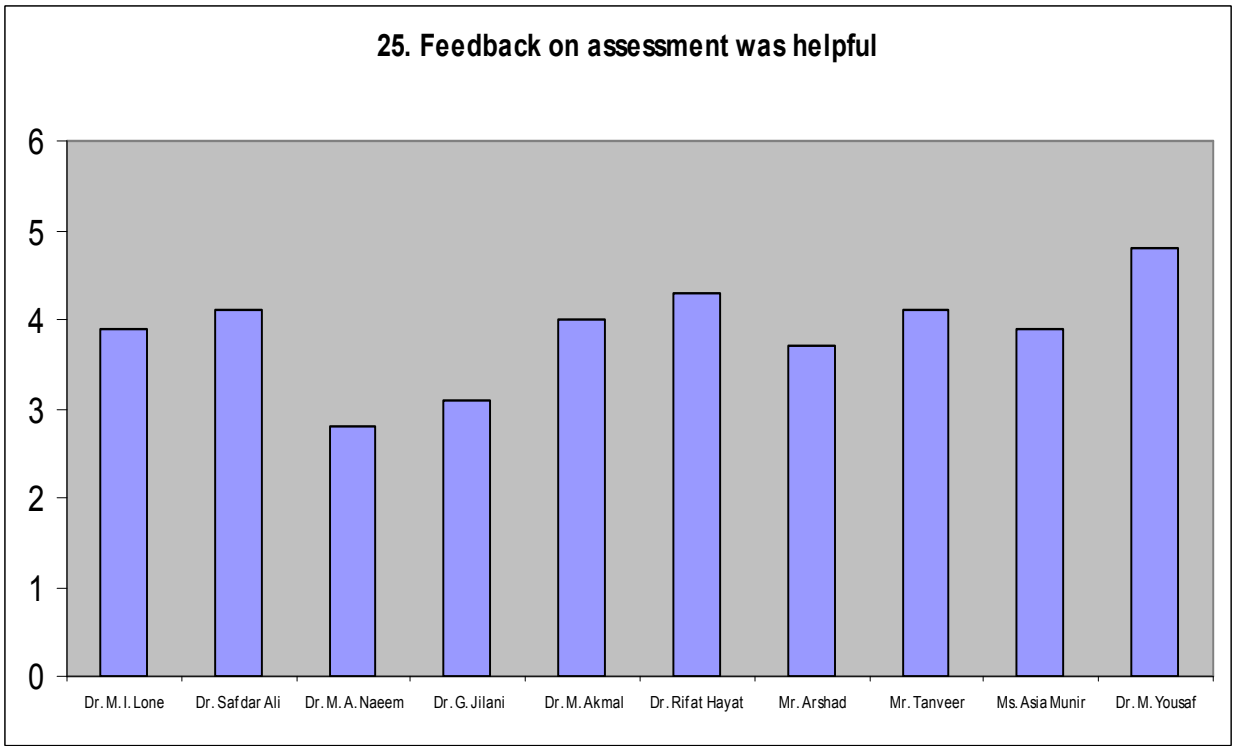
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


25. Feedback on assessment was helpful
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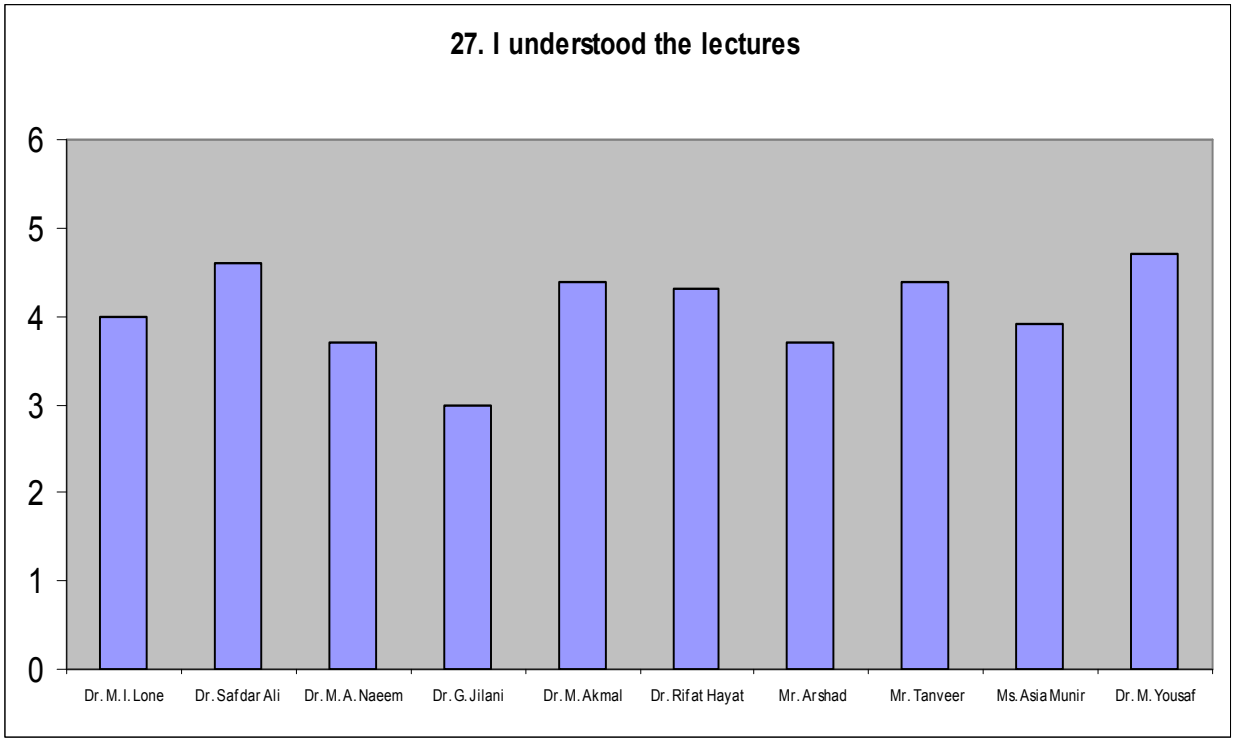
5
4
3
2
1
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


27. I understood the lectures
6
5
4
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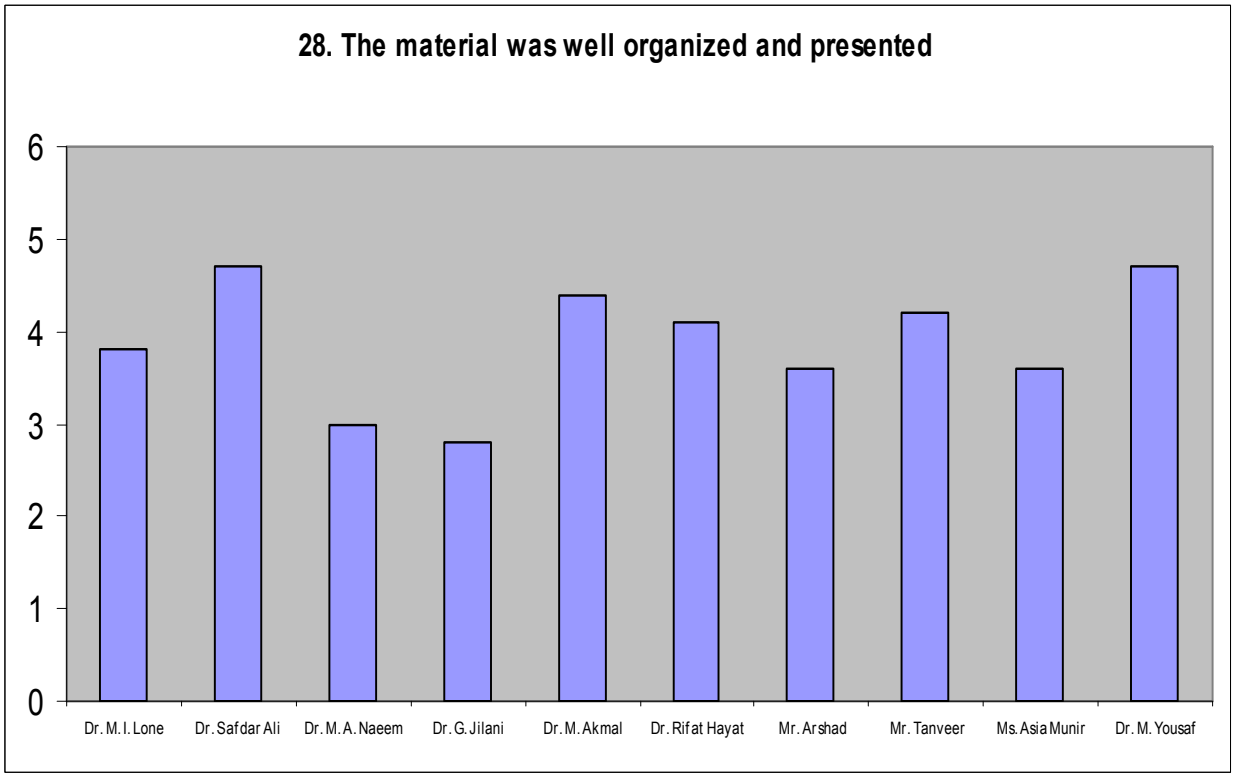
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


28. The material was well organized and presented
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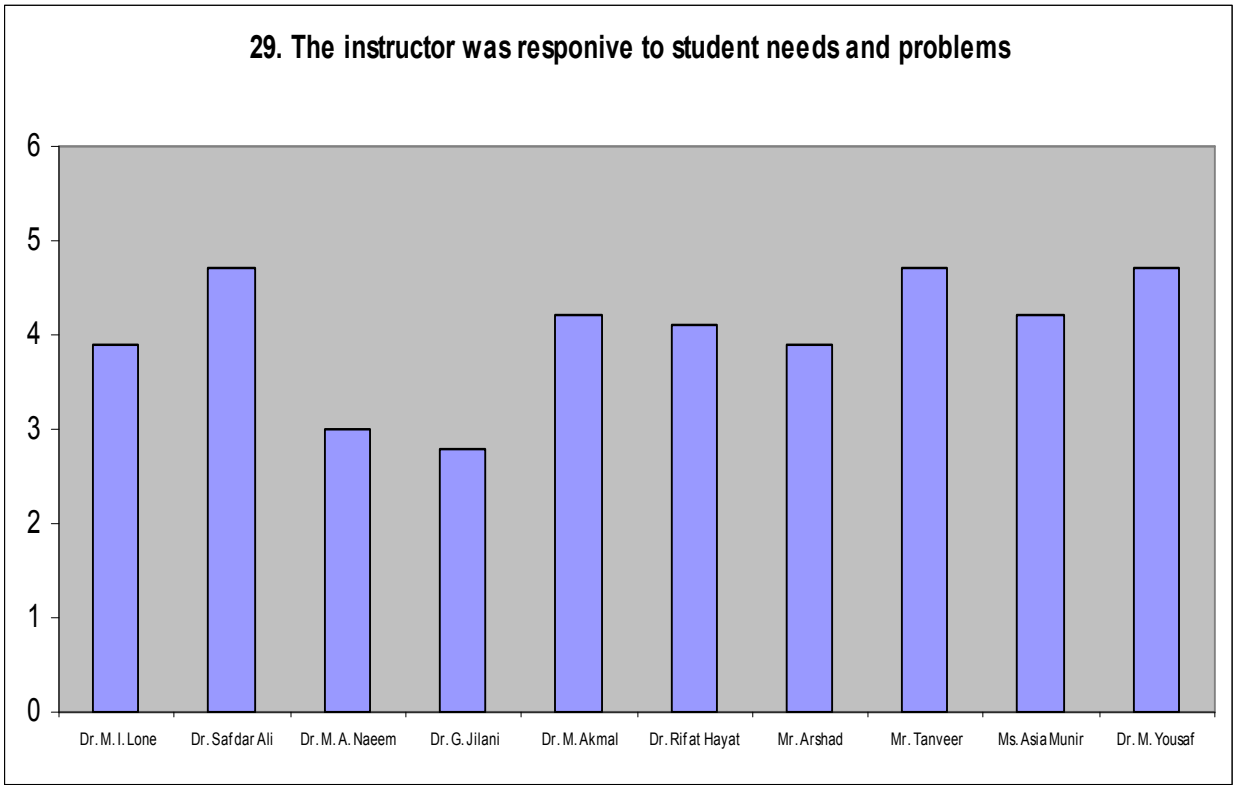
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


29. The instructor was responive to student needs and problems
6
5
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3
2
1
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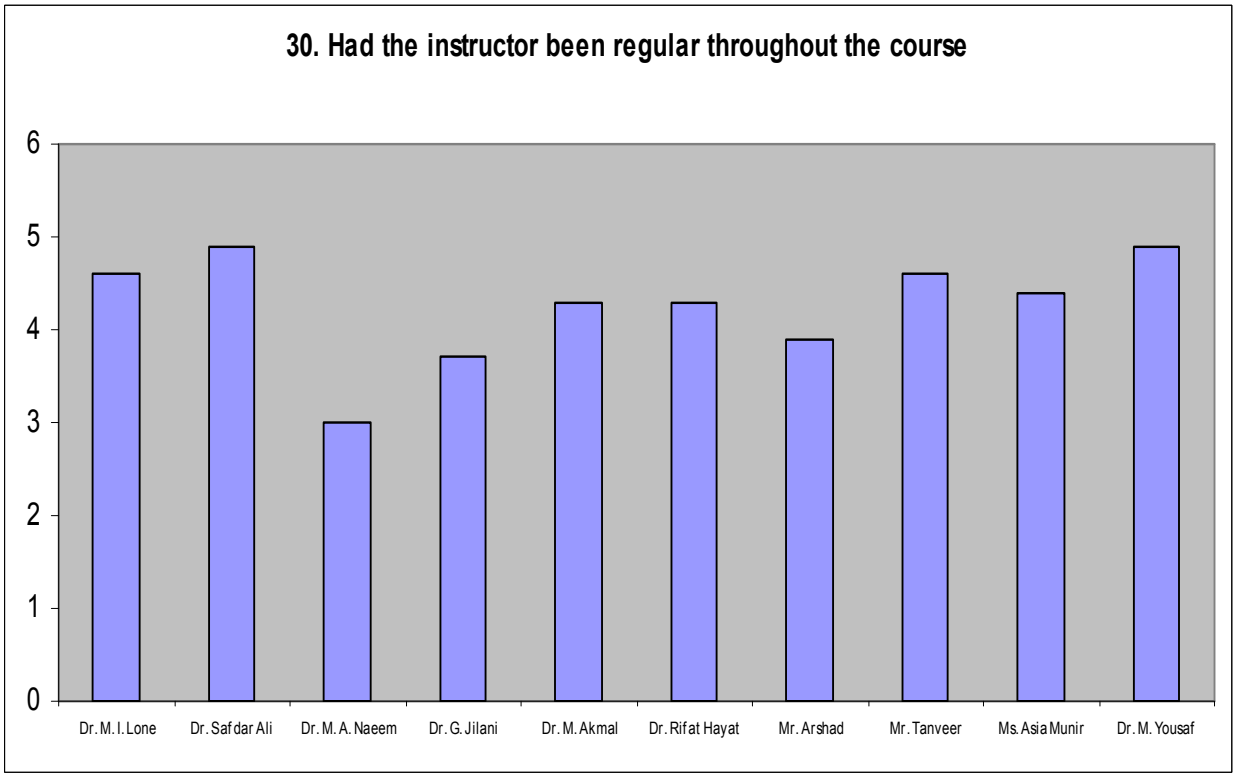
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


30. Had the instructor been regular throughout the course
6
5
4
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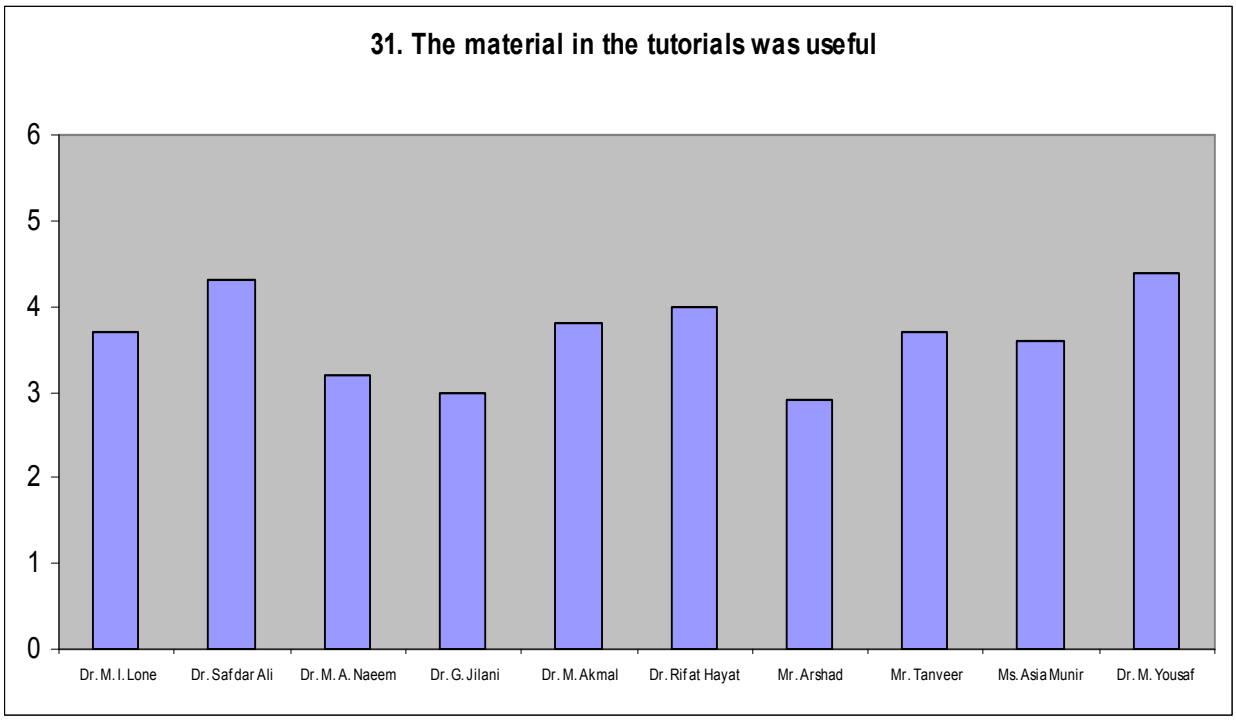
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


31. The material in the tutorials was useful
6
5
4
3
2
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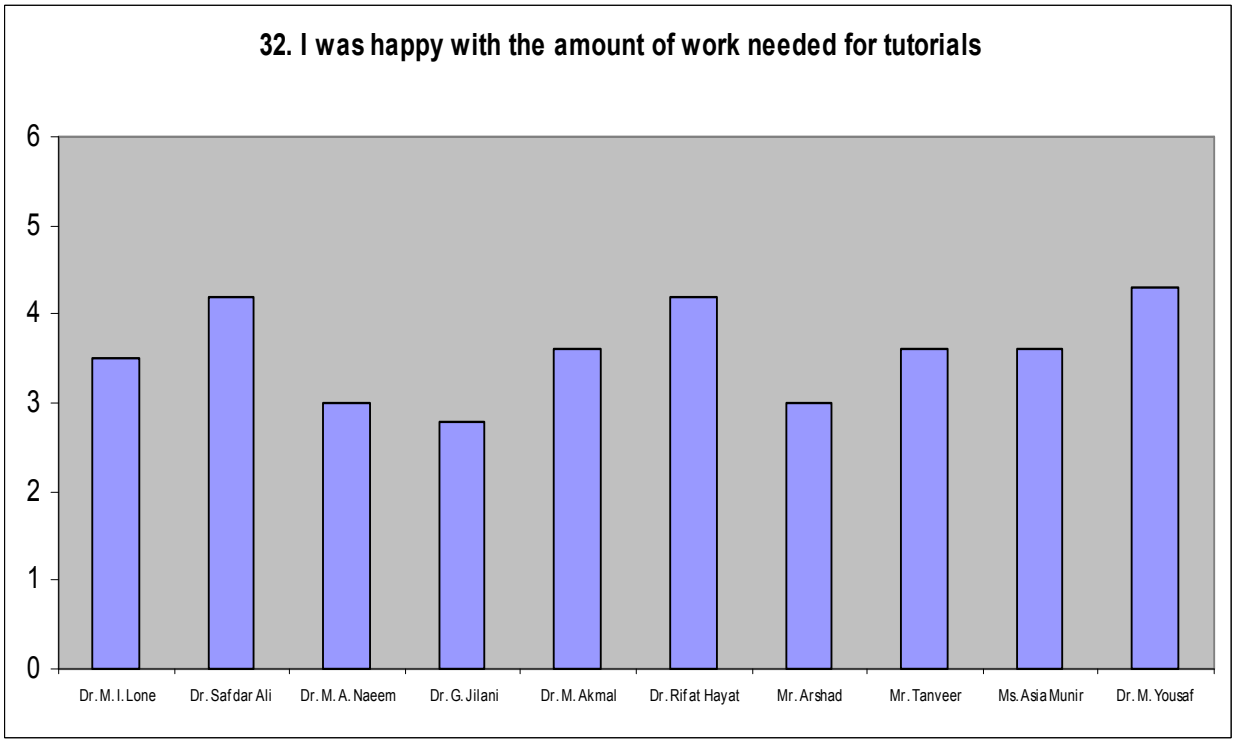
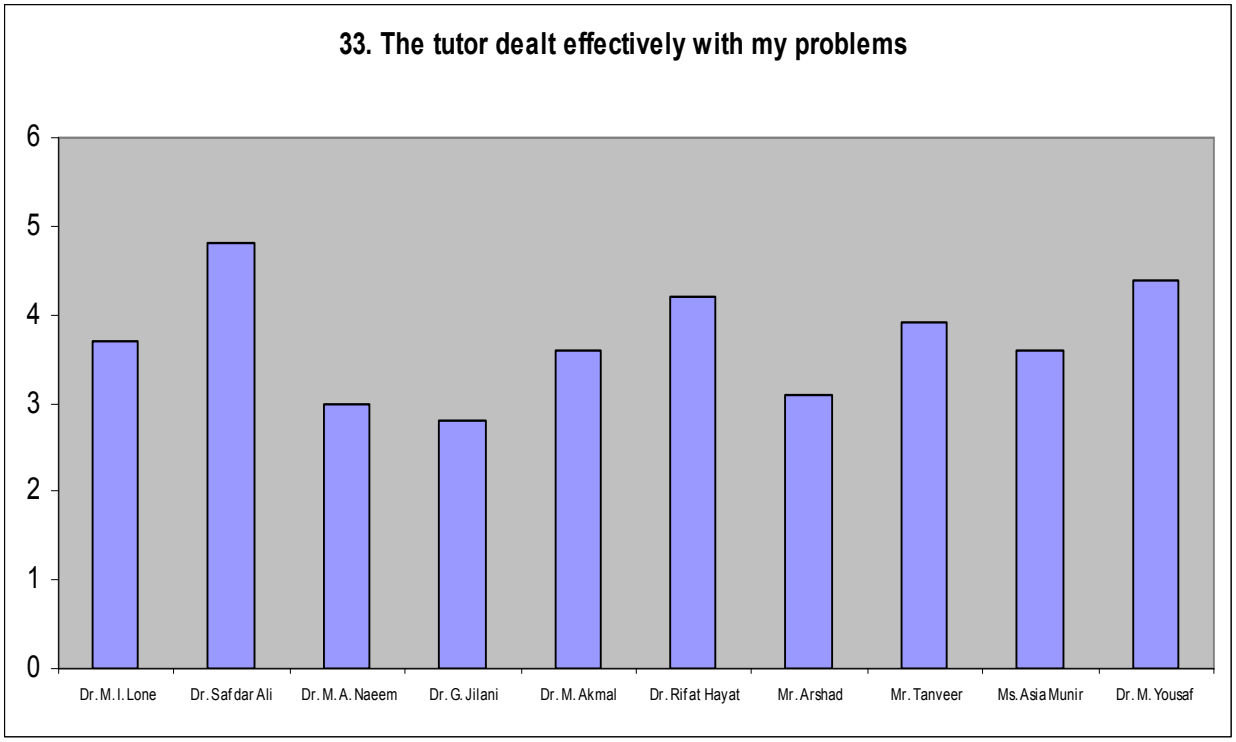
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


32. I was happy with the amount of work needed for tutorials
6
5
4
3
2
1
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


33. The tutor dealt effectively with my problems
6
5
4
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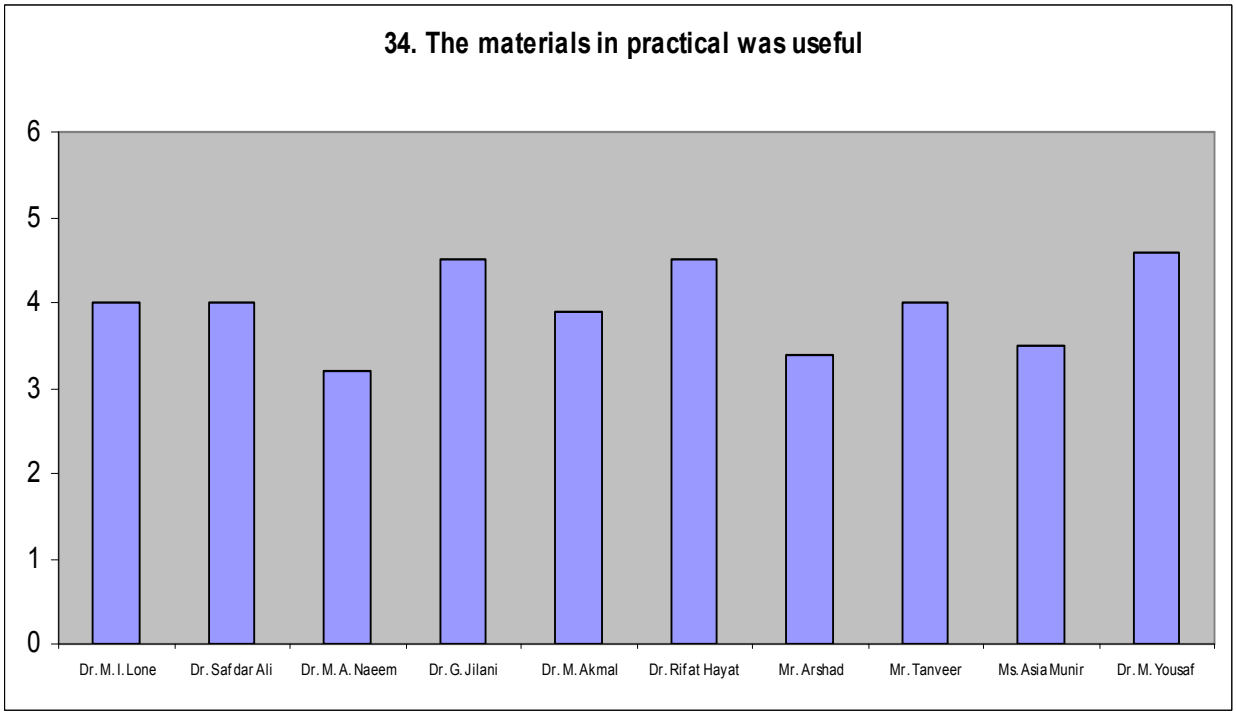
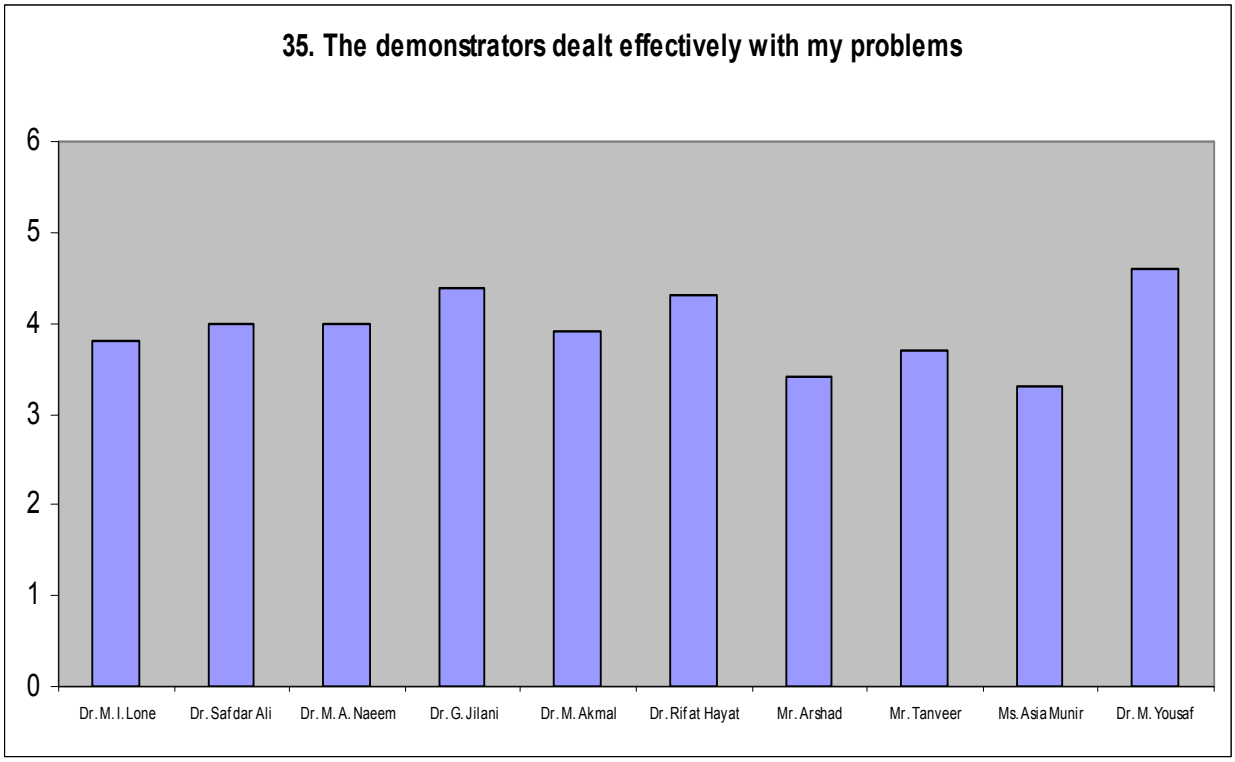
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


34. The materials in practical was useful
6
5
4
3
2
1
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf


35. The demonstrators dealt effectively with my problems
6
5
4
3
2
1
0
Dr. M. I. Lone
Dr. Safdar Ali
Dr. M. A. Naeem
Dr. G. Jilani
Dr. M. Akmal
Dr. Rifat Hayat
Mr. Arshad
Mr. Tanveer
Ms. Asia Munir
Dr. M. Yousaf

Program Outcomes:

Skills and Capabilities Reflected in Performance as Plant Pathologists:

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

Strength of the Department:

The main strength of the department is the availability of highly qualified teachers, 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 but they lack knowledge of latest and modern molecular approaches. They have implemented national research projects and are highly conscious of the problems to be taken by the post-graduate students. Two National Professor from Higher Education Commission (HEC) specialized in their subjects are currently in action.

Weakness Identified in the Program:

Advanced teaching and research is being handicapped due to lack of important equipment as ELISA Reader, Mass Spectrophotometer, NMR, PCR equipment and ultra-centrifuge for post-graduate students. Latest literature and reviews are hardly available. There is a need for short term foreign training to faculty members. Green-house and animal-house facilities are lacking. Lecture rooms, post-graduate laboratories and survey / field diagnostic aids are also lacking.

Major Future Improvement Plans:

- To impart quality education in Soil Science & SWC 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 Soil Science & SWC to meet future challenges for sustainable agriculture leading to self sufficiency in food

- To emphasize problem oriented research on specific and serious 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.

TABLE-4: QUANTITATIVE ASSESSMENT OF THE DEPARTMENT

Sr. #	Particular	No.	Remarks
	B. Sc. (Hons.) Soil Science	190	
	M. Sc. (Hons.) Soil Science	73	
	Ph. D. (Soil Science)	5	

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).

TABLE- 5: PRESENT PERFORMANCE MEASURES FOR RESEARCH ACTIVITIES

Name	Journal Publications (National & International)	Projects
Dr. M. Iqbal Lone, Professor	41	1
Dr. Safdar Ali, Professor	49	9
Dr. M. Azhar Naeem, Associate Professor	25	-
Dr. Ghulam Jilani, Associate Professor	53	3
Dr. Khalid Saifullah, Associate Professor	27	1
Dr. Muhammad Akmal, Assistant Professor	7	-
Dr. Tariq Siddique, Assistant Professor	12	2
Mr. Arshad Nawaz, Lecturer	6	-
Mr. Tanvir Iqbal, Lecturer	2	-
Dr. Rifat Hayat, Lecturer	10	1
Dr. M. Yousaf, HEC Eminent Scholar	40	1

The Department is providing following community Services:

- Organization of farmers' day (local Pothwar area).
- Advisory services to the farmers as and when desired.
- Supervision of students on internship in various organizations in the Punjab.

Faculty Satisfaction Regarding the Administrative Services:

- The department maintains a ratio of 4:1 for the academic (technical) and administrative non-technical staff which fulfils this standard set by the HEC.
- Administrative meetings (departmental, university, academic council, and syndicate) are attended as and when required. Generally two meetings of academic council are held in a year. Board of studies of the department meets quarterly.
- Proper records of individual students, their theses etc. are maintained.

3. CURRICULUM DESIGN AND ORGANIZATION

Degree Title: B.Sc. (Hons) Agriculture - Soil Science & SWC

Intent: All the courses for degree program were developed by a committee constituted by the Higher Education Commission, Pakistan. The committee consists of experts and learned professors, subject-matter specialists from other universities and research organization from Pakistan. When and if needed, curriculum for the Department of Soil Science & SWC 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 chairman 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. The semester is of 18 weeks.

Degree Plan:

Presently three degree programs are organized by the department: B.Sc. (Hons) Agric. Majoring in Soil Science & SWC**:** 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 the following formula:

Matric	10%
Intermediate	50%
Entry test	40%

Degree Requirements:

As a whole a student has to study 149 credit hours. In the 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 other four semesters courses of major specialized subject are taught including some other courses of other departments (Detail is given in Table-6). 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 for obtaining the degree in 2.50.To remain on the roll of the university a student shall be required to maintain the following minimum GPA/CGPA in each semester.

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

Examination & Weightage:

a) THEORY

In theory paper, student's 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 shall be deemed to have failed in that course. In theory, weightage to each component of examination is as prescribed here under:

Mid Examination	30%
Assignments	10%
Final Examination	60%

b) PRACTICAL

For practical examination (if applicable) 100% weightage is given to practical 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.

TABLE-6: 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 Soil Science & SWC	3(2-2)
STAT-402	Introduction to Statistics	3(3-0)

Fifth semester

Course No.	Course title	Credit hours
SS-501	Physical Properties of Soils	3(2-2)
SS-503	Chemical Properties of Soils	3(2-2)
SS-505	Instrumentation and Laboratory Techniques	3(0-6)
SS-507	Soil Genesis and Morphology	3(2-2)
SS-509	Introduction to Soil Classification	3(2-2)
AEN-501	Farm Mechanization	2(1-2)
AGRO-501	Arid Zone Agriculture	2(2-0)
SOC-501	Rural Postral Sociology	2(2-0)

Sixth semester

Course No.	Course title	Credit hours
SS-502	Salt-affected Soils & Their Management	3(2-2)
SS-504	Soil Survey & Land Evaluation	4(3-2)
SS-506	Soil and Water Conservation	3(2-2)
SS-508	Instrumentation and Laboratory Techniques	2(0-4)
SS-510	Wind Erosion and its Control	2(2-0)
SS-512	Introduction to Soil Microbiology	3(2-2)
AEN-502	Conservation Engineering & Water Resources Development	2(1-2)

Seventh semester

Course No.	Course title	Credit hours
SS-601	Biochemistry of Soil Processes	3(2-2)
SS-603	Soil and Water Pollution	3(2-2)
SS-605	Methods of Soil and Plant Analysis	4(2-4)
SS-607	Nuclear Techniques in Soil Research	3(2-2)
SS-609	Project Planning & Scientific Writing	2(1-2)
STAT-601	Experimental Designs	2(1-2)
MGT-601	Introduction to Agri. Business Management	2(2-0)

Eighth semester

Course No.	Course Title	Credit Hours
SS-602	Internship Including Report writing and Presentation	20(0-40)

Detailed course contents of undergraduate schemes of studies are given in annexure-II

M.Sc. (Hons) Agric. Soil Science

A minimum of 2 years / four semesters duration program after B.Sc. (Hons) Agriculture majoring Soil Science & SWC.

Pre-requisites

A candidate seeking admission to the course must have passed the B.Sc. (Hons) Soil Science & SWC Degree with 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 the 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. (Soil Science)

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 the following formula

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

Degree requirements

The program contents meet the program objectives as highlighted and provided by the 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 technically advanced countries.

TABLE-7: POST GRADUATE COURSES (M. SC. (HONS) AGRI. / Ph. D. AGRI)

Course No.	Course title	Credit hours
SS-701	Instrumental Analysis	3(2-2)
SS-702	Soil Fertility Management in Rainfed Areas	3(2-2)
SS-703	Soil Management & Plant Growth	4(3-2)
SS-704	Fertilizer Technology and Marketing	3(3-0)
SS-705	Soil Classification	3(2-2)
SS-706	Soil Mineralogy	4(3-2)
SS-707	Plant growth and Soil Water Relation	3(2-2)
SS-708	Nutrient Diagnostic Techniques	2(1-2)
SS-709	Fertilizer Technology and Marketing	4(3-2)
SS-710	Soil Salinity and Water Logging	3(3-0)
SS-711	Soil Conditions and Plant Growth	3(3-0)
SS-712	Heavy Metals in Soils and Plants	3(3-0)
SS-713	Advanced Soil Physics	3(3-0)
SS-714	Advanced Soil Fertility	3(2-2)
SS-715	Advanced Soil Microbiology	4(3-2)
SS-716	Advance Soil Chemistry	3(3-0)
SS-717	Edaphology	3(2-2)
SS-719	Special Problem	1(1-0)
SS-720	Seminar	1(1-0)

Detailed course contents of Post-graduate schemes of studies are given in annexure-II.

Standard 2.1: Assessment of the Soil Science & SWC Curriculum

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

TABLE-8: COURSES VS PROGRAM OUTCOME

Courses/Group	Outcome				
	1	2	3	4	5
Soil Fertility and Microbiology	☆☆☆	☆☆☆☆	☆☆☆	☆☆☆	☆☆
Soil Chemistry and Microbiology	☆☆☆	☆☆☆☆	☆☆☆	☆☆☆	☆☆
Soil Physics, Soil and Water Conservation	☆☆☆☆	☆☆☆☆	☆☆☆	☆☆☆	☆☆
Analysis and Instrumental Techniques	☆☆	☆☆☆☆	☆☆☆	☆☆☆	☆☆

☆ = Relevant

☆☆ = Relevant & satisfactory

☆☆☆ = Very relevant & satisfactory

☆☆☆☆ = Highly relevant & highly satisfactory

- 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 discipline required for the program according to demands and requirements set by the Pakistan Higher Education Commission.

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

Elements	Course No.
Theoretical backgrounds	SS-301, SS-302, SS-501, SS-502, SS-503, SS-504, SS-505, SS-506, SS-507, SS-509, SS-510, SS-512, SS-601, SS-603, SS-605, SS-607, SS-609, SS-701, SS-702, SS-703, SS-704, SS-705, SS-706, SS-707, SS-708, SS-709, SS-710, SS-711, SS-712, SS-713, SS-714, SS-715, SS-716, SS-717,
Problem analysis	SS-301, SS-501, SS-502, SS-503, SS-504, SS-505, SS-507, SS-508, SS-509, SS-512, SS-601, SS-602, SS-603, SS-605, SS-607, SS-609, SS-701, SS-702, SS-703, SS-704, SS-705, SS-706, SS-707, SS-708, SS-711, SS-712, SS-714, SS-715, SS-717, SS-719, SS-720,
Solution design	SS-301, SS-501, SS-502, SS-503, SS-504, SS-505, SS-507, SS-508, SS-509, SS-512, SS-601, SS602, SS-603, SS-605, SS-607, SS-609, SS-701, SS-702, SS-703, SS-704, SS-705, SS-706, SS-707, SS-708, SS-710, SS-711, SS-712, SS-714, SS-715, SS-717, SS-719, SS-720,

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 "STAT-402 Introduction to Statistics 3 Cr. hrs. and STAT-601 Experimental Design 2 Cr. hrs (total 5 credit hours) based on computer practical usage are 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: Enhancing Oral and Written Communication Skills of the students

- A number of courses including "ENG-302 Communication Skills 3 Cr. hrs." "SS-602 Internship Including Report writing and Presentation 20 Cr. hrs." "SS-609 Project Planning & Scientific Writing 2 Cr. hrs." each are compulsory at the graduate level and "SS-720 two Seminars 1 Cr. hr. each" are part of Post-graduate level studies.
- Assignments are given to BSC (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.

4: LABORATORIES AND COMPUTER FACILITIES

There are 5 laboratories in the department. The facilities and shortcomings of these laboratories are listed as under:

Facilities:

There are 5 laboratories in the department. All the laboratories are situated in Block **D** in the main campus at ground floor. The laboratories are used for practical demonstration to undergraduate students and research work of graduate and Ph. D. students. The research projects of the department also use the same laboratories.

Shortcomings

The laboratories need serious renovation to be proper and arranged work place. The laboratories are used as class rooms which disturbs the usual laboratory activities. Further, the department is in immediate need of computer lab. So that the students can carry out data analysis, thesis write up, the review of literature and preparation of publications, etc.

The safety measures in the laboratories are not available in terms of fire extinguishers and first aid kit, etc.

Standard 3-1: Laboratory Manuals:

The manuals used in the laboratories of the department are internationally accepted manuals, e.g. ICARDA Manual. A specific manual for nitrogen fixation assessment and other soil and plant analysis namely, **"Manual Method for Nitrogen Fixation Assessment"** is being prepared by the professors of the department.

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

There are only three Lab. Attendants for all the five labs. However, the Lab. Attendants have not relevant knowledge. On the other hand, the Labs. have highly sophisticated equipment therefore this is imperative to have Lab. Technician in the department.

INSTITUTIONAL FACILITIES:

The departmental library has 350 books relevant to the programs. However, there is no specific room and sitting arrangement for use of these books.

INSTITUTIONAL SUPPORT

Unfortunately, this aspect is very weak. Due to unavailability of class rooms, classes are taken in the labs. Faculty offices are inadequate and therefore two or three teachers have one office room. Space limitation is the major constraint in the development and strengthening of discipline.

Standard 3-3: Computing Infrastructure and Facilities

- **Computing facilities support*:*** Not available to all the post graduate students.
- **Shortcoming in computing infrastructure:** Computers with internet facilities are available to all faculty members and postgraduate students.
- **Safety Arrangements:** There are no proper safety arrangements and no security plan is available in case of emergency. No fire extinguishers have been installed in any laboratory. No first aid kits/facilities provided in the laboratories/department.

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.

Standard 4-1: Frequency of Courses

- Courses are taught as per criteria of HEC.
- 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: Structure of the Courses

To ensure effective interaction between students, faculty and teaching assistants, at the time of course formulation both theoretical and field/practical aspects are focused. Theoretical problems are explained and assignments are also given to the students whereas practical are carried out in the labs and field.

Field visits and study tours to various research organizations are also organized to keep them updated 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 the commencement of the 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 to the students

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

- Students are informed about the program requirement through the office of the head of the department.
- Through the personal communication of the teachers with the students.
- 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 students for extracurricular 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 Soil science society of Pakistan and Soil Science society of America
- Realizing the need for exploring job opportunities for the university graduates, Directorate of Placement Bureau has been established.

5: PROCESS CONTROL

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

Standard 5.1: Program Admission Criteria

- The process of admission is well established and followed as per rules and criteria set by HEC. For this purpose, an advertisement is published in the National News Papers by the Registrar Office.
- Admission criteria for B.Sc. (Hons) Agri. F.Sc. pre medical and pre engineering and entry test.
- Admission criteria for M.Sc. (Hons) and Ph.D. are same as mentioned in section 2.
- Admission criteria are revised every year before the announcement of admissions.

Standard 5.2: Process of Registration

- The student name, after completion of the admission process, is forwarded to the Registrar Office for proper registration in the specific program and the registration number is issued to the student.
- After the 4^{th} semester students are allotted different majors (e.g. Soil Science & SWC, Entomology) 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, they are promoted to the next semester.
- In general, the students are registered on competition bases keeping in view the academic and research standards.

Standard 5.3: Recruiting Process for Faculty

Recruitment policy of Higher Education Commission is followed by the University. 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, 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 Selection Board.

- 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 deputes them in concerned departments of the University.

Standard 5.4: Teaching and Delivery of Course Material

- To provide high quality teaching, department periodically revises the curriculum depending upon requirements, innovations and new technology.
- With the emergence of new fields, new courses are introduced, and included in the curriculum.
- Students usually buy cheap Asian editions of technology books. These are also available in the University library, where 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: Completion of Program Requirements

- The controller of examinations announces the dates of commencement of examination. After each semester, the controller office notifies the results of the students. The evaluation procedure consists of quizzes, mid and final examinations, practicals, assignments and 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 annual convocation that is held late every year.

6: FACULTY

Standard 6.1: Full Time Faculty

Professors	3
Associate Professors	3
Assistant Professors	2
Lecturers	3
HEC Eminent Scholar	1
Total:	**12**

Professors

- Dr. M. Iqbal Lone
- Dr. Safdar Ali
- Dr. M. Saleem Akhtar

Associate Professors

- Dr. M. Azhar Naeem
- Dr. Ghulam Jilani
- Dr. Khalid Saifullah Khan

Assistant Professors

- Dr. Muhammad Akmal
- Dr. M. Tariq Siddique

Lecturers

- Mr. Arshad Nawaz Ch.
- Mr. Tanveer Iqbal
- Dr. Rifat Hayat

HEC Eminent Scholar

- Prof. Dr. M. Yousaf, HEC Scholar

Sr. #	Name	Total	HEC Approved	Within Last Five Years	Imp. Fac. Publication
1.	Dr. Safdar Ali	49	19	12	3
2.	Dr. M. I. Lone	41	22	7	3
3.	Dr. Saleem Akhtar	50	27	17	10
4.	Dr. Azhar Naeem	25	21	8	3
5.	Dr. G. Jilani	53	33	15	17
6.	Dr. K. S. Khan	27	10	10	12
7.	Dr. M. Akmal	7	7	7	7
8.	Dr. Tariq Siddique	12	7	7	5
9.	Mr. Arshad Nawaz	6	6	5	3
10.	Mr. Tanveer Iqbal	2	2	2	1
11.	Dr. Rifat Hayat	10	4	7	2
12.	Dr. M. Yousaf	70	2	2	8
Total:		**350**	**160**	**99**	**72**

TABLE-9: FACULTY DISTRIBUTION BY PROGRAM AREAS IN SOIL SCIENCE & SWC

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
Soil Fertility	9	04	02
Soil Chemistry	7	03	02
Soil Biology/Biochemistry	8	02	02
Soil & Water Conservation	9	02	02
Soil Physics/Minerology	5	01	02
Total:	**38**	**12**	**10**

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DR. KHALID SAIFULLAH KHAN, ASSOCIATE PROFESSOR

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DR. MUHAMMAD AKMAL, ASSTT. PROFESSOR

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DR. M. TARIQ SIDDIQUE, ASSISTANT PROFESSOR

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DR. RIFAT HAYAT, LECTURER

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DR. MUHAMMAD YOUSAF, HEC EMINENT SCHOLAR

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Standard 6.2: 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.
- Incentives in the form of allowances to theses supervisors have been implemented lately to promote high standard research.
- Existing facilities include mainly internet access, which is available through networking system in addition to library facility with latest books is also available.
- Effective programs for faculty development has been just introduced since the last semester.

Standard 6.3: Faculty member motivation

- Time to time provision of enthusiasm to the young faculty by the senior faculty members.

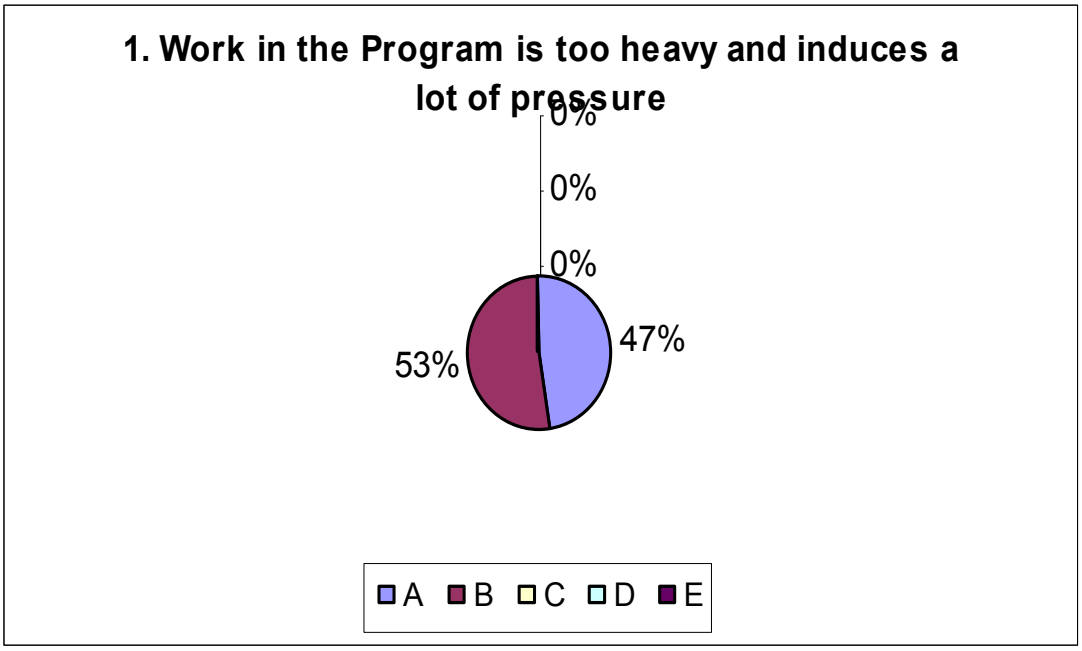
Faculty survey

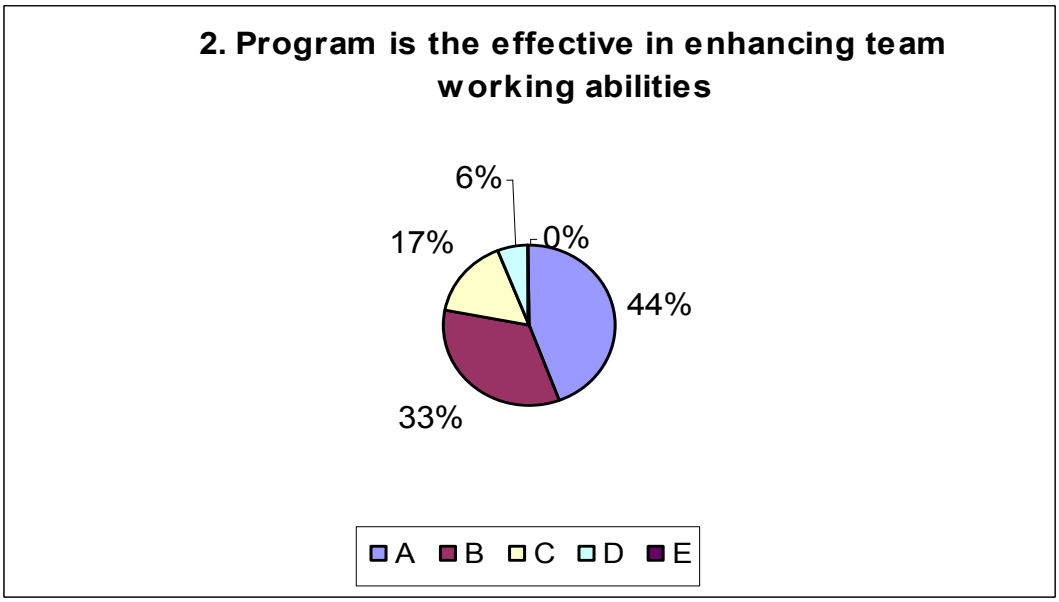
The results of faculty survey were summarized and given in annexure III.

Survey of graduating students

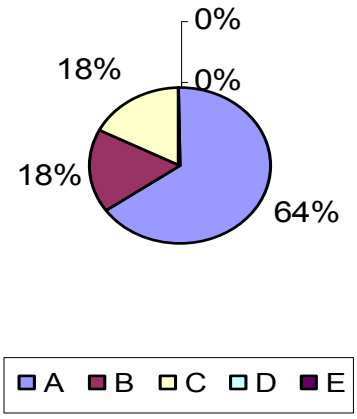
The graduating students in last semester were surveyed as per Proforma 3 before the award of degree. The results of graduating students were summarized and given in subsequent figures.

SURVEY OF GRADUATING STUDENTS (PROFORMA – 3)

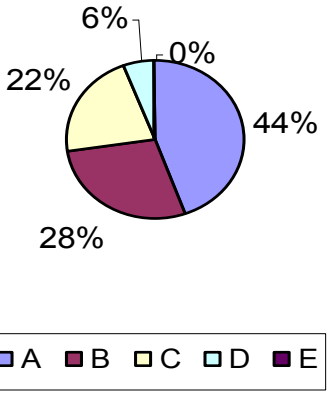


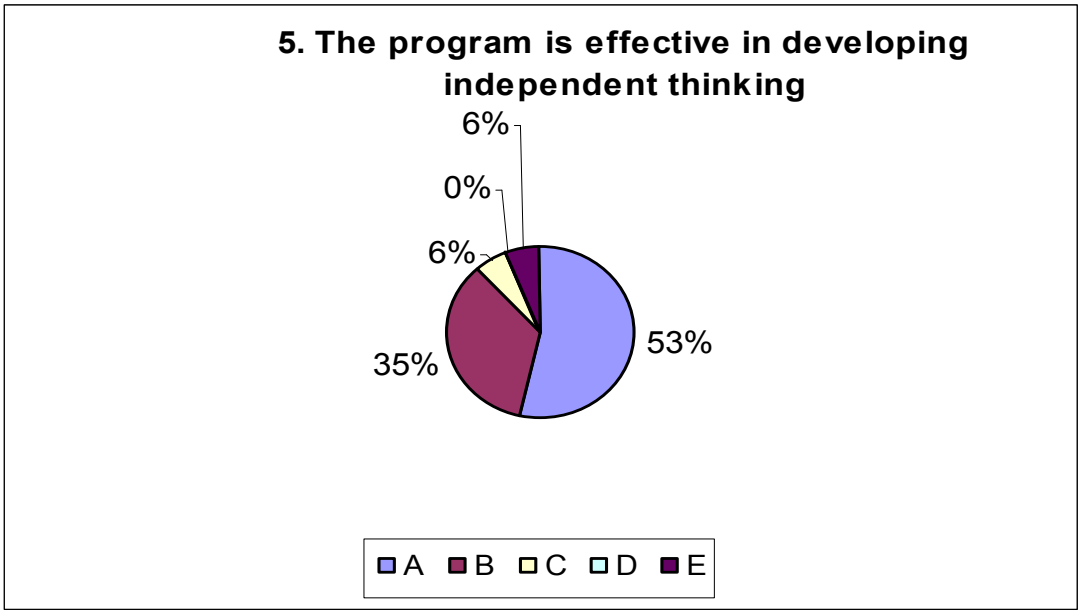


3. The program administration is effective in supporting learning



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




5. The program is effective in developing independent thinking
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0%
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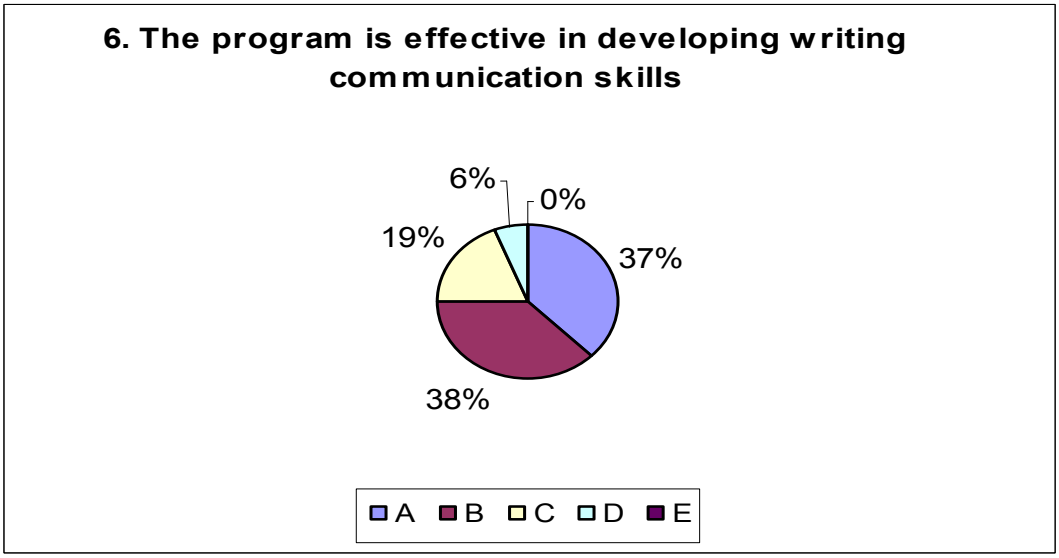
35%
A B C D E


6. The program is effective in developing writing communication skills
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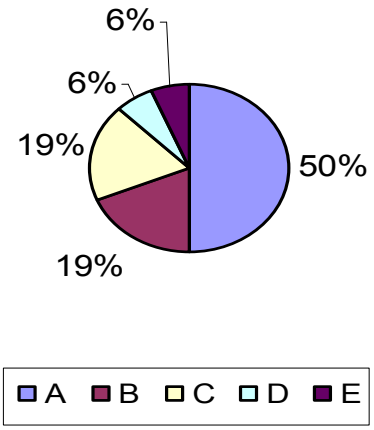
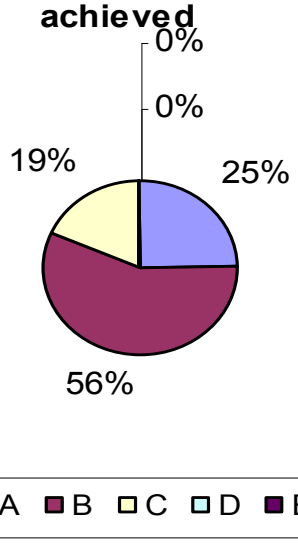
0%
19%
37%
38%
A B C D E

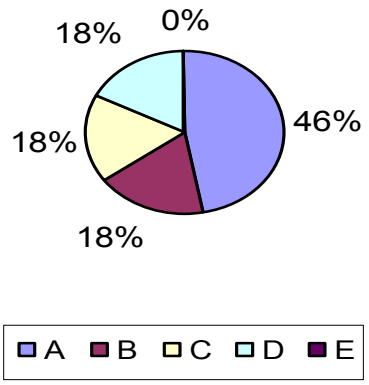
7. The program is effective in developing planning abilities



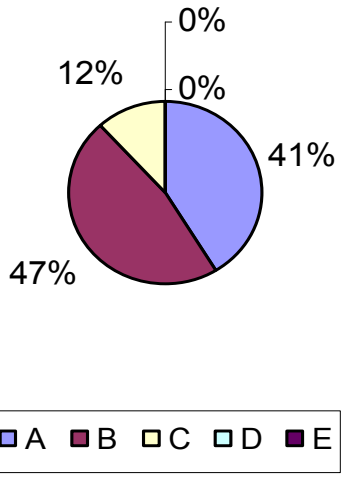
8. The objectives of the program have been fully achieved



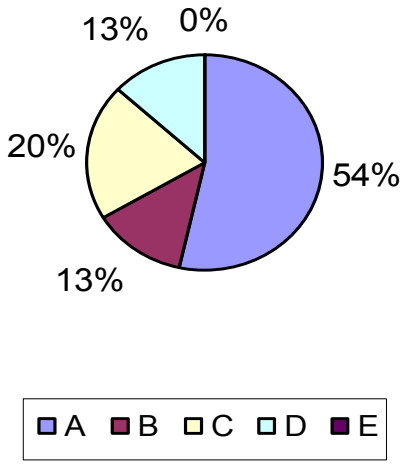
9. Whether the contents of curriculum are advanced and meet program objectives



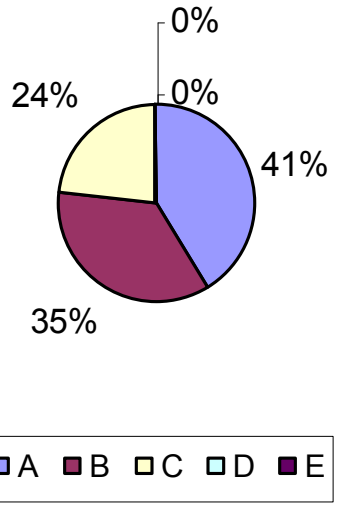
10. Faculty was able to meet the program objectives



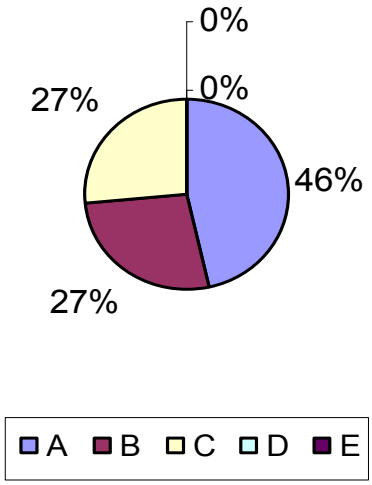
11. Environment was conducive for learning



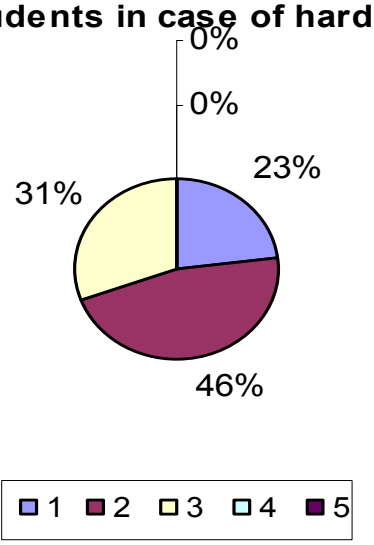
12. Whether the infrastructure of the department was good



13. Whether the program was comprised of co-curricular and extra-curricular activities



14. Whether the scholarship/grants were available to students in case of hardship



INSTITUTIONAL FACILITIES

Standard 7-1: Infrastructure:

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

- The internet services provided by the university are poor. The speed of internet is slow and often internet does not work. The telephones are also connected with the internet and the services are often breached.
- Breach of power intermittently, due to which research and academic work both are suffered.
- Untrained supporting staff.
- Lack of research students computer laboratory in the department

Standard 7-2: Library Facilities:

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

Standard 7.3: Class Room and Faculty Offices

Currently the class rooms are not enough and the space is not only limited but also some basic facilities are lacking. Multimedia are not available for the lecture halls. 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.

INSTITUTIONAL SUPPORT

The university administration has been struggling hard to strengthen all the departments and up gradation of departments and establishing new faculties and Institutes. The university is also trying to attract highly qualified faculty.

Standard 8-1: Support and Financial Resources

- 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 library, laboratories and computer facilities. Soil Science & SWC department has recently submitted a project for strengthening of department and it is hoped to be funded 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.
- Trainings should be arranged in abroad to train the faculty members.

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

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 the following Table.

TABLE-10: 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	20	20
M.Sc. (Hons)	05	08	08	11	05	8	20
Ph.D.	02	04	03	04	02	02	01

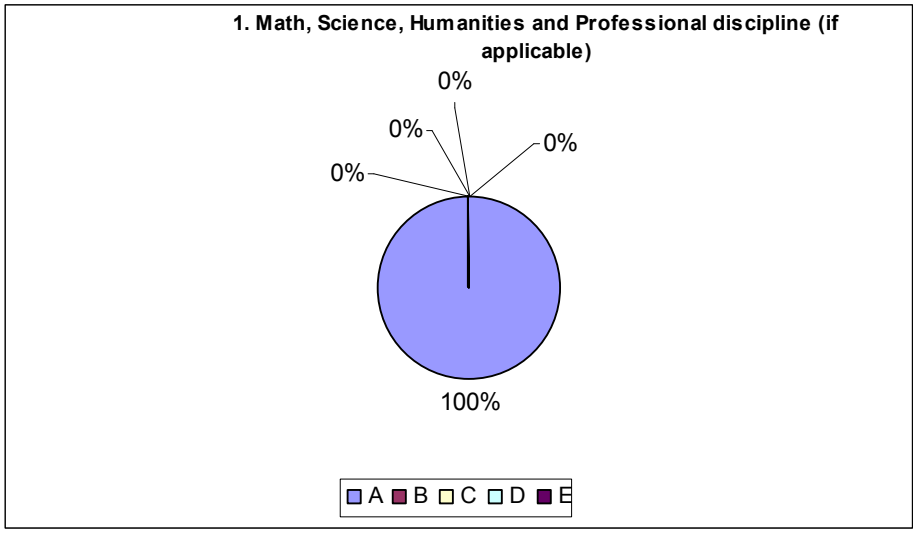
Standard 8-3: Financial Resources

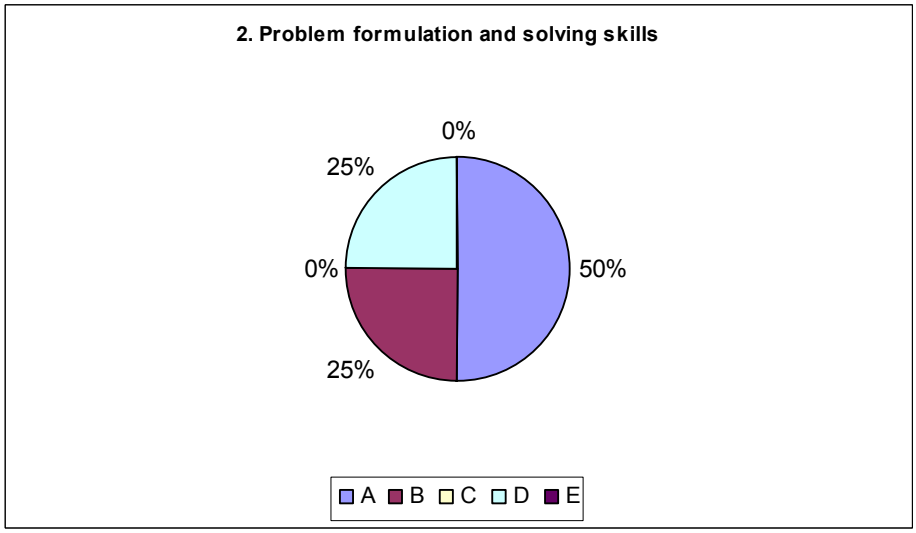
Total budget of the department for the financial year 2007-08 is **Rs 32000** which hardly fulfill the departmental needs particularly for the purchase of equipments, chemicals for laboratories and books for the department library.

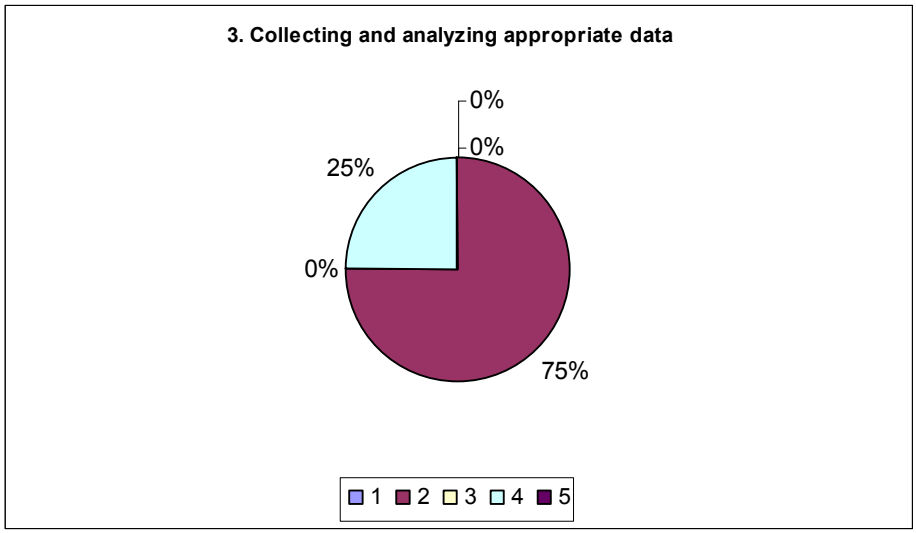
Alumni Survey (Proforma – 7)

Alumni survey information is summarized in the subsequent figures.

Alumni Survey
I. Knowledge






3. Collecting and analyzing appropriate data
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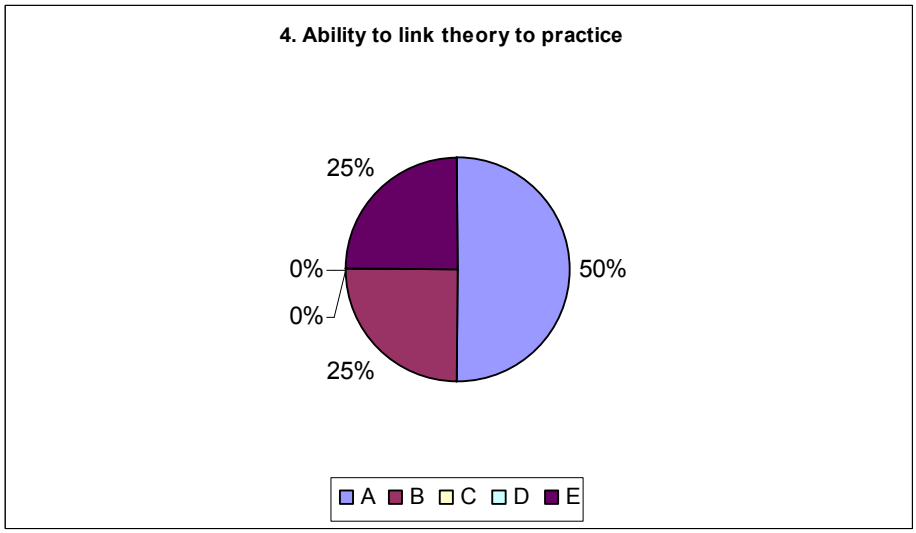
4. Ability to link theory to practice
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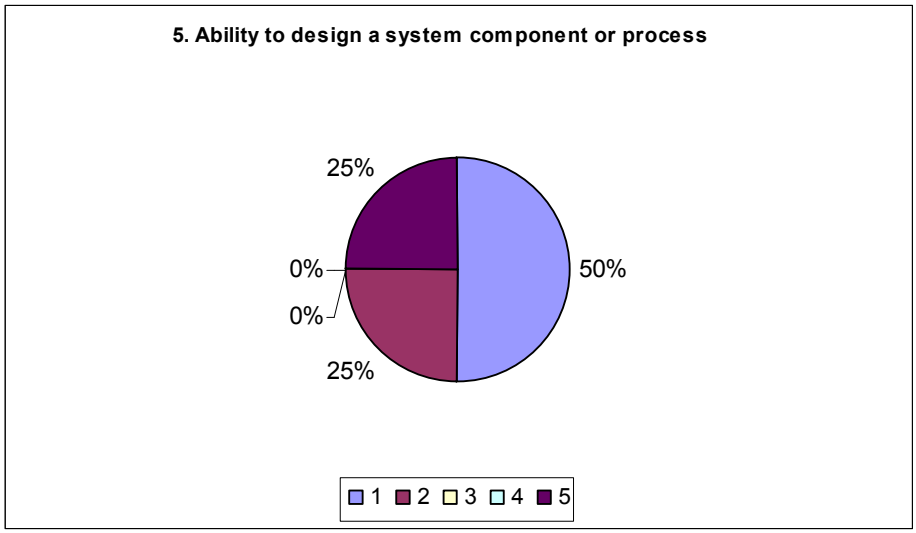
5. Ability to design a system component or process
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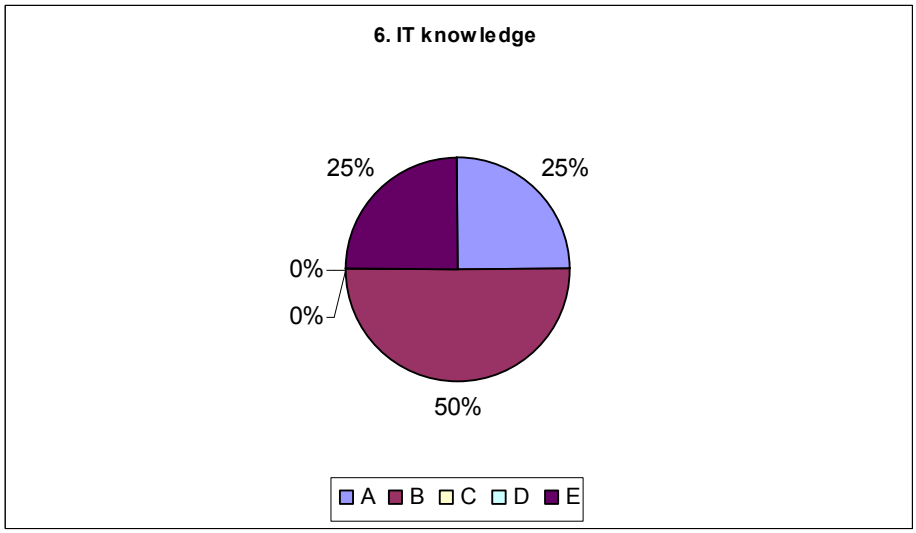
6. IT knowledge
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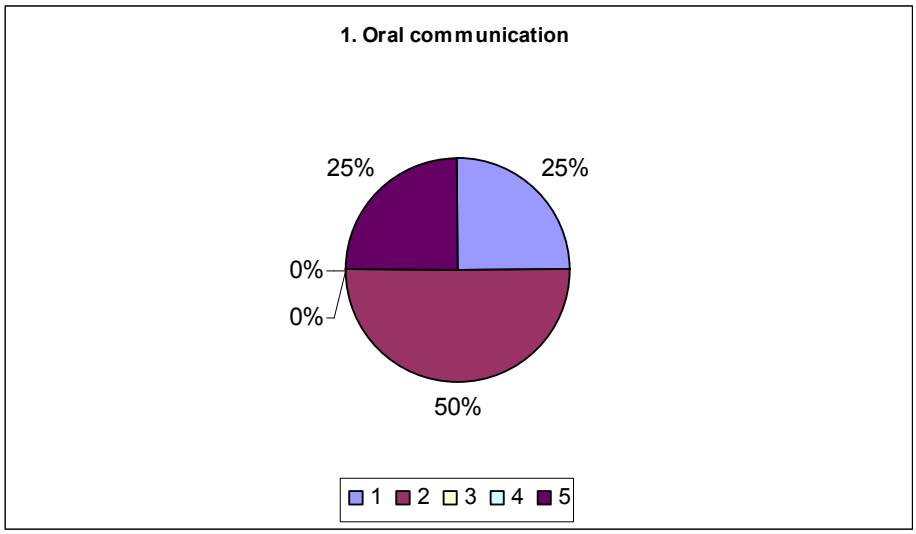
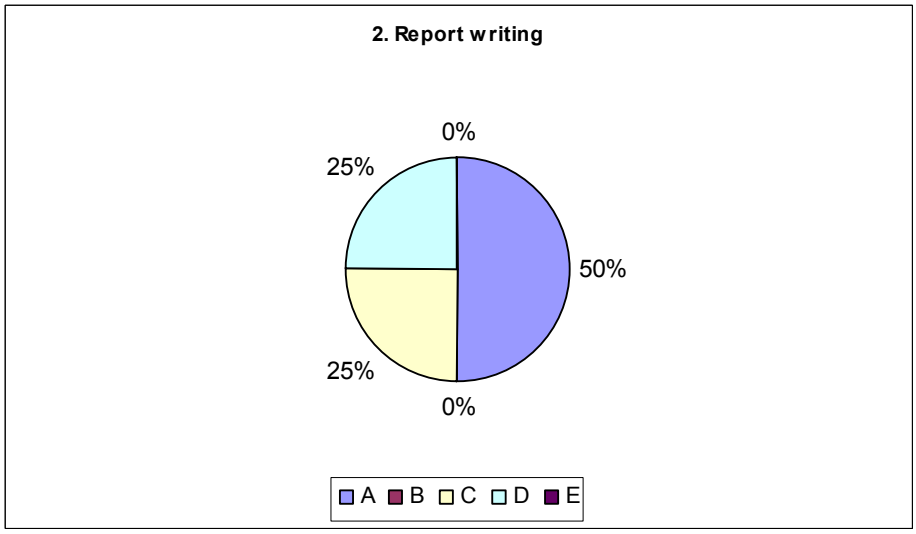
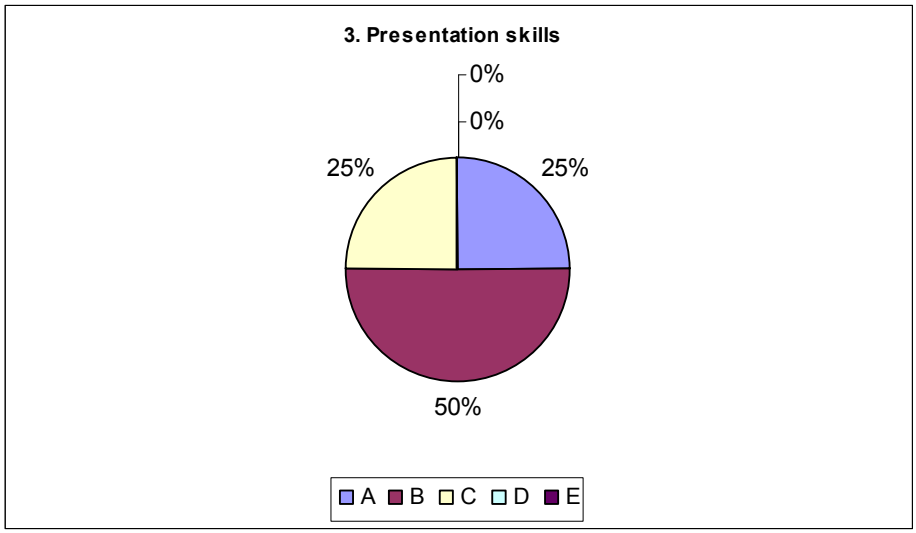
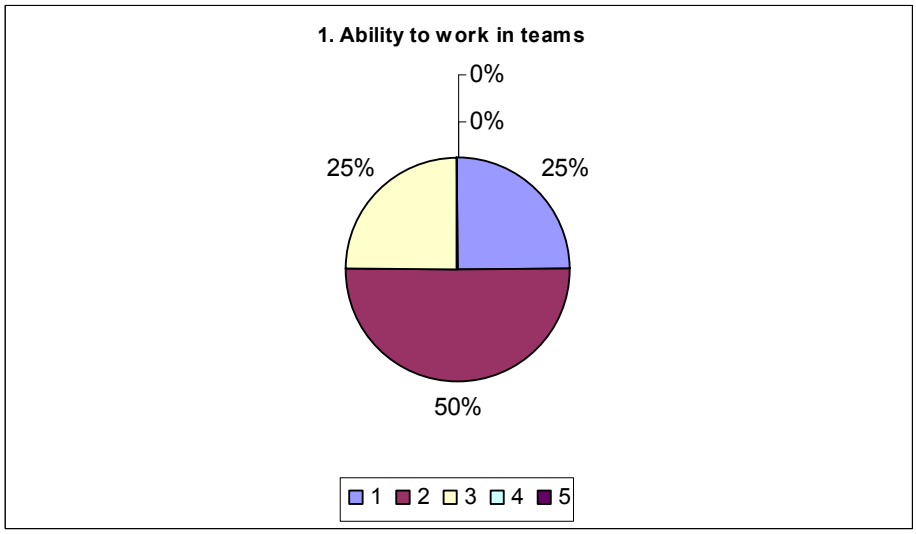
II. Communication Skill

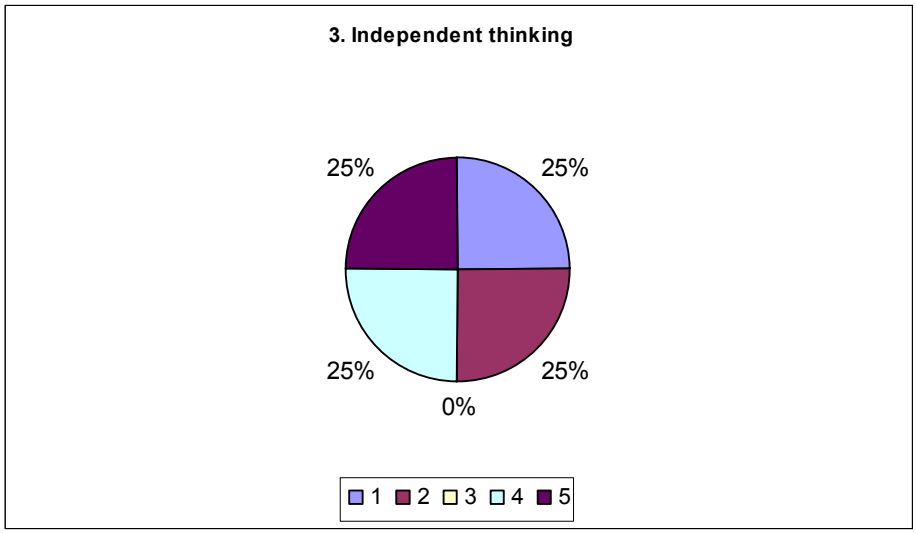






III. Interpersonal Skills




3. Independent thinking
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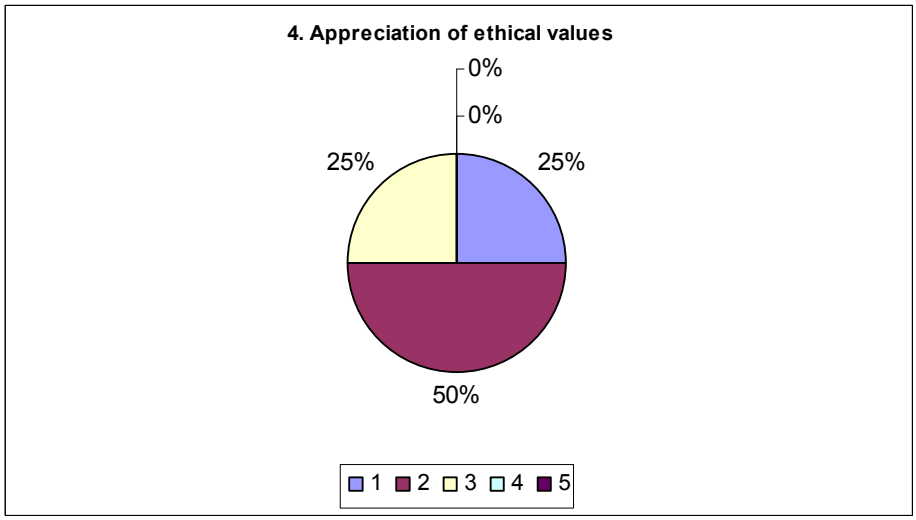
4. Appreciation of ethical values
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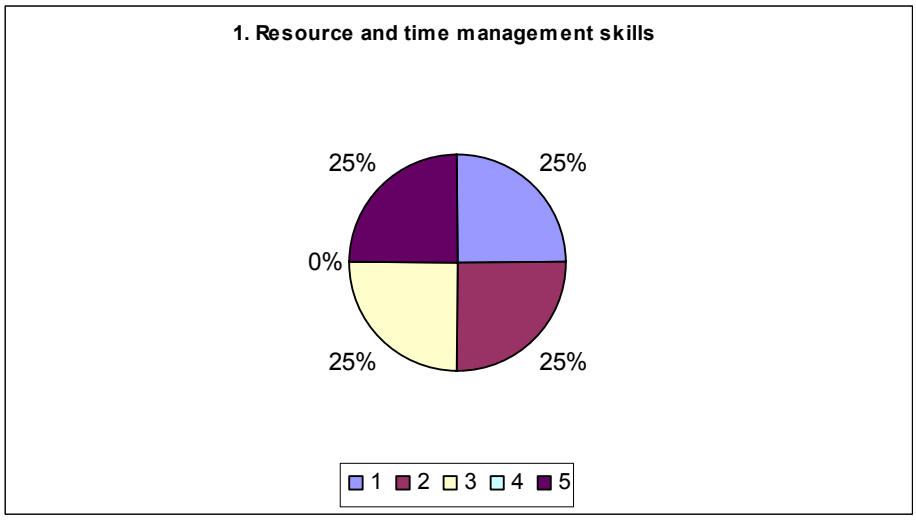
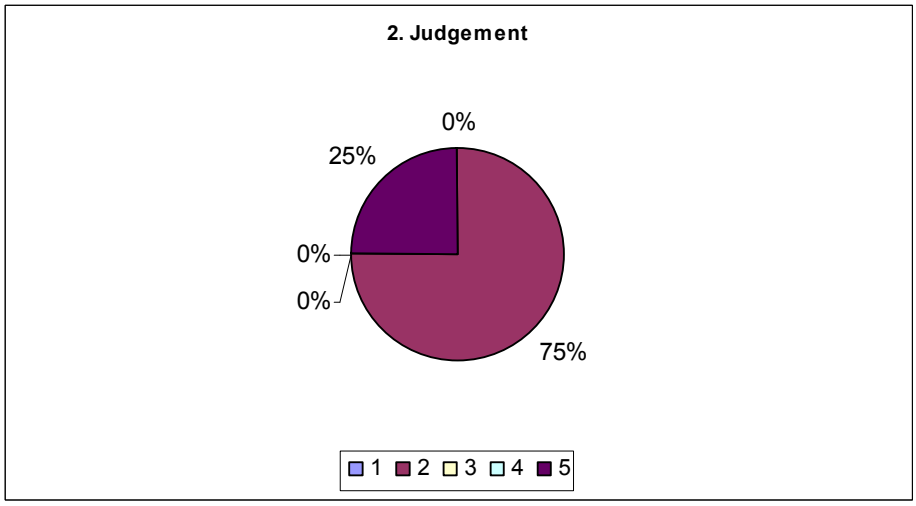
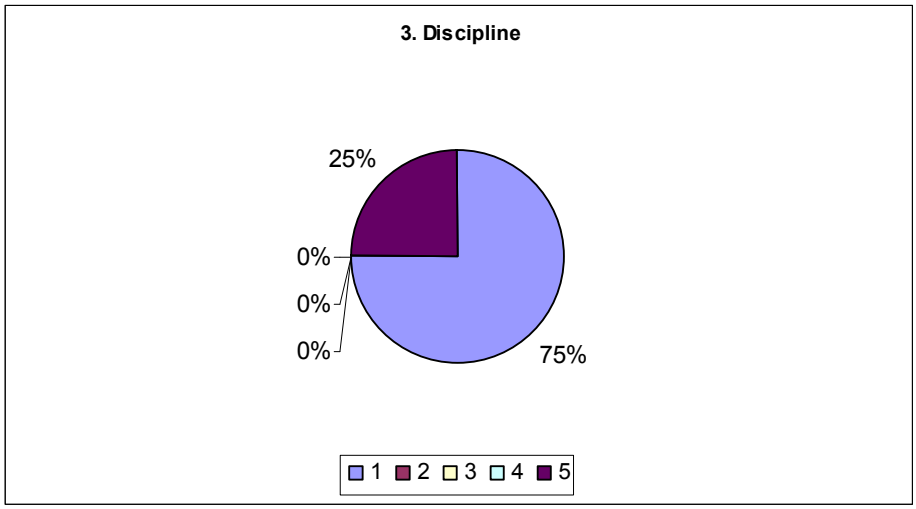
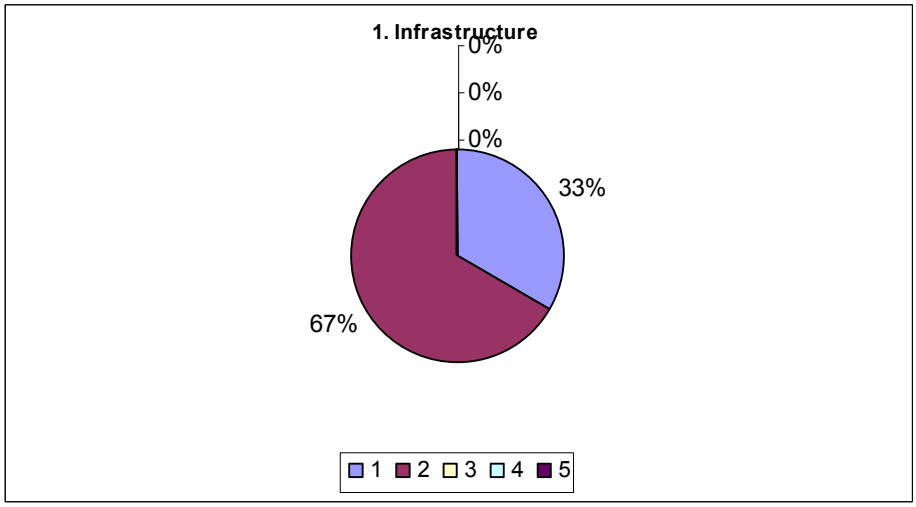
IV. Management

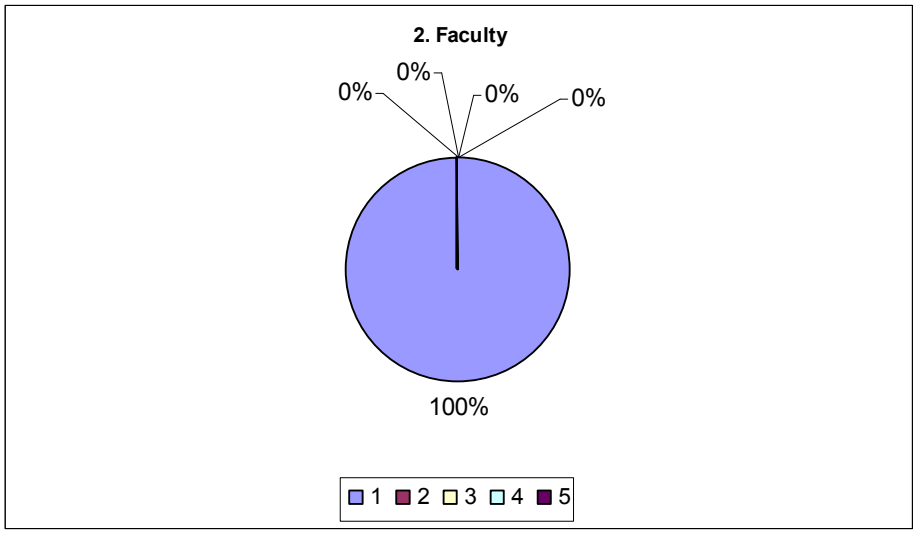






VII. Department Status




2. Faculty
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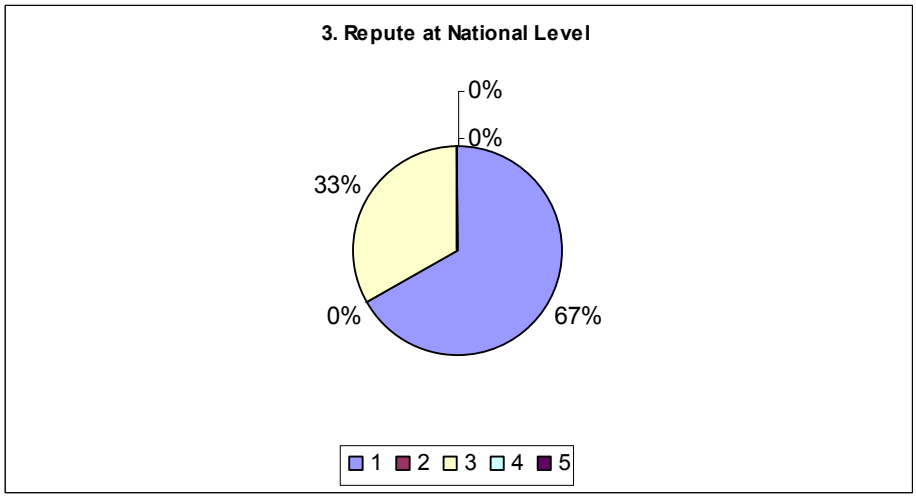
3. Repute at National Level
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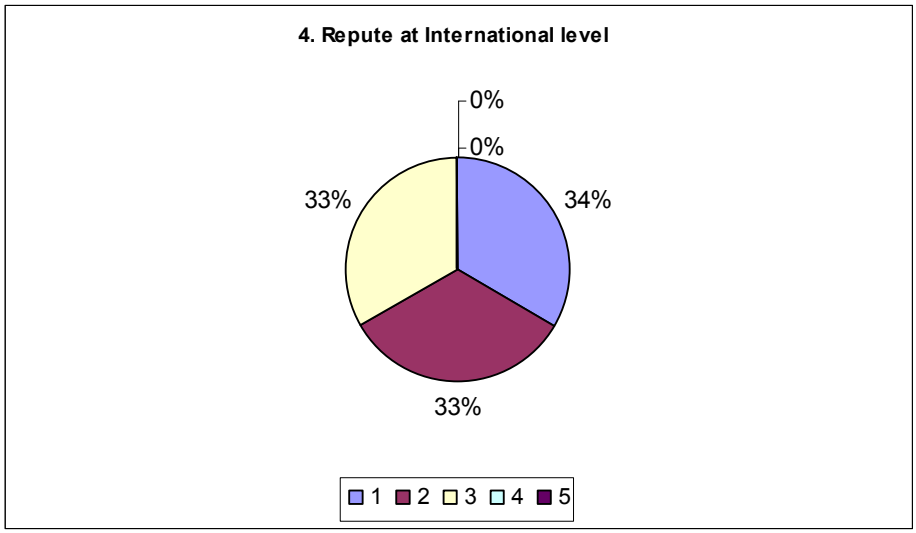
4. Repute at International level
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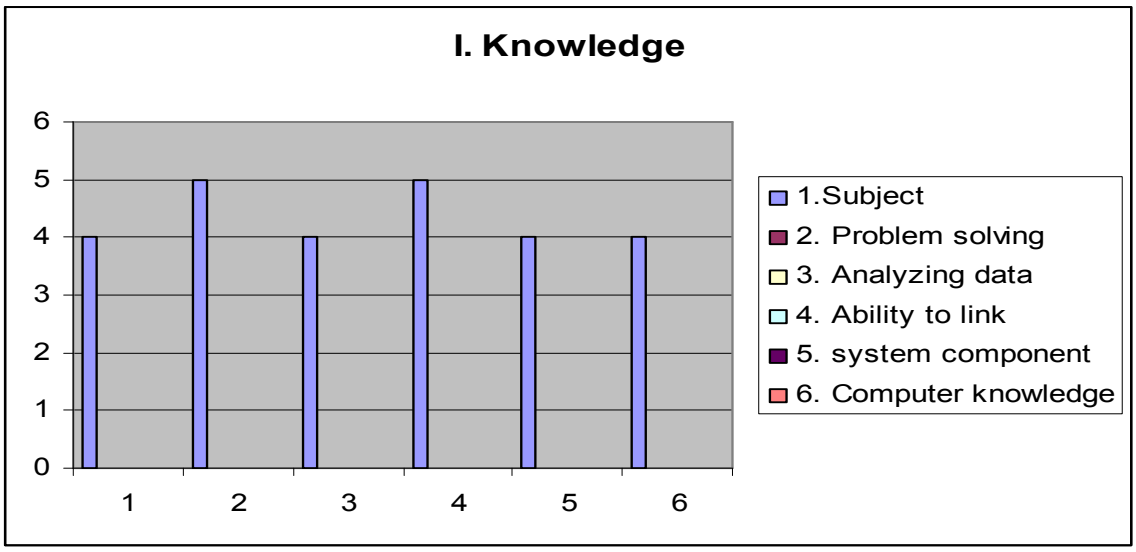
I. Knowledge
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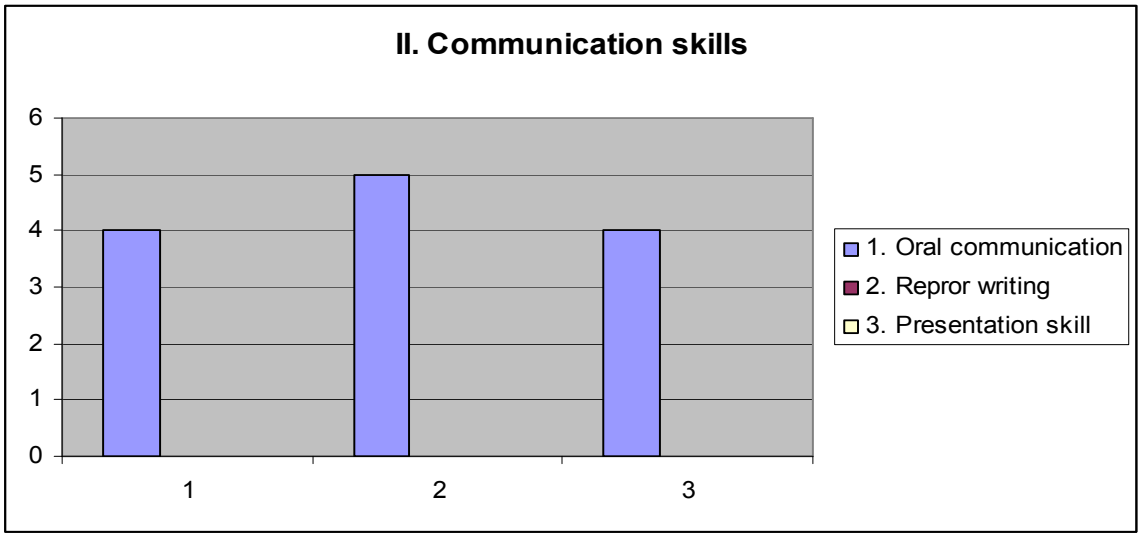
1.Subject
2. Problem solving
3. Analyzing data
4. Ability to link
5. system component
6. Computer knowledge


II. Communication skills
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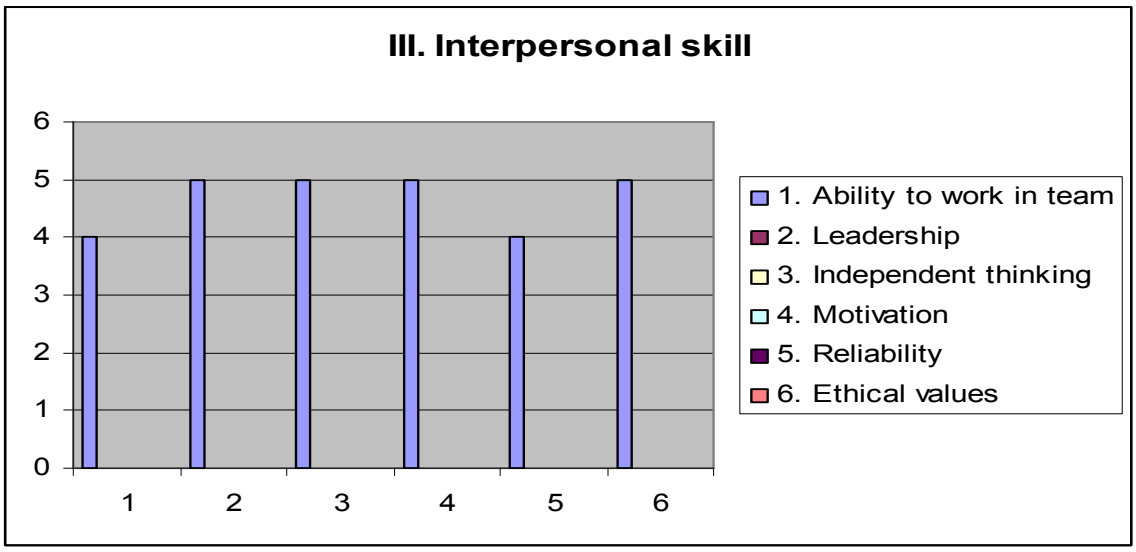
1. Oral communication
2. Repror writing
3. Presentation skill


III. Interpersonal skill
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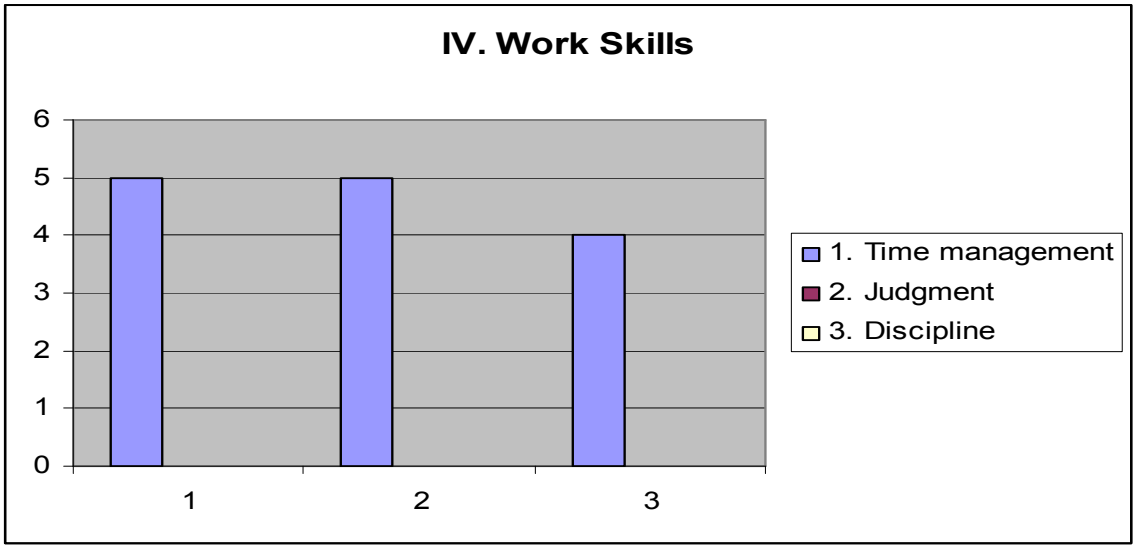
6
1. Ability to work in team
2. Leadership
3. Independent thinking
4. Motivation
5. Reliability
6. Ethical values


IV. Work Skills
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1. Time management
2. Judgment
3. Discipline

SUMMERY

Department of Soil Science & SWC has occupied 12 faculty members, including 3 professors and 3 Associate Professors, mostly hacing thair PhD from abroad. Department also has the credit of 350 intenationl and national publications and 8 faculty members are HEC recognized supervisors.

Department has national and international linkages and one dozen on going projects to strengthening research activities in the field of soil science. At present 18 PhD and 27 MSc (Hons) students are engaged and 5 PhD and 72 MSc (Hons) degess have been awarede.

Present assessment report is for the year 2007 and includes; Progeam Mission, Objectives, Outcomes, Curriculum Design and Organization. Information about loboratories, computing facilities, sthdent support and guidance is revealed in detail. Process control, capacity of faculty members, institutional facilities and support information is also cited in the document. Graphical representation of different assessment performance is also referred.

Teacher's performance quality bar ranged from 3.1 to 4.95, while student course evaluation quality bar ranged from 2.8 to 3.98. Faculty survey revealed an over all level of satisfaction while students research progress review indicate a good level of satisfaction about research facilities available in the department, however, they feel less confident in operating sophisticated instruments. Graduating and Alumni survey show high rank gratification among graduate and post-graduate students. Employers fell that there is still need of improvement in the fields of project designing/handling, use of equipment and analytical skills to review the data and reports.

ANNEXURE I: DETAILED COURSE CONTENTS OF SCHEME OF STUDIES SOIL SCIENCE & SWC

SS–301 INTRODUCTION TO SOIL SCIENCE 3(2–2)

THEORY:

Definition of Earth, Soil, Land and Soil Science
Disciplines: Soil Chemistry, Soil Survey, Soil Genesis, Soil Morphology, Soil Classification, Soil Conservation, Soil Fertility Soil Microbiology
Soil Mineralogy, Soil Physics and Soil Salinity
Major Parts of Earth, Lithosphere, Hydrosphere, Atmosphere and Biosphere,
Soil Forming Rocks and Minerals: Types and their Formation
Weather of Rocks and Minerals: Agents and Processes
Parent Materials: Residual, Alluvial, Aeolian, Glacial and Colluvial
Soil Formation: Processes and Factors Affecting
Soil Profile and its Description
Soil Development Processes
Physical Properties of Soil: Texture, Structure, Density, Consistence, Colour, Temperature, Porosity, Aeration and Soil Water
Introduction to Soil Classification and Land Use Capability Classes

PRACTICAL:

Identification of Rocks and Minerals
Methods of Soil Sampling, Preparation and Labeling
Preparation of Saturated Soil Paste
Determination of Saturation Water Percentage by Oven-drying Analysis of Irrigation Water and report Writing
Determination of Bulk Density

BOOKS RECOMMENDED:

1. Bashir, E. and R Bantel. 2001. Soil Science. National Book Foundation, Islamabad.
2. Brady, N. C. and R R Weil. 2002. The Nature and Properties of Soils. 13th ed. Prentice-Hall, Inc., Upper Saddle River, NJ, USA.
3. Foth, H. D. 1990. Fundamentals of Soil Science. 8th ed. John Wiley and Sons, NY, USA.
4. Dane, J. H. and Topp, G C, eds., 2002, Methods of Soil Analysis, Part 4, Physical Methods, Soil Sci. Soc. Am. No. 5, Madison, WI, USA.
5. Miller, R. W. and R L Donah.ue. 1990. Soils: An Introduction to Soils and Plant Growth. 6th ed. Prentice-Hall, Inc., Englewood Cliffs, NJ, USA.
6. Singer, M. J. and D N Munns. 1996. Soils: An Introduction.3rd ed. Prentice-Hall, Inc. Upper Saddle River, NJ, USA.
7. Ryan, J. G. Estefan and A Rashid. 2001. Soil and Plant Analysis. Laboratory Manual. International Centre for Agricultural Research in the Dry Areas, Aleppo, Syria.

SS–302 SOIL AND WATER CONSERVATION 2(2–0)

THEORY:

Soil Erosion: Description, Types and Extent
Hydrological Cycle and its Components
Water Erosion: Forms, Causes and Damages
Wind Erosion: Forms, Causes and Damages
Gravity Erosion and Landslides
Erosion Prediction
    6.1 Modified Universal Soil Loss Equation
    6.2 Wind Erosion Equation
Erosion Control and Management Agronomic, Engineering and Bioengineering
Water Conservation: Losses of Soil Water, Conservation Practices and Water Harvesting Techniques
Strategies for Soil, Water and Environment Conservation
Socio-economic Issues of Soil and Water Conservation

BOOKS RECOMMENDED:

1. Arakeri. 1987. Principles of Soil Conservation and Water Management. IBH Publishing Co., New Delhi, India.
2. IBH Publishing Co., New Delhi, India
3. Bhushan, L. S., I P Abrol and M S RM Rao. 1998. Soil and Water Conservation: Challenges and Opportunities. Vol. 1 & 2. A. A. Balkema, Rotterdam, The Netherlands.
4. Ehlers, W. and G Michael. 2003. Water Dynamics in Plant Production. CAB Publishing, Cambridge, UK.
5. Follett, R. F. and B A Stewart. 1985. Soil Erosion and Crop Productivity. ASA, Madison, WI, USA.
6. Morgan, R. P. C. 2005. Soil Erosion and Conservation. 3rd ed. Longman Group Ltd., Essex, UK.

SS-501 PHYSICAL PROPERTIES OF SOILS 3(2-2)

THEORY:

1. Introduction
2. Soil Texture, Specific Surface Area and Importance
   Stokes' Law: Derivation, Application and Limitations
   Soil Textural Classes (USDA and ISSS)
3. Soil Structure: Description and Management
   Genesis, Factors Affecting and Management
   Soil Crusting and Sealing: Mechanism and Significance
   Particle and Bulk Density: Measurement and Significance
   Total Porosity and Pore-size Distribution
4. Soil Air and Aeration: Description and Significance
5. Soil Temperature: Factors Affecting and Management
6. Soil Colour: Causes and Significance
7. Soil Consistency: Description and Significance
8. Soil water and its measurement
   8.1 Soil water potential and its components
   8.2 Soil Hydraulic Properties
9. Soil compaction: causes and remedies
10 Soil tillage and significance

PRACTICAL:

Textural analysis
Bulk density by clod, core, and excavation method
Total soil porosity estimation.
Aggregate stability
Measurement of soil water contents and field capacity
Determination of plant available water

Books Recommended

1. Bashir, E. and R. Bantel. 2001. Soil Science. National Book Foundation, Islamabad.
2. Brady, N.C. and R.R. Weil. 2002. The Nature and Properties of Soils.13th ed. Prentice-Hall, Inc., Upper Saddle River, NJ, USA.
3. Hillel, D. 2004. Introduction to Environmental Soil Physics. Elsevier, CA, USA.
4. Jury, W. A. and R. Horten. 2004. Soil Physics. 6th ed. John Wiley & Sons. Inc., NY, USA.
5. Lal, R. and M. K. Shukla. 2004. Principles of Soil Physics. Marcel & Dekker. Inc., NY, USA.
6. Miller, R.W. and R.L. Donahue. 1990. Soils - An Introduction to Soils and Plant Growth. 6th ed. Prentice-Hall International, Englewood Cliffs, NJ, USA.
7. Warrick, A.W. 1999. Soil Physics. In: Sumner, M.E. (Ed.) Handbook of Soil Science. CRC Press Inc., Boca Raton, Florida, USA.

SS-502 SALT–AFFECTED SOILS AND THEIR MANAGEMENT 3(2-2)

THEORY:

Salt-affected soils: classification, properties and extent'
Salination and sodication
Gapon and pHc equations
Systems of characterization of salt affected soils
Relation of *Ed* to salt concentration and solute potential
Chemistry of soil solution
Root zone salinity
Reclamation methods
Management through leaching, salt tolerant crops, irrigation, fertilization and planting techniques
Irrigation water quality, criteria and classification
Ground water: characteristics, resources and management
Salinity build up and prediction
Waterlogged soils: causes, effects and management
SCARP programmes: objectives and achievements
Salinity and Environment
water logging and environment.

PRACTICAL:

Sampling of salt-affected soils and irrigation water Saturated soil extracts analysis Analysis and classification of irrigation water Determination of gypsum requirement of soil and water Visit to Soil Salinity Research Institutes and salt affected areas

BOOKS RECOMMENDED:

1. Avers, R.S and D.W. Westcot. 1985. Water Quality for Agriculture. Irrigation Drainage Paper No *29*. FAO, Rome, Itlay.
2. Bresler, E., B.L. McNeal and D.L. Carter. 1982. Saline and Sodic Soils: Principles-Dynamics- Modeling. Springer- Verlag, NY, USA.
3. Ghafoor, A, M. Qa.dir and G. Murtaza, 2004 Salt' Affected Soil Principles 3. of Management. Allied Book"Center, Lahore, Pakistan.
4. Gupta, I.C. 1990. Use of Saline Water in Agriculture. Oxford and IBH Pub.
5. Shainberg, I. and I. Shalhevet. 1984. Soil Salinity under Irrigation: Processes and Management. Springer-Verlag, NY, USA
6. Sparks, D.L. (ed.). 1996. Methods of Soil Analysis. Part 3, Chemical Methods. Soil Sci. Soc. Am. Book Series NO.5. Am. Soc. Agronomy, Madison, WL USA.
7. Tanji, K.K. (Ed.). 1990. Agricultural Salinity Assessment and Management.

SS-503 CHEMICAL PROPERTIES OF SOILS 3(2-2)

THEORY:

Silicate clay minerals: structures and properties
Allophanes and sesquioxides
Organic soil colloids
Charge characteristics of colloids: sources and significance.
Characteristics of ion exchange
Cation exchange and its significance
Zero point of net charge
DOL theory: assumptions and properties
Anion exchange and its significance
Acidic and basic cation saturation percentage: description and significance
Exchange equations: limitations and assumptions
Adsorption and desorption in soil Soil pH: description and significance
Buffering capacity of soils and significance

PRACTICAL:

Effect of Soil Water Ratios on pH
Determination of soluble and extractable cations in soil
Determination of CEC

BOOKS RECOMMENDED:

1 Bashir, E. and R. Bantel. 2001. Soil Science. National Book Foundation, Islamabad.
2 Bonn, H. L., D. L. McNeal and G. A. O'Connor. 2001. Soil Chemistry. 3'ded. John Wiley& Sons. Inc., NY, USA.
3 Huang, P.M. 1999. Soil Chemistry. In: Sumner, M.E. (Ed.) Handbook of Soil Science, CRC Press Inc., Boca Raton, FL, USA.
4 McBride, M.B. 1994. Environmental Chemistry of Soils. Oxford University Press, NY, USA.
5 Tan. K. H. 1998. Principles of Soil Chemistry. 3'd ed. Marcel & Dekker.lnc.,USA.

SS-504 SOIL SURVEY AND LAND EVALUATION 3(2-2)

THEORY-:

Soil and landform: introduction
Kinds and levels of soil survey
Field operations and requirements
Aerial photographs and their interpretation
Stereoscopic vision theory
Field traverse selection
Soil maps: purposes, characteristics and identification of mapping units
Mapping legend
Mapping and tax; iqmic units
Interpretation and use of soil survey reports
Land capability and suitability classification
Land evaluation: principles, land qualities, and utilization types.
Application of GIS, GPS, and remote sensing in soil survey.

PRACTICAL:

Reading of topographic map and calculation of slope percentage
Stereoscope: types, parts, and use
Interpretation of aerial photographs
Demonstration of GIS, GPS, and remote sensing techniques
Field visits

BOOKS RECOMMENDED:

1 Bashir, E. and R. Bantel. 2001. Soil Science. National Book Foundation,Islamabad.
2 Dent, D, and A. Young. 1981. Soil Survey and Land Evaluation. George Alien and Unwin
3 Publishers Ltd.. London, UK.
4 FAO. 1985. Guidelines: Land Evaluation for Irrigated Agriculture. FAa Soils
5 Bill LS5. Rome, Italy.
6 Reybolu, W.U.and G.W. Peterson. 1987. Soil Survay Technique. SSSA.
7 Special Publication No. 19- Madison. WI, USA.
8 Soil Survey Division Staff. 1993. Soil Survey Manual USDA, Washington DC, USA.
9 Soil Survey of Pakistan. Reconnaissance Soil Survey Reports.
10 'Soil Survey of Pakistan. 1986. Proceedings of Xll International Forum on Soil Taxonomy and Agro technology Transfer. *Vol.* 1 & 2. Soil Survey of Pakistan. Lahore

SS-505 SOIL FERTILITY AND FERTILIZERS 3(2-2)

THEORY:

Introduction
Crop growth and factors affecting
21 Growth expressions: Mitscherlich and Quadratic equations
Essential nutrient elements: functions, deficiency and toxicity
3.1 Movement of nutrients to roots and uptake by plants
Nitrogen: gains in soil, transformations and losses
4.1 N-fertilizers and their fate in soil
Phosphorus: forms in soil and transtonnaLion;;
P-Fertilizers and their behavior in soils
5.2 Crop responses: factor affecting and residual effects
Potassium: forms, amount, exchange equilibrium and factors affecting
Soil status of calcium, magnesium and sulfur: factors affecting availability
Micronutrients: forms in soils and factors affecting their availability.
Integrated plant nutrient management
Nutrients behavior in submerged soils
Soil fertility problems and their management in Pakistan
Fertilizers and environmental pollution.

PRACTICAL:

Fertilizer requirement calculation
Determination of total nitrogen, available P, K, Zn, Fe, Mn and Cu in soil.
Plant analysis for N, P and K
Interpretation of soil and plant analysis results
Visit to fertilizer factories, soil fertility institutes and demonstration trials

BOOKS RECOMMENDED:

1 Ahmad, N., and M. Rashid. 2003. Fertilizer and Their Use in Pakistan: An
2 Extension Guide. Planning Commission, National Fertilizer Development Centre, Islamabad, Pakistan.
3 Brown, J.R. (Ed.). 1987. Soil Testing: Sampling, Correlation, Calibration and Interpretation.Soil Sci. Soc. Am., Inc., Madison, WI, USA.
4 Havlin, J.L., J.D.Beaton, S.L.Tisdale, and w.L. Nelson, 2004. Soil Fertility and Fertilizers an Introduction to Nutrient Management. 6th ed. Pearson Education, Singapore, Patparganj, New Delhi, India.
5 Kamprath, EJ. 1999. Soil Fertility and Plant Nutrition. In. Sumner,.M.E (Ed.). Handbook of Soil Science. CRC Press Inc., Boca Raton, Florida, USA
6 Mengle, K and EA. Kirkby 2000. Principles of Plant Nutrition, 5th ed. International Potash Inst., Bern, Switzerland.Inst., Bern, Switzer/and.
7 Westerman, R.L.(Ed.). 1990. Soil Testing and Plant Analysis. 3'd ed. Soil Sci. Soc. Am.,Madison, WI, USA

SS-506 **WATER CONSERVATION AND NON-CONVENTIONAL EROSION CONTROL** **3(3-0)**

THEORY:

Concept of water conservation, principles of water conservation, methods for water erosion control in arable lands, engineering and biological approaches, use of agricultural machinery in soil water conservation, water conservation and water harvesting, non arable lands, vegetative and other control measures, control of erosion along stream banks, wildlife and water conservation. Farm water storage, ponds, mini dams, farm drainage, flood control in upstream areas. Field visits to water conservation projects.

BOOKS RECOMMENDED:

1. Troeh. F R , J.A. Hobbs and R. L Donahue. 1980 Soil and water conservation. 1st Edition, Prentice Hall Inc., Eaglewood Cliffs, N. Y., USA.
2. F.A.O. 1978. Soil Erosion by water. Rome, Italy.
3. Talebbey Dokttili, N., A. Telvari and S.A. Heydarian. 1999. Proceedings of Regional Workshop on Traditional Water Harvesting Systems. 347 pp.

SS-507 SOIL GENESIS AND MORPHOLOGY 3(2-2)

THEORY:

Introduction, Weathering of rocks and minerals and types of parent materials, Soil genesis and factors affecting, Pedogenic processes additions, losses, transformations and translocations., Soil macro and micro morphology, Special soil features, Description of soil profiles, Land forms, parent materials and soil development in Pakistan.

PRACTICAL:

Profile description of representative soil series field trips

BOOKS RECOMMENDED:

1 Bashir, E. and R. Bantel. 2001. Soil Science. National Book foundation, Islamabad.

2 Buol. S.W., S.D. Hole, R.J Mo Gracken and R.J Southard. 1997. Soil Genesis Classification. 4th ed. Panima Publication Corporation, New Delhi, India.

3 Fitzpatrick, E.A. 1984. Micromorphology of Soils. Chapman and Hall Ltd NY, USA

SS–508 INSTRUMENTATION AND LABORTORY TECHNIQUES 2(0-4)

PRACTICAL:

Quality assurance in laboratory. S.I and derived S.I. units. Basic analytical techniques, analysis - sample collection, preparation and storage. Plant analysis - sample collection, handling, preparation and storage plant analysis - wet oxidation and dry ashing. Data interpretation. Preparation of standard solutions. Instrumental analysis. Conductivity metry -principle and instrumentation. Potentiometry - Principle instrumentation. Spectrophotometer -principle and instrumentation. Transmission spectroscopy - principle and instrumentation. Absorption spectroscopy - principle and instrumentation. Introduction to chromatography. Use of isotopes in natural and plant sciences.

BOOKS RECOMMENDED:

1 Delevie, R. 1997. Quantitative Chemical Analysis. McGraw-Hill Co. Inc. New York, USA.

2 Harris. D.C. 2003.Quantitative Chemical Analysis. 6th ed. W.H. Freeman & Co. NY, USA.

3 Jaffery. G.H. et. Al. (Eds.) 1989. Vogel's Text Book of Quantitative Chemical Analysis. 5th ed., English Language Book Soc. Longman. UK.

SS–509 INTRODUCTION TO SOIL CLASSIFICATION 3(2-2)

THEORY:

Concepts and Importance, Introduction to Soil Taxonomy, Criteria of Classification, Properties Diagnostic to Categories, Diagnostic Horizons and Other Diagnostic Properties, Soil Moisture Regimes: Classes and Importance, Soil Temperature Regimes: Classes and Importance, Categories and Nomenclature, Keys to Categories: Order, Suborder, Great Group and Subgroup, FAO and other systems of Classification, Agro Ecological zones of Pakistan

PRACTICAL:

Designation of genetic horizons found in Pakistan, Identification of Taxonomic names: Orders, Suborders, Great Groups, Families and Series

BOOKS RECOMMENDED:

1. E. and R. Bantel. 2001. Soil Science. National Book Foundation, Islamabad
2. Buol, S.W., M.P. Walker, R.J. Southard and PA McDaniel. 2003. Soil Genesis and Classifications, 5th Ed. Iowa State University Press, Ames. USA.

SS–510 WIND EROSION AND ITS CONTROL 3(3–0)

THEORY:

General characteristics and location of wind erosion areas and extent. Damages by wind erosion. The process of wind erosion; wind erosion, soil particle movement, effects on soil, principles of wind erosion control: measures to control soil erosion by wind; basis or control methods: control on cultivated lands including cover crops, strip cropping, crop rotation, wind breaks and shelter belts, crop residue management, tillage practices and machinery, planting equipment, emergency tillage, control on grazing lands, sand drifts, other measures of erosion control, future prospects and recommendations; legislation and action to control wind erosion. Field visits to erosion prone areas and erosion control projects

BOOKS RECOMMENDED:

1. F.A.O. 1960. Soil Erosion by Wind, F.A.O., Rome, Italy:
2. Troeh, F R, J. A. Hobbs and R. L. Donahue. 1980. Soil and Water Conservation. Prentice Hall Inc., Eaglewood Cliffs, N.Y.

SS–512 INTRODUCTION TO SOIL MICROBIOLOGY 3(2-2)

THEORY:

Introduction and significance. Classification of soil microorganisms Based on taxonomy, morphology, nutrition, temperature, aeration; growth factors alld DNA based techniques. Distribution, adaptation, activity find functions, of bacteria, archaea, actinomycetes, fungi, eukaryotic algae", and cynobacteria. Growth phases of soil micro flora. Environmental factors affecting microbial growth. Concept of microbial biomass. Significance of microbial biomass as source/ sink of plant nutrients and catalyst in the cycling of plant nutrients.

PRACTICAL:

Introduction to laboratory equipments related to Doil microbiology. Soil sampling storage and sterilization. Preparation of medial stains and functioilS of constituents.. Microbial population. Rossi-Cholodny Contact Slide Technique and Dillution Plate Technique. Algal culturing and their microscopy. Staining techniques

BOOKS RECOMMENDED:

1 Tate, R. 1. 2000. Soil Microbiology. 2nd Edition. 101m Wiley& Sons, Inc., USA.

2 Coleman, D.C., D.A. Crossley, P.p. Hendrix. 2004. Fundamentals of Soil Ecology. 2nd Edition. Elsevier Inc., USA.

3 Metting, B. 1992. Soil Microbial Ecplogy. Marcel D~kl(er Inc., New York, USA.

4 Cyone, M.S. 1999. Laboratory Manual to Accompany Soil Microbiology: An Exploratory-Approach. Delmar Publishers, USA.

SS-601 BIOCHEMISTRY OF SOIL PROCESSES 3(2-2)

THEORY:

Soil organic matter: sources and significance. Biochemistry of organic matter decomposition. Immobilization and mineralization of carbon. Microbial transformations of nitrogen. Nitrogen cycle. Biological nitrogen fixation: Biochemical transformations of P, S, Fe and other plant nutrition Soil enzymes, their sources and significance in biochemical, transformations in soil. Bio-fertilizers and their significance in plant nutrition. Concept of bioremediation. Biodegradation and detoxification of polluted agricultural soils and wastewater.

PRACTICAL:

Study of ammonification, nitrification and denitrification. Study of biological nitrogen fixation using conventional and advance techniques. Estimation of dehydrogenase, protease and phosphatase in soil samples.

BOOKS RECOMMENDED:

1. Paul, E. A. 1999. Soil Biology and Biochemistry. In: Sumner, M.E. (Ed). Handbook of. Science. CRC, Boc(;l Raton, FL , USA.
2. Paul, E.A., and F. E. Clark. 1989. Soil Microbiology and Biochemistry. Academic Press Inc., San Diego, CA., USA.
3. Alef, K., and P. Nannipieri. 1995. Methods in Applied Soil Microbiology and -Biochemistry. Academic Press Inc., San Diego, CA, USA

SS-603 SOIL AND WATER POLLUTION 3(2-2)

THEORY:

Types of soil pollutants - heavy metals, pesticides' etc. Sources of soil pollution. Fate of pollutants in soils - adsorption, degradation and movement Management, control and remediation of soil pollution. Sources of water pollution...;, pesticides, city waste, industrial refuse, animal wastes' and fertilizers. Nitrate and phosphate pollution by synthetic fertilizers and animal wastes. Eutrophication of surface waters. Management and control of water pollution. Government policies and public awareness.

PRACTICAL:

Sampling of industrial and municipal effluents. Determination of total suspended solids' (TSS), total dissolved solids (TDS), biological oxygen demand (BOD), and chemical oxygen demand (COD) in city I industrial effluents. Determination of toxic metal ions in eftl~ents, sludge and vegetation.

BOOKS RECOMMENDED:

1. Kabata,.P.A. and H. Pendias. 1992. Trace elements in Soils and Plants. CRC, Boca Raton, Florida, -USA.'
2. McBride, M.B. 1994. Environmental Chemistry of Soils. Oxford University Press, NY, USA.
3. Misra, S.G. and D. ManL 1991. Soil Pollution. Ashish Publishing House, New Delhi, India.

SS-605 METHODS OF SOIL AND PLANT ANALYSIS 4(2–4)

THEORY:

Quality assurance in the laboratory. S.L Units and derived S.L Units. Soil testing - its objectives and principles. Soil sampling techniques. Collection, preparation and storage for various objectives. Methods, for correlating and calibrating soil tests. Interpretation of soil test results. Testing soils for macro and micronutrients Principles and practicles of plant analysis. Sampling and handling plant tissue samples.. Plant analysis for macro and micronutrients.

PRACTICAL:

S.I. Units. Preparation of standard solutions. Soil sampling and preparation. Soil extraction of macro and micronutrients and their estimation by relevant instruments. Collection . and preparation of plant samples. Wet and dry ashing: Determination of macro , and micronutrients in plant tissues.

BOOKS RECOMMENDED:

1. Westerman, R.L.. (ed.). 1990., Soil Test-g and Plant Analysis. 3rd Ed. Soil Sci. Soc: Am. Inc Madison, WI, USA.
2. Brown, JR. (ed.). 1987: Soil Testing, Sampling, Correlation, Calibration and Interpretation. Soil Sci. Soc. Am., Inc. Madison, WI, USA.
3. Page, AL. (ed.). 1982. Methods of Soil Analysis. Part 2. Chemical and microbiological properties. 2nd Ed. ASA and SSSA, Inc., Madison.'WI, USA.
4. Jaffery, G.H. (ed.). 1989. Vogel's Text Bd"ok of Quantitative Chemical analysis.. 5th Ed. English Language Book Soc. Longman UK.
5. Reuter, DJ. and J.B. Robinson. 1997. Plant Analysis: An Interpretation Manual. 2nd Ed. CSIRO Publ., CoilinKwood.Australia.
6. Perverill- K.r,~.ASparrow and D.l" Reuter. -t999,Soil Analysis: An Interpretation Manual. CSIRO Pub!., Collingwood, Australia

SS-607 NUCLEAR TECHNIQUES IN SOIL RESEARCH 3(2-2)

THEORY:

Atomic structure. Isotopes; stable and unstable isotopes. Radio-active decay specific activity, half life. Types of radiations, radiation detection (detectors, autoradiography) Use of radioisotopes in soil and agriculture research, limitations and considerations in the radio isotopes.

PRACTICAL:

Working protocol in the nuclear research laboratory. Use of gamma radiation and neutron prob.

BOOKS RECOMMENDED:

1. NIFA. 1994, The use of Nuclear and other Advanced Techniques in Food and Agricultural Research. NIFA, Tarnab, Peshawar.

SS – 609 PROJECT PLANNING AND SCIENTIFIC WRITING 2(1–2)

THEORY:

Definition of research, types of -research, selection of research project, literature review as a basis of research project. Essential features in planning of research project. Layout and conduct of research experiments in the field, greenhouse and laboratory. Literature review -sources and procedure

PRACTICAL:

Each student will plan an experiment under supervision of faculty members Literature review pertinent to the project.

BOOKS RECOMMENDED:

1. Anonymous. 1974. General Notes on the Preparation of Scientific Paper. 3rd Ed. The Royal Society, London, UK
2. Gomez, K.A. and A.A. Gomez. 1988. Statistical Procedures for Agricultural Research. 2nd Ed
3. Little, T.M. and FJ. Hills. 1978. Agricultural Experimentation. Jhon Wil.ey and Sqpi'Inc., NY, USA

SS-602 INTERNSHIP 15 (0-30)

SCHEME OF STUDY

M. Sc. (Hons.) SOIL SCIENCE. /Ph. D. SOIL SCIENCE

SS-701 INSTRUMENTAL ANALYSIS 3(2-2)

THEORY

Laboratory working protocol ISO – 17025 Laboratory Protocol, Electrical and electronic components of analytical instruments. Study of electrical balances. Principles of potentiometery and conductivity-metery. Principals of flame photometer, Spectrophotometer, Atomic absorption spectrophotometer and Gas chromatography.

PRACTICAL

Visit to ISO – 17025 accredited laboratories, Introduction to functioning of balance, pH meter, conductivity meter, flame photometer, spectrophotometer, atomic absorption spectrophotometer, gas chromatograph.

BOOKS RECOMMENDED

1. Page et al. 1982. Methods of soil analysis. Part-2, SSSA and ASA, USA.
2. Westerman, R.L. 1990. Soil Testing and Plant Analysis. 3rd Edition, Soil Science. Society of America Inc., Madison, USA.
3. Carter, M.R. 1993. Soil Sampling and Methods of Analysis. Lewise, Boca Raton, Florida, USA.
4. Sparks, D.L. 1996. Methods of Soil Analysis. Part-3, Chemical Methods. SSSA, Madison, USA.

SS-702 SOIL CHEMISTRY 4(3-2)

THEORY

The study of clay colloidal properties. Ion exchange reactions. Absorption isotherms. Application of free energy function. Chemical potential. Use of Nernst equation. Determination of ion activity coefficients. Soil fixation of plant nutrients and chelation. Phosphate equilibria in soils.

PRACTICAL

Titration curve of H-clay. Management of pH and redox potential. P fixation in soil.

BOOKS RECOMMENDED

1. Bohan H.B. McNeal and G.A. O'Connor. 1985. Soil Chemistry 2nd Ed. Johan Wiley, New York, USA.
2. Sporito, G. 1989. The Chemistry of Soils. Oxford University Press, New York, USA.
3. Sparks, D.L. 1995. Environmental Soil Chemistry. Academic Press Inc., San Diego, CA, USA.
4. Huang, P.M., D.L. Sparks and S.A. Bonyd. 1998. Future Prospects for Soil Chemistry, SSSA Special Publication No. 55, SSSA, Madison, USA.

SS-703SOIL FERTILITY MANAGEMENT IN RAINFED AREAS 3(2-2)

THEORY

Soil fertility status of rainfed areas. Factors affecting soil fertility under minted conditions; soil moisture, soil organic matter, soil erosion, and cropping systems. Fertilizer-moisture interaction; water-use efficiency and fertilizer-use-efficiency. Improving fertilizer-use-efficiency; balanced fertilization, efficient method of fertilizer application. Soil moisture management. Soil organic matter management in rainfed areas. Proper use of crop residues, poultry manure, organic wastes. Use of biofertilizer for soil fertility improvement; mycorrhizae, effective microorganisms (EM) blue and green algae rhizobia.

PRACTICAL

Field and pot-experimentation to demonstrate comparative use of fertilizers, organic manures, biofertilizers, and cropping systems for soil fertility management in rainfed areas. Soil fertility evaluation through soil testing and plant analysis.

BOOKS RECOMMENDED

1. Tisdale, SL, WL. Nelson, JD. Beaton, and J.L. Havlin 1993. Soil Fertilizers 5"[1] Ed. McMilla Publishing Co., New York, USA.
2. Engelstad, G.P. (Ed.). 1985. Fertilizer Technology and Use. Soil Sci. Soc. Am. Inc., Madison, WL, USA.
3. Mengel, K and E.A. Kirkby. 1987. Principles of Plant Nutrition. 4th Ed. Int., Potash Inst. Bern, Switzerland.
4. Black, C.A. 1995. Soil Fertility Evaluation and Control. Lewis Publishers, Boca Raton, PI., USA.
5. Subba Rao, N.S. 1992. Biofertilizers in Agriculture. Oxford and IBH Publishing Co. Pvt, Ltd., New Dellhi, India.
6. Raymond P. Poincelot. 1986. Towards a More Sustainable Agriculture. A VI Publishing Co., Inc., West Port, Connectient.
7. Publications related to Soil Fertility by NFDC, Islamabad, Pakistan.

SS-704 SOIL MANAGEMENT AND PLANT GROWTH 4(3-2)

THEORY

Saline-sodic soils and their management Selection and screening of crops for salinity, sodicity and boron toxicity. Current assessment of crop salt tolerance. Mechanism of salt tolerance. Effect of drought on plant growth drought tolerance. Land capability evaluation for erosion control. Management of rangeland, woodland, commercial forests and plantation. Management of water logged soils in relation to plant growth.

PRACTICAL

To study the effect of salinity, sodicity and water-logged conditions on plant growth.

BOOKS RECOMMENDED

1. Sopher, G.G. and J.V. Baird 1978. Soil and Soil Management. Apprentice Hall Co. Virginia, USA.
2. Rabincite, G.C. 1984. Water Conservation in Land Seape, Design and Management. Van Noster and Reiahold Company., Publisher.
3. Abrol. l.P., J.S.P. Yadav. And F.I. Masood. 1988. Salt-affected Soils and their Management. Soil Bull. No. 390, FAO, Rome, Italy.

SS-705 SOIL CLASSIFICATION 3(2-2)

THEORY

Principles and historical development of soil classification. Soil taxonomy, Detailed study ofsoil orders, suborders, great groups, families and series with emphasis on Pakistan soils. Differentiation of soils in the field. Aerial photographs and their interpretation.

PRACTICAL

Aerial photographs and map reading. Mapping techniques and representation of field data on a map. Visit to different soil series under variable climatic conditions or Rawalpindi, Muzaffarabad, Peshawar, Gujransala and Faidalabad.

BOOKS RECOMMENDED

1. Soil Survey Staff. 1978. Soil Taxonomy. A basic system of soil classification for making and interpreting soil survey. Agri. Handbook 436, US. Government Printing Office, Washington, D.C.
2. Buol, S.W, FD. Hole and R.J. Mecracken. 1980. Soil Genesis and Classification. The Iowa State University Press. Ames.
3. Soil Survey Division Staff. 1993. Soil Survey manual USDA, US Govt. Printing Office, Washington, D.C., USA.
4. Soil Survey Staff. 1998. Key to Soil Taxonomy 7th Ed. USDA. Washington, D.C. USA.

SS-706 SOIL MINERALOGY 4(3-2)

THEORY

The Principles of mineralogy and crystal chemistry applied to the classification and nomenclature of soil clay minerals. Structure, properties and weathering transformation of common soil minerals and their relation to chemical composition of soils. Techniques of mineral identification including chemical, X-ray diffraction, optical and electron microscopic methods.

PRACTICAL

Identification of soil minerals by chemical methods. X-ray diffraction analysis and electron microscopic techniques.

BOOKS RECOMMENDED

1. Dixon, J.B. and S.B. Weeds. 1977. Minerals in Soil Environments. Soil sci. Soc. America Inc., Madison, Wisconsin, USA.
2. Marshall, C.E. 1977. The Physical Chemistry and Mineralogy of soils. Vol. II. Wiley Interscience Publications, New York.
3. Jackson, M.I. 1975. Soil Chemical Analysis. Advanced Course. 2nd Ed. Madison, Wisconsin, USA.
4. Page, A.L., R.H. Miller and D.R. Keeney. 1982. Methods of Soil Analysis, Chemical and Microbiological Properties. 2nd Ed. SSSA. Monograph No. 9, Part 2, Madison, Wisconsin, USA.

SS-707 PLANT GROWTH AND SOIL WATER RELATION 3(2-2)

THEORY

Water movement in the soil. Darcy's and Extended Darcy's Law. Evaluation of field water balance. Movement of water from soil to plant and translocation. Water uptake models. Resistance to water flow in plants. Root elongation and water uptake. Water uptake in stress environment. Hypoxia and plant growth. Growth response curve.

PRACTICAL

Measurement of field soil water by different techniques. Measurement of soil water diffusivity. Determination of infiltration rate by pressure, infiltrometer and tension infiltrometer. Use of mathematical models for study of plant growth in stressed environment.

BOOKS RECOMMENDED

1. Barber, S.A. and D.R. Bouldin (Eds.). 1984. Roots, Nutrients and Water Influx and Plant Growth. ASA Spee. Publ. No. 49, ASA Madison, WL, USA.
2. Marschner, H. 1986. Mineral Nutrition of Higher Plants. Academic Press. Inc., London., UK.
3. BARD. 1990. Soil Physics-Application under Stress Environments. Proceedings of Intern. Symposium on applied soil physics in stress environment, PARC., Islamabad.

SS-708 NUTRIENT DIAGNOSTIC TECHNIQUES 2(1-2)

THEORY

Different nutrient diagnostic techniques. Nutrient deficiency syrpptorns.ot'N, P, K, Ca, My, S, Fe, Mn, Zn, Cu, B, Mo and Cl. Chemical methods of soil fetUUzer assessment. Rapid methods of soil fertility assessment. Correlation of soil tests with crop response. Biological methods for determining nutrient status of soils. Plant analysis. Plant tissue tests for determining nutrient status of plants. Critical limits of essential elements in plants.

PRACTICALE

Deficiency symptoms in the field. Visit to NARC, AAR1 and NIAB. Nutrient status of plants in the field by quick test. Nutrient status of soil by quick test. Soil Testing Kit. Each student will conduct sand culture experiment to create deficiency symptoms.

BOOKS RECOMMENDED

1. Chapman, H.D. 1966. Diagnostic Criteria for Plants and Soils. Division of Agricultural Science, California, Riverside.
2. Tisdale, S.L., W.L., Nelson, J.D. Beaton and J.I. Havlin. 1993. Soil Fertility and Fertilizers. 5th Edition, McMillan Publishing Co., New York, USA.

SS-709 FERTILIZER TECHNOLOGY AND MARKETING 3(3-0)

Agriculture and Fertilizer use at present and by year 2010. Chemical fertilizers in relation to 1PNS (Integrated Plant Nutrition System). Organic fertilizers, Biofertilizers and compost making. Fertilizer manufacturing, manufacturing of nitrogen, phosphates potassium and micronutrient fertilizers. Raw materials need, chemical reations involved, manufacturing process, handling, labeling, storage and transportation. Essentials of laboratory for quality control. Per unit cost of fertilizers and economics of fertilizers use. Source of energy for fertilizer industry. Fertilizer production at present and by year 2010. Public and private sectors involved in fertilizer industry. Problems of fertilizer industry. Future plans and policies of fertilizer production. Fertilizer use and impact on crop production and environment. Straight vs Complex fertilizers. Blending of fertilizer, import i and export of fertilizers.

Fertilizer marketing, agencies involved, public vs. private sector. Distribution of fertilizers. Distribution channels. Quality control, Malpractices in fertilizer marketing and mixing of odd materials with fertilizers. Quality checking, fertilizer law. Measures for timely availability of fertilizers. Problems and constraints of fertilizer marketing. Suggestions and measures for improvement of marketing systems.

BOOKS RECOMMENDED

1. Mcvikar, M.H., G.L,. Bridger and L.B. Nelson. 1983. Fertilizer Technology and Usage. 3rd Edition, SSSA, Madison. Wisconsin, USA.
2. NDFC, 1998. Integrated Plant Nutrient System (IPNS): Combined use of organic and inorganics. NFDC, Islamabad Publication 3/98.
3. NFDC. 1998. Micronutrients in Agriculture. Pakistan perspective, NFDC, Islamabad publication 4/98.
4. NFDC. 1999. Fertilizer Related Statistics. NFDC, Islamabad.
5. Twyford L.T., M.I. Bajwa and M.T. Saleem. 1993. Fertilizer use at Farm Level. NFDC publication No. 5/93.

SS-710 SOIL SALINITY AND WATERLOGGING 3(2-2)

THEORY

Introduction; origin of saline and sodic soils, processes of formation of salt affected soils. Classification criteria and categories of salt affected soils. Extent of problem in Pakistan. Effect of salinity on plant growth. Reclamation of salt affected soils. Measurement of salinity and sodicity. Quality and classification of irrigation water. Water logging and its causes, physical and chemical changes in waterlogged soils, control and its measurement. Extent of problem in Pakistan.

PRACTICAL

Measurement of electrical conductivity of soil saturation extract. Measurement of cation-exchange capacity of soil. Determination of the amount of soluble calcium + magnesium and soluble sodium in soil saturation extract to calculate Sodium Adsorption Ratio (SAR). Calculation of exchangeable sodium percentage (ESP). Determination of the amounts of chlorides and sulphates in soil saturation extract. Analysis of irrigation water for electrical conductivity, sodium adsorption ratio, chlorides, sulphates, carbonates, bicarbonates, nitrates, fluorides, boron, and silica.

BOOKS RECOMMENDED

1. Brady, N. C. 1996. The Nature and .Properties of Soil. 11th Edition. MacMillan Publication Co., New York.
2. Rashid, A. 1996. Soil Science. National Book Foundation, Islamabad.
3. F.A.O. 1976. Quality of Water in Agriculture. Bulletin 29. Irrigation and Drainage series.

SS-713 ADVANCED SOIL PHYSICS 3(3-0)

THEORY

Physical characteristics of soil, the disperse system, soil dynamics, soil water content and potential. Mechanist view point. Potential concept and various types of potentials, thermodynamic view point of potential. Practical view point of soil water, soil transport of solutes, hydrodynamic dispersion. Heat flow, stress strain relationships. Measurement and modeling of evaporation and transpiration.

BOOKS RECOMMENDED

1. Baver, L. D., W.H. Gardner, and W.R. Gardner 1972. Soil Physics.
2. Gildval, B.P. and R. R. Tripathi 1987. Soil Physics. John Wiley and Son, N.Y.
3. Hillel, D. 1980. Fundamentals of Soil Physics. Academic Press, N.Y.
4. Hillel, D. 1980. Applications of Soil Physics.

SS-714 ADVANCED SOIL FERTILITY 3(2-2)

THEORY

Fertilizer application and plant growth response. Economic, scientific basis of fertilizer application. Efficient fertilizer use technology for field, garden and vegetable crops. Fertilizer use technology for rainfed areas. Modern developments in N, P and K fertilizer research. Foliar feeding of plant nutrients. Biological aspects of nutrient availability. Rhizobia and Mycorrhizae symbiosis and chemical fertilizer application Fertilizer guide for irrigated and rainfed areas.

PRACTICAL

Study Rhizobia and Mycorrhizae symbiosis in relation to chemical fertilizer application. Fertilizer guide based on soil test values. Visit to NFDC and NARC, Islamabad, and to UAF and AARI, Faisalabad to study research trends/achievements in soil fertility.

BOOKS RECOMMENDED

1. Engelstad, O.P. 1985. Fertilizer Technology and Use. SSSA., Madison, USA.

2. Tisdale, S.L., W.L. Nelson J.D. Beaton and J.I. Havlin. 1993. Soil Fertility and Fertilizers 5th Edition McMillan Publishing Company, New'York, USA.

3. Foth, H.D. and B.G. Ellis. 1997. Soil Fertility. 2nd Ed. Lewis, CRC Press, Boca Raton, Florida, USA.

4. Mortvedt, J.J., F.R. Lox, L.M. Shuman and R.M. Welch. 1991. Micronutrients in Agriculture. 2nd Ed. SSSA, Madison, USA.

5. Black, C.A. 1993. Soil Fertility Evaluation and Control. Lewis, Boca Raton, Florida, USA.

SS-715 ADVANCED SOIL MICROBIOLOGY 4(3-2)

THEORY

Soil microorangisms. Rhizosphere environments. Organic matter decomposition. Humus formation. Mineralization immobilization, Nutrient transformations. Nitrogen, phosphorus, sulphur and micronutrient cycling, Microbial interactions, commensalisms, mutual and antagonistic relationships, Biological Nitrogen Fixation (BNF), Biochemistry of BNF, Biotechnology and genetic engineering, Mycorrhizae relationship. Composting. Biofertilizers, Present and future prospects, Effective microorganisms (EM) Technology.

PRACTICAL

Nutrient culture media. Isolation of bacteria, actinomycetes and fungi. Organic matter decomposition, nitrogen fixation, compost preparation.

BOOKS RECOMMENDED

1. Alexander. M. 1977. Introduction to Soil Microbiology. John-Wiley and Sons, New York, USA.

2. Paul, E.A. and F.E. Clark. 1989. Soil Microbiology and Biochemistry. Academic Press Inc. San Diego, CA, USA.

3. Metting, B. 1992. Soil Microbial Ecology. Marcel and Dekker Inc., New York, USA.

4. Stevenson, F.J. 1986. Cycles of Soil Carbon, Phosphorus, Sulfur and Micronutrients John Wiley and Sons, New York, USA.

5. Page, A.L., R. H. Miller and D. R. Keeney (Ed.). 1982. Methods of Soil Analysis. Part – II, Chemical and Microbiological Properties. 2nd Edition, American Society of Agron and Soil Science Society of America, Madison, WL, USA.

6. Sylvia, D.M., J.J. Fuhi-mann, P.G. Hortel and D.V. Zuberer. 1998. Principles and Applications of Soil Microbiology. Prentice Hall Inc., New York, USA.

SS-716 ADVANCED SOIL CHEMISTRY 3(3-0)

Chemical thermodynamics of soils. Thermodynamic processes. Variable of state. The Maxe well. The Eular, the Gibbs-Duhem relationships. Equilibria in soils, solubility equilibrum in soil solution. Chemistry of soil colloids. Adsorption in soils. Chemistry of submerged soils, Electrodynamic changes.

BOOKS RECOMMENDED

1. Lindsy, W.L., 1979. Chemical Equilibria in Soils. John Wiley and Sons, N.Y., USA
2. Sparks, D.L. 1986. Soil .Physical Chemistry, CRC Press Inc. Boca, USA.
3. Sposito, G. 1984. The Thermodynamics of Soil Solution. Clarenden Press, Oxford, UK.
4. Ponnamperuma, F.N. 1972. The Chemistry of Submerged Soils Advances in Agronomy, N. C. Brady (Ed.), Academic Press, New York, Vol. 24. pp 29-96.

SS-717 EDAPHOLOGY 3(2-2)

THEORY

Introduction; the soils as a natural body for plant growth. Weathering and its types, factors affecting weathering. Classification of soils; their nature, properties and utilization. Soil survey and its utilization. Soil organisms (micro and macro). Soil nitrogen, phosphorus and potassium and their availability for plant growth. Soil resources of Pakistan. Land capability classification.

PRACTICAL

Determination of carbonates, bicarbonates and chlorides in soil saturation extract and in irrigation water. Effect of soil moisture contents and salinity on seed germination and growth of different crops. Determination of bulk density and particle density of soil.

BOOKS RECOMMENDED:

1. Brady, N. C. 1996. The Nature and Properties of Soil. 11th Ed. MacMillan Pub., New York.'
2. Rashid, A. 1996. Soil Science. National Book Foundation, Islamabad.
3. Tisdale, S.L., W. L. Nelson, J. D. Beaton and J. I. Havlin. 1993. Soil Fertility and Fertilizers, 5th Edition, MacMillan Publication Company, New York USA

Answer question 9 if applicable

The internship experience is effective in enhancing

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	Decipline	33	45	22	0	0
h	The link between theory and practice	30	40	20	10	0

Annexure III: Faculty Resumé

Name	Position	Qualification	Specialization
Dr. M. Iqbal Lone	Professor	Ph. D.	Soil & Water Quality
Dr. Safdar Ali	Professor	Ph. D.	Soil & Water Conservation
Dr. M. Saleem Akhtar	Professor	Ph. D.	Soil Mineralogy & Soil Physics
Dr.M. Azhar Naeem	Associate Professor	Ph. D.	Soil & Water Conservation
Dr. Ghulam Jillani	Associate Professor	Ph. D.	Soil Microbiology
Dr. Khalid Saifullah Khan	Associate Professor	Ph. D.	Soil Environment
Dr. Muhammad Akmal	Assistant Professor	Ph. D.	Soil Environment
Dr. M.Tariq Siddique	Assistant Professor	Ph. D.	Soil Fertility/Environment
Arshad Nawaz Ch	Lecturer	M. Sc. (Hons.)	Soil Fertility and
Tanveer Iqbal	Lecturer	M. Sc. (Hons.)	Organic Farming
Dr. Rifat Hayat	Lecturer	Ph. D.	Soil Biology/BNF
Dr. Muhammad Yousaf	HEC Eminent Scholar	Ph. D.	Soil Chemistry

Annexure III:Results of Faculty Survey

Sr. #	Parameter	Dr. M. Iqbal Lone	Dr. Safdar Ali	Dr. M. Saleem Akhtar	Dr. M. Azhar Naeem	Dr. Ghulam Jilani	Dr. Khalid Saifullah	Dr. Muhammad Akmal	Dr. M. Tariq Siddique	Mr. Arshad Nawaz	Mr. Tanveer Iqbal	Dr. Rifat Hayat	Dr. Muhammad Yousaf
1	Your mix of research, teaching and community service	A	A	A	A	A	On Leave	A	A	A	A	A	A
2	The intellectual stimulation of your work	B	B	B	A	B		A	A	A	A	B	A
3	Type of teaching/research you currently do.	A	A	B	B	A		A	A	B	B	B	A
4	Your interaction with students	B	A	A	A	A		A	A	A	A	A	A
5	Cooperation you received from colleagues	B	B	A	A	B		A	A	B	B	A	A

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6	The mentoring available to you	B	B	D	C	B	On Leave	B	B	B	B	A	A
7	Administrative support from the department	A	B	B	B	B		A	A	B	B	A	A
8	Providing clarity about the faculty promotion process	A	A	A	A	B		A	A	D	C	B	-
9	Your prospects for advancement and progress through ranks	A	A	A	A	B		A	A	B	A	B	-
10	Salary and compensation packages	B	A	B	A	B		A	A	C	B	A	A

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11	Job security and stability at the department	A	A	A	A	A	On Leave	A	A	A	A	A	A
12	Amount of time you have for yourself and family	A	A	C	D	C		B	B	B	B	B	B
13	The overall climate at the department	B	B	B	B	B		A	B	B	B	A	A
14	Whether the department is utilizing your experience and knowledge	B	A	B	B	B		A	A	B	B	A	A

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15	what are the best programs/ factor currently available in your department that enhance your motivation and job satisfaction.	Facilities that have been created in the department	Head of the Institution and Research Projects		Practical Work	-nil-	On Leave	The department may be upgraded to institute and strength to Ph. D. and M. Sc. Research program	Teaching and support to students				
									Upgradation & strengthening of department research projects	Department strengthening of upgradation research & teaching		Department may be upgraded to Institute.		Department may be upgraded as an institution
16	suggest programs/factors that could improves your motivation and job satisfaction	Workshops, Short Courses and Training Program	N. A.		Teaching through participation	Encourgements, Awards and Remarks							Strenthening of Ph. D. program in department is in progress

The results of the faculty survey are summarized as follows:

A: Very Satisfied **B: Satisfied** **C: Uncertain**

D: Dissatisfied **E: Very Dissatisfied**