

Pir Mehr Ali Shah
ARID AGRICULTURE UNIVERSITY
RAWALPINDI



Self Assessment Report
3rd Cycle (2010-2012)
B.Sc. (Hons) Program

DEPARTMENT OF SOIL SCIENCE & SWC

Prepared by:

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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 eleven faculty members; 2 Professors, 3 Associate Professors, 5 Assistant Professors and 2 Lecturers. Nine out of eleven faculty members are Ph.D. The Department offers undergraduate and post-graduate studies. Till now, 297 students have graduated as B. Sc. (Hons.) Agric. At present 40 BSc (Hons) students are studying for their degrees.

Presently deparmental faculty has published very strong resume with reference to international publications and impact factor in addition to national publication publications. It holds national and international seminars to exchange knowledge and views

Criterion 1:

PROGRAM MISSION, OBJECTIVES AND OUTCOMES

Vision: The mandate of the university is to produce high quality agricultural scientists and to form an organized scientific infrastructure for teaching for the development of dry land regions of the country, thus minimizing the income gap between rich and poor. The department of Soil Science & SWC follows this vision.

Mission: To attain excellence in teaching by continual monitoring and evaluation through feedback of faculty members and students, to develop quality in research especially of rainfed areas by addressing the issues of low soil fertility, and soil/water erosion, and to generate professional Soil Science research scientists to serve in public and private sectors.

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 and 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 activities will be emphasized over the next report period: 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: The curriculum for undergraduate and graduate students is prepared to achieve professional positions in industry, private and public sectors. 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 review 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. 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: The program must have measureable objectives to support mission

Documented Measureable 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. Publication of scientific papers, books, manuals etc.
5. Implementation of research projects funded by the universities and other agencies.
6. Development of linkages with national and international research organizations to foster research.

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

Table 1: Program objectives assessment

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 soil problems/issue 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 examination	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 and feed back of students	Before start up projects	Students to make presentations and reports	Presentations, seminars, communication skill development
4	To anticipate new problems in the field	Through entry tests, interviews research own interest	Subject / courses selection before start	Related subjects to be recommended for studies	Enhancement of know-ledge and vision

Standard 1.2: The program must have documented outcome of graduating students

Program Learning Outcomes:

- Revision of teaching methods on modern lines.
- Revision of curriculum as per policy of Higher Education Commission.
- Presentations, seminars, communication skill development.
- Enhancement of knowledge and vision.
- Approval of new curriculum integrated approaches.

Questionnaire surveys were conducted to assess program outcomes of the department graduates for BSc (Hons) Table 2.

Table 2: Relationship of program objectives with program outcomes

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

+ = Relevant

++ = Relevant & satisfactory

+++ = Very relevant & satisfactory

++++ = Highly relevant & highly satisfactory

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

PROGRAM ASSESSMENT RESULTS

(Proformae 1 & 10)

Assessment results of B.Sc. (Hons) program for two years i.e., 2008-09 and 2009-10 comprising four semesters commencing from Fall 2008 to spring 2010 are summerized and illustrated below.

Fall 2010

Teacher Evaluation

Dr. Muhammad Akmal (SS-301)

Comments/suggestions

Teacher is dedicated and conveys the knowledge effectively. He is very friendly and gives respect to the students.

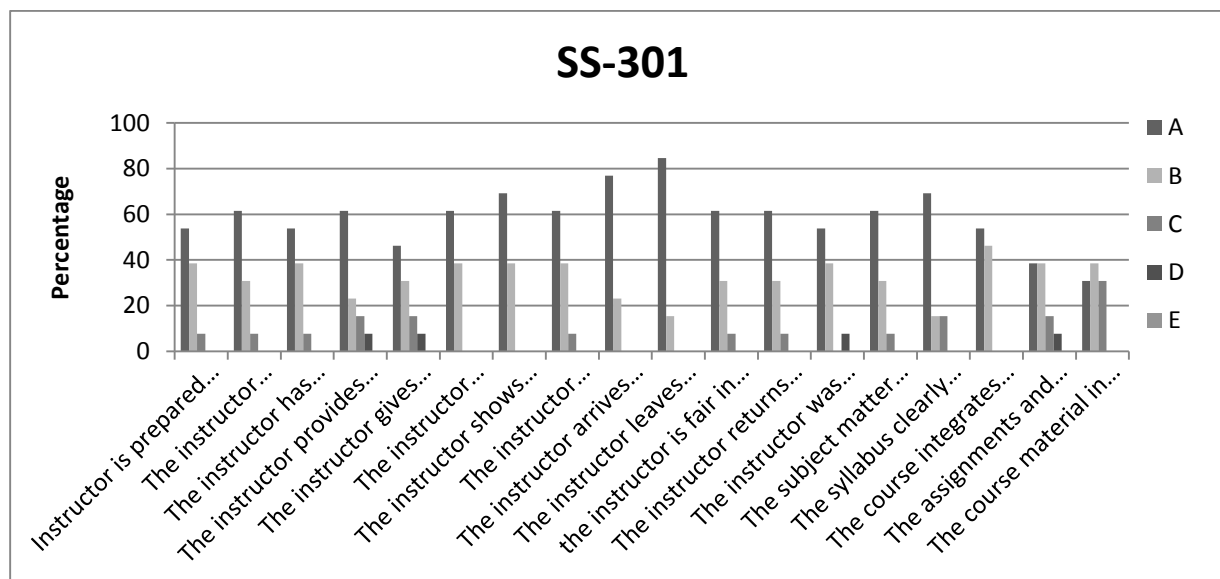


Figure-1: Teacher Evaluation SS-301, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Prof. Dr. M. Azhar Naeem (SS-501)

Comments/suggestions

His attitude was very positive and inspired interest.

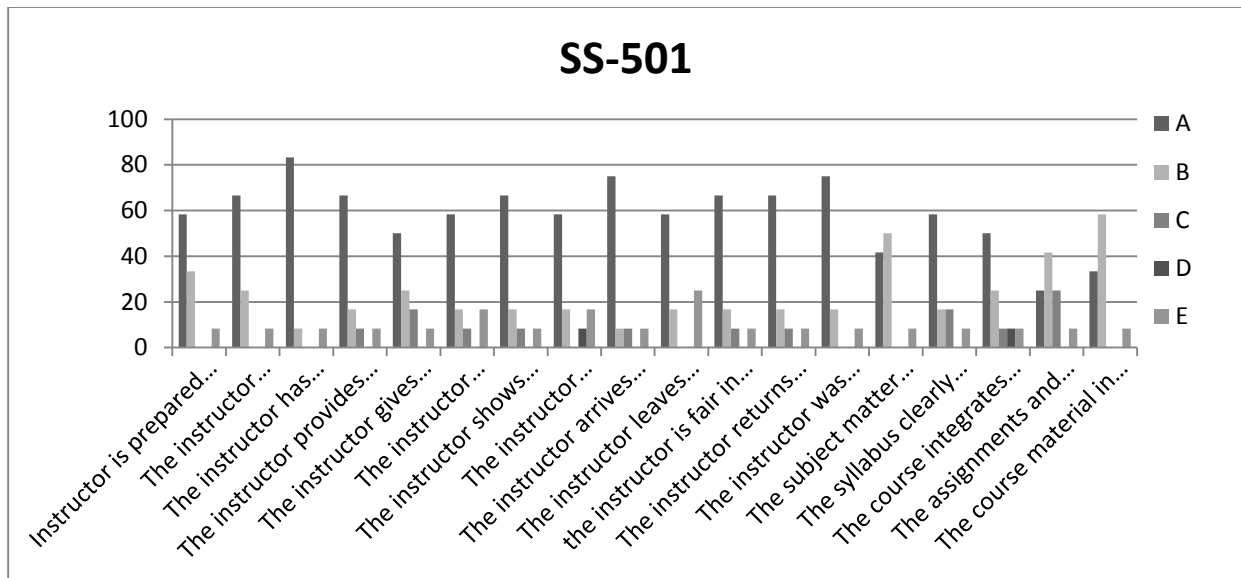


Figure-2: Teacher Evaluation SS-501, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. S. Sohail Ijaz (SS-503)

Comments/suggestions

He has a really great attitude toward students - interested in making sure we're learning.

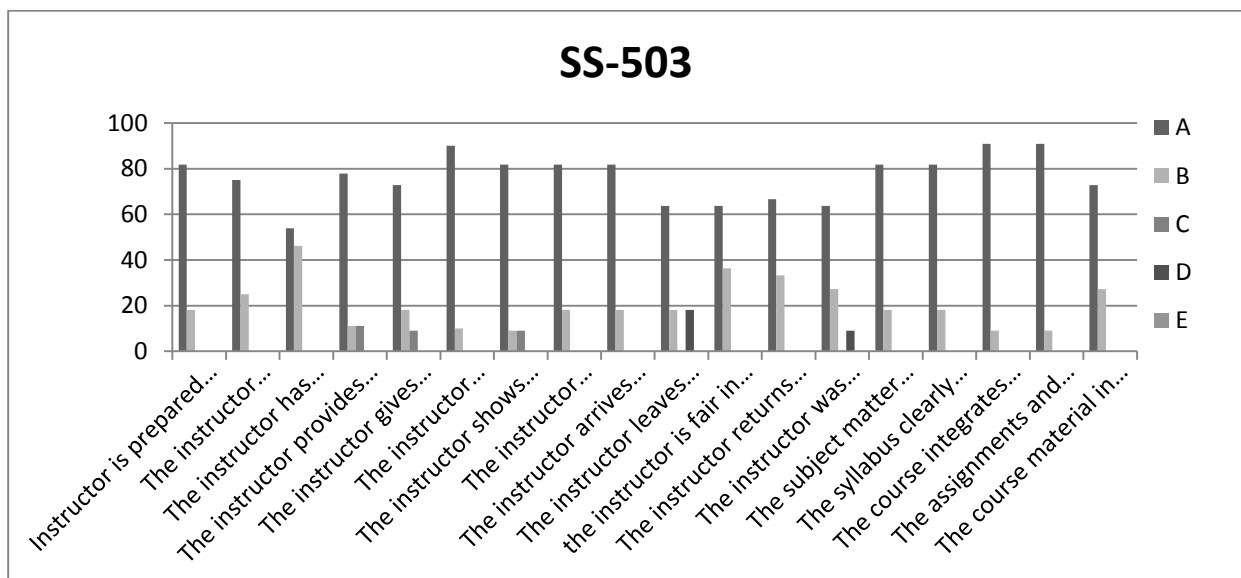


Figure-3: Teacher Evaluation SS-503, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. M. Tariq Saddique (SS-505)

Comments/suggestions

Professor had a great attitude for students. He was very engaged and interested in student's learning.

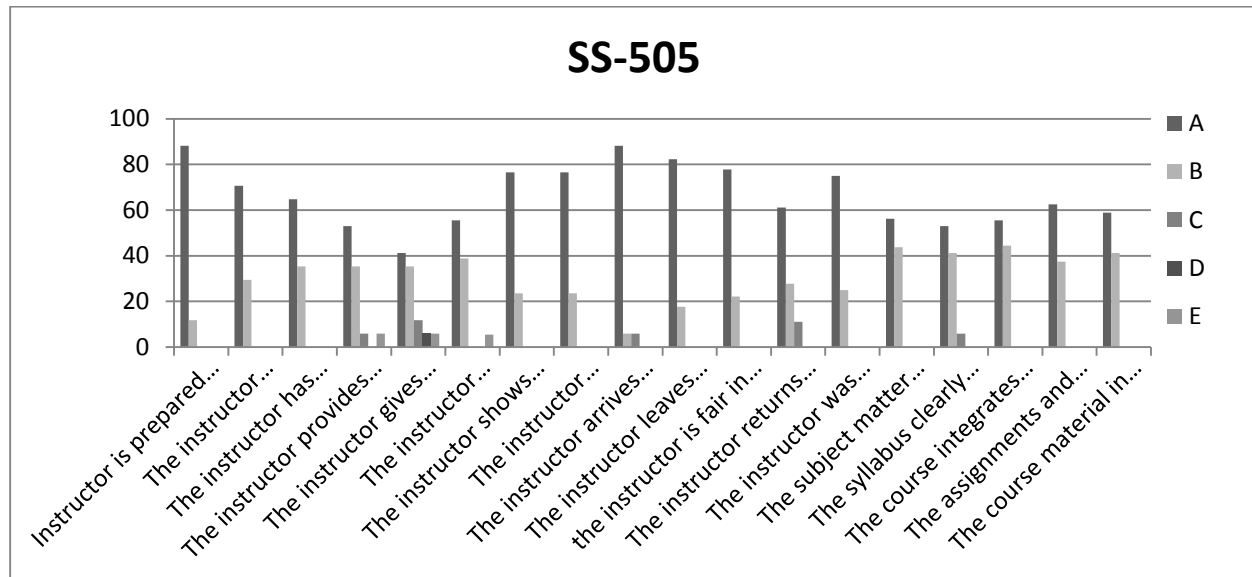


Figure-4: Teacher Evaluation SS-505, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Arshad Nawaz (SS-507)

Comments/suggestions

He had very positive attitude. He was very concerned about students' understanding of topic.

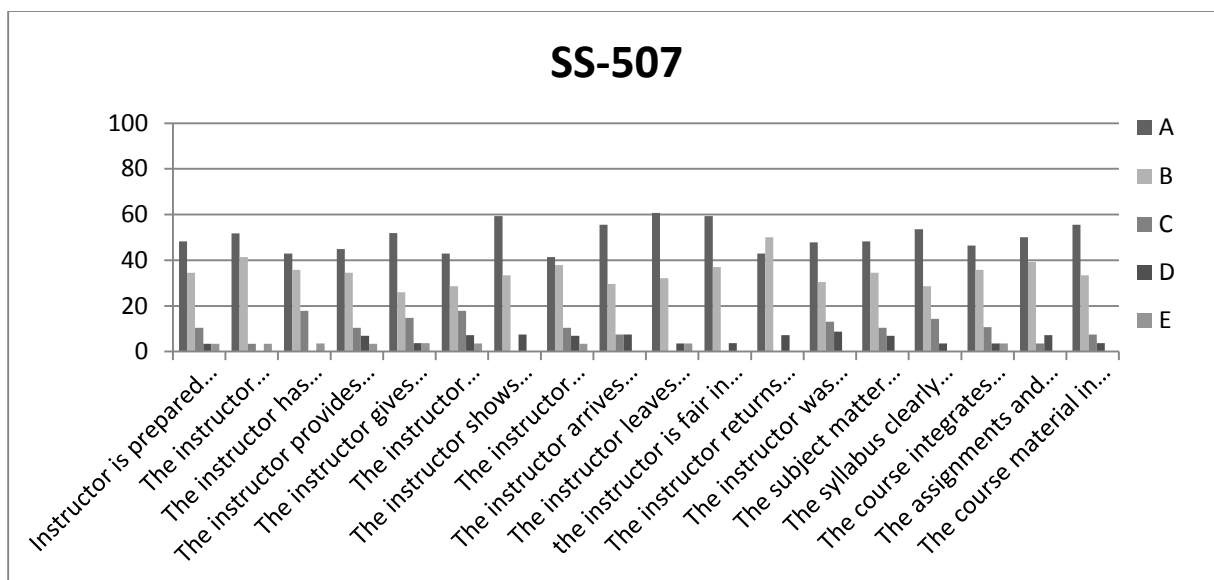


Figure-5: Teacher Evaluation SS-507, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. M. Akmal (SS-509)

Comments/suggestions

We are satisfied for what the teacher had delivered in all of the lectures. His teaching method is fine. He has a good hold of class.

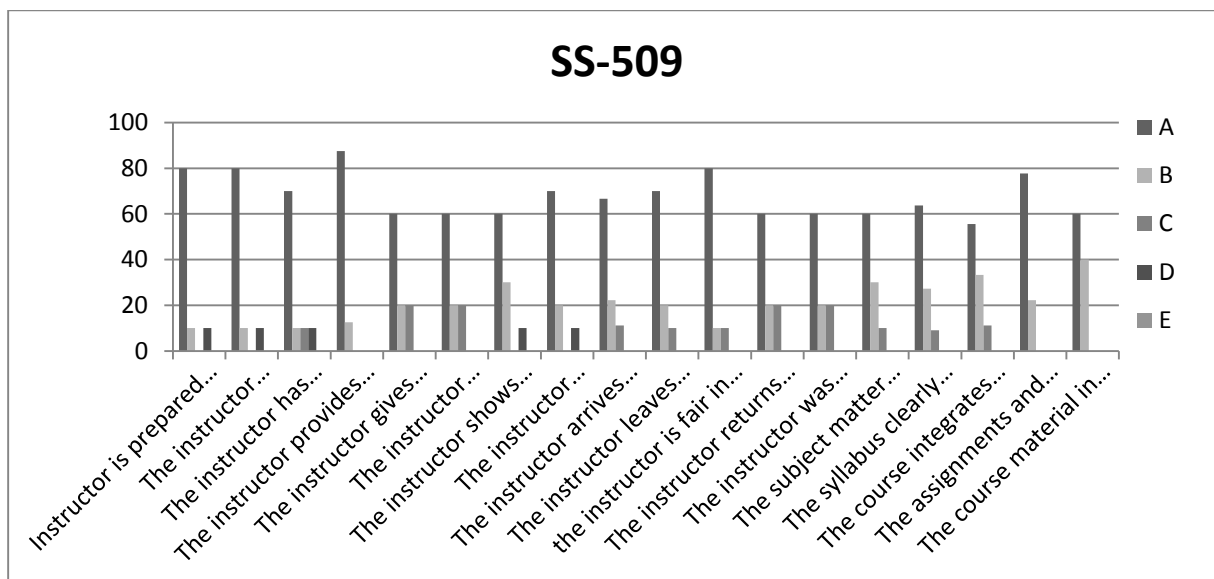


Figure-6: Teacher Evaluation SS-509, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Ghulam Jilani (SS-601)

Comments/suggestions

He is very open to students. Teacher demonstrated concern lecture for learning effectively. I admire his friendly attitude.

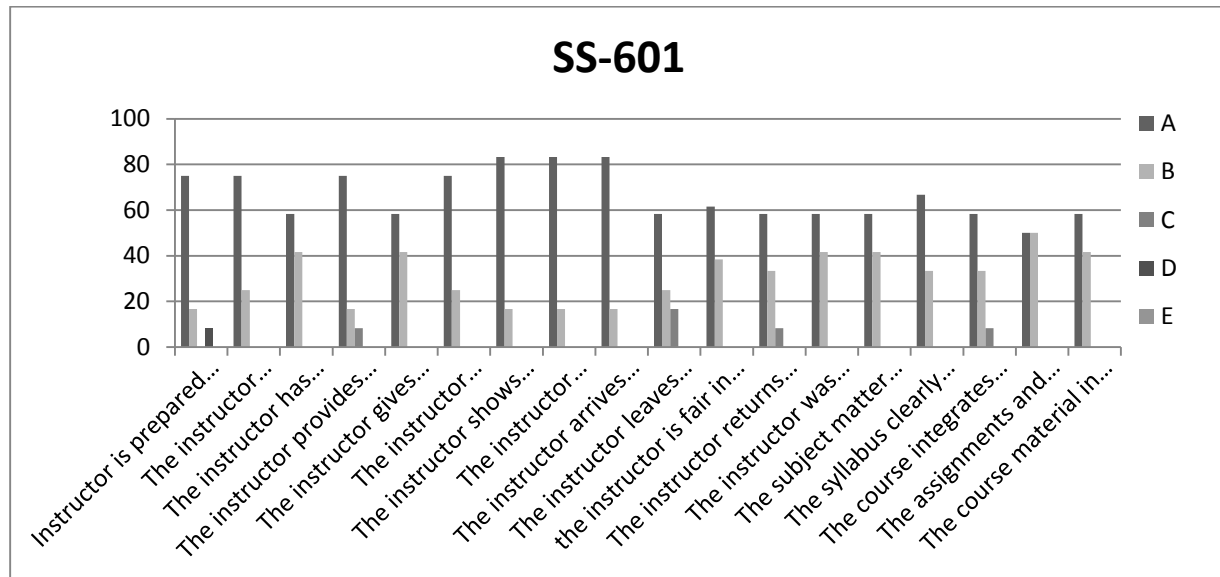


Figure-7: Teacher Evaluation SS-601, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Riaz Ahmad (SS-603)

Comments/suggestions

Instructor offered frequent class hours. He is very dedicated and has strong hold of his subject.

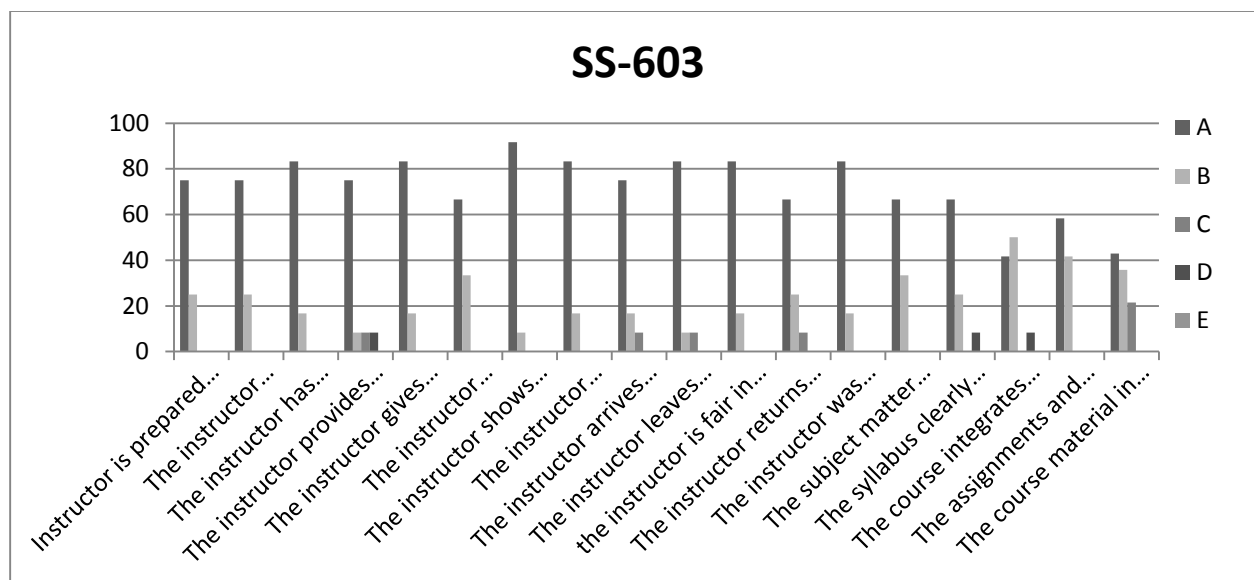


Figure-8: Teacher Evaluation SS-603, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Mr. Tanveer Iqbal (SS-605)

Comments/suggestions

He is very nice and friendly teacher. I am impressed by his regularity in the class.

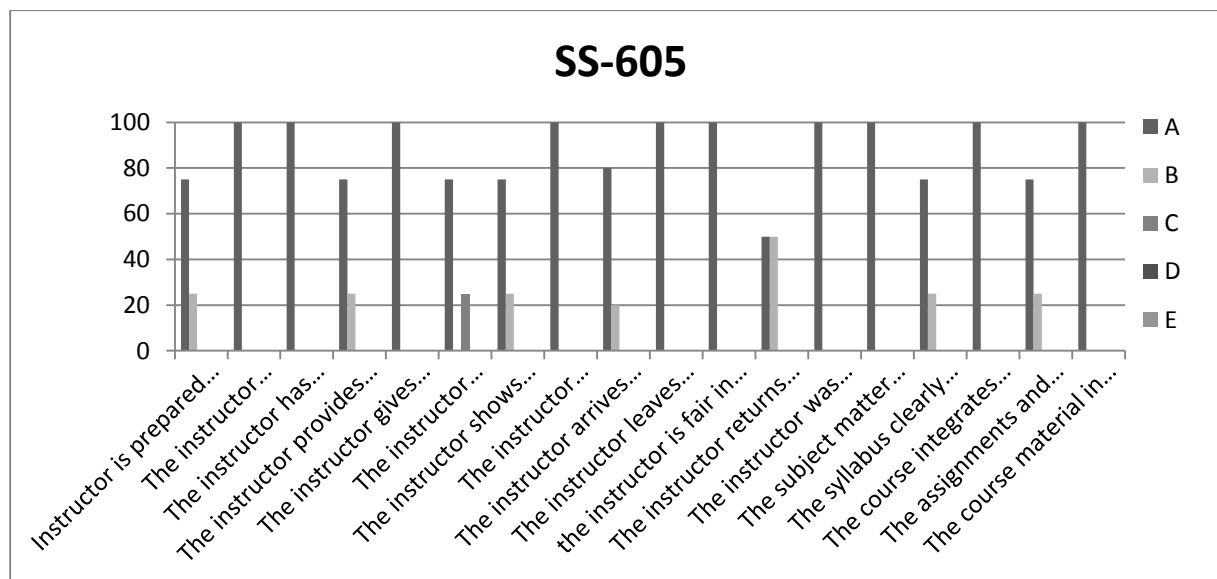


Figure-9: Teacher Evaluation SS-605, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Khalid S. Khan (SS-607)

Comments/suggestions

Teacher is very committed with his lecture delivery. I like his teaching style very much. He is very regular in class and gives respect to the students.

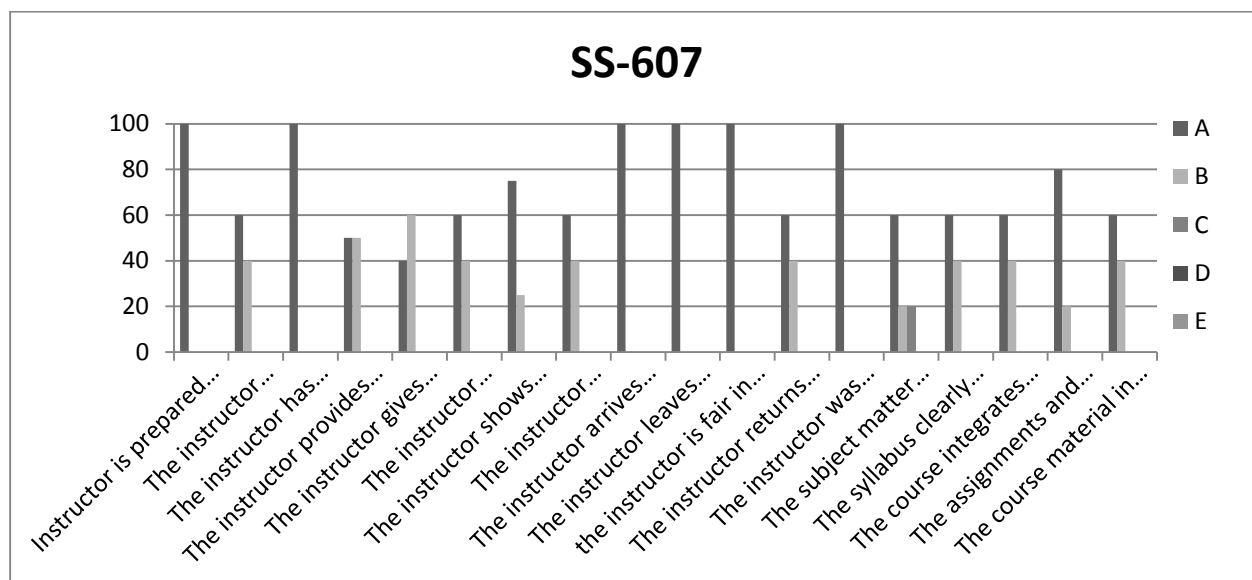


Figure-10: Teacher Evaluation SS-607, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Rifat Hayat (SS-609)

Comments/suggestions

He taught in a way that was easy to understand and encouraged students to participate. His attitude towards students was great.

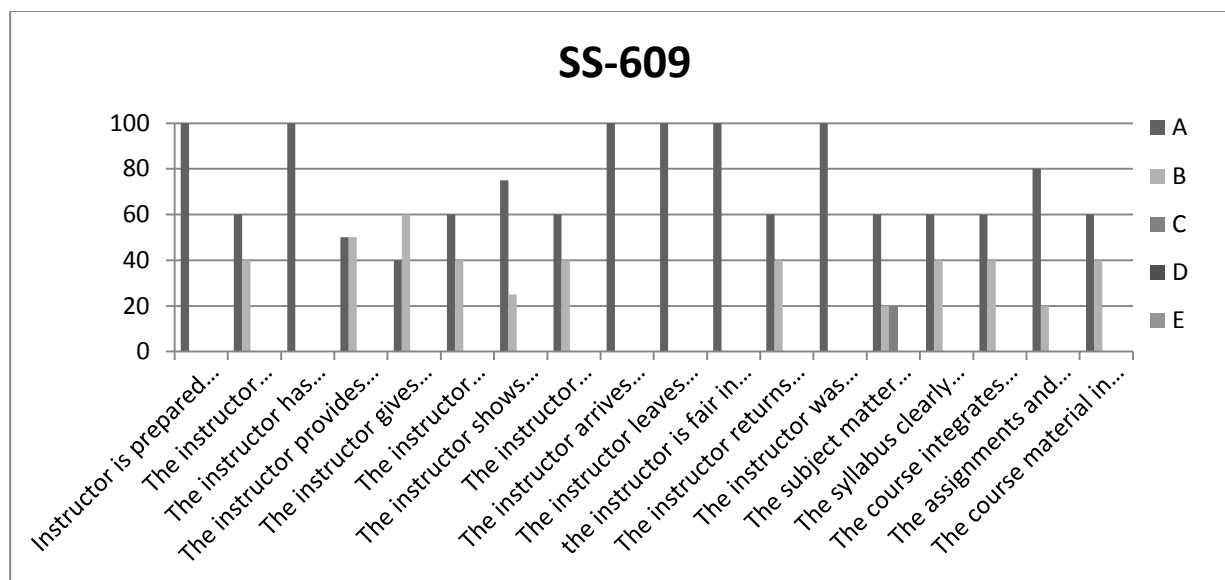


Figure-11: Teacher Evaluation SS-609, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation

Course Evaluation (SS 301)

Comments/suggestions

This course was effective and provided useful knowledge about the basic properties of soil.

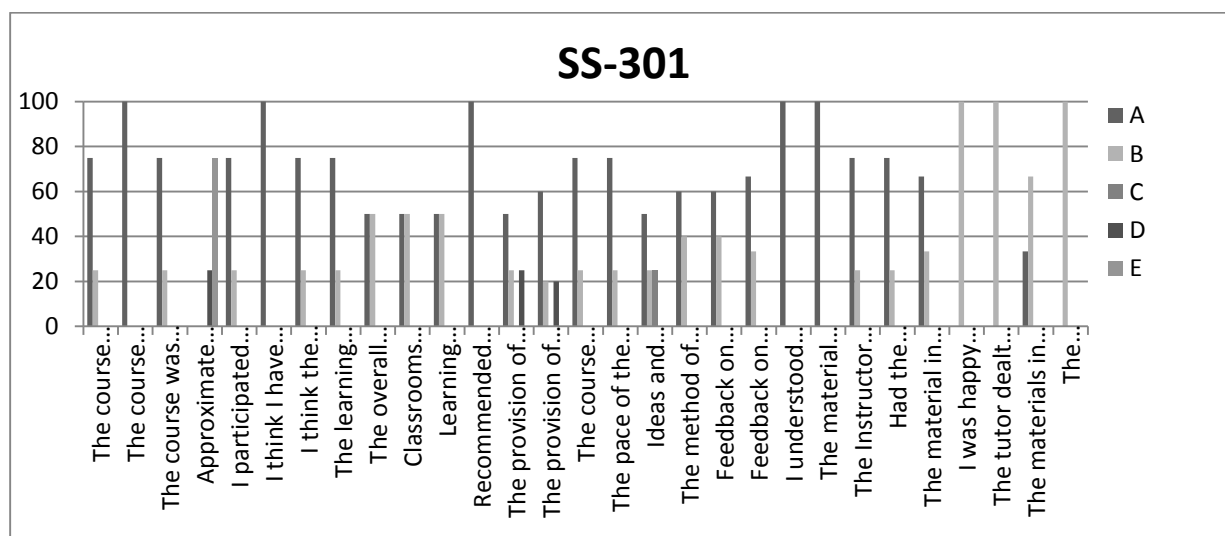


Figure-12: Course Evaluation SS-301, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-501)

Comments/suggestions

The course was interesting and well organized. This course facilitates the understanding of basic knowledge of soil physical properties.

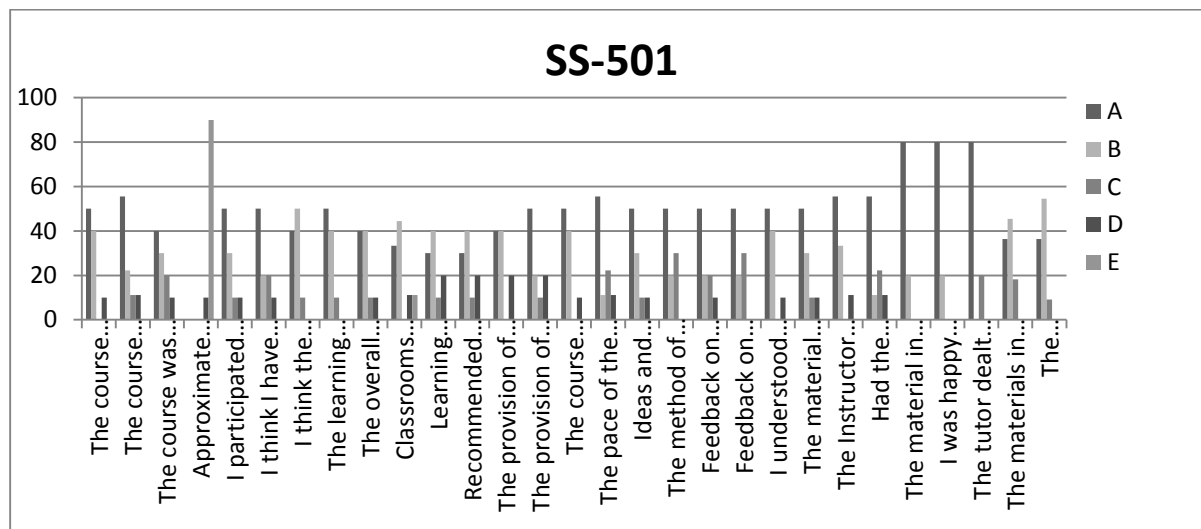


Figure-13: Course Evaluation SS-501, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-503)

Comments/suggestions

This course was difficult, but teacher made it interesting and easy. Course was informative.

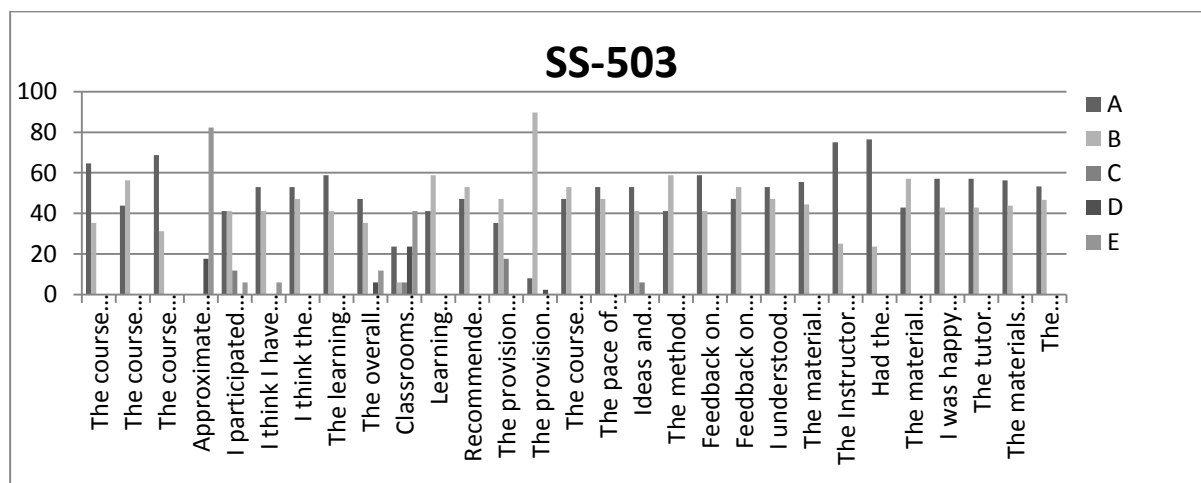


Figure-14: Course Evaluation SS-503, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-505)

Comments/suggestions

The course was easy to understand. The contents of the course were advanced and useful.

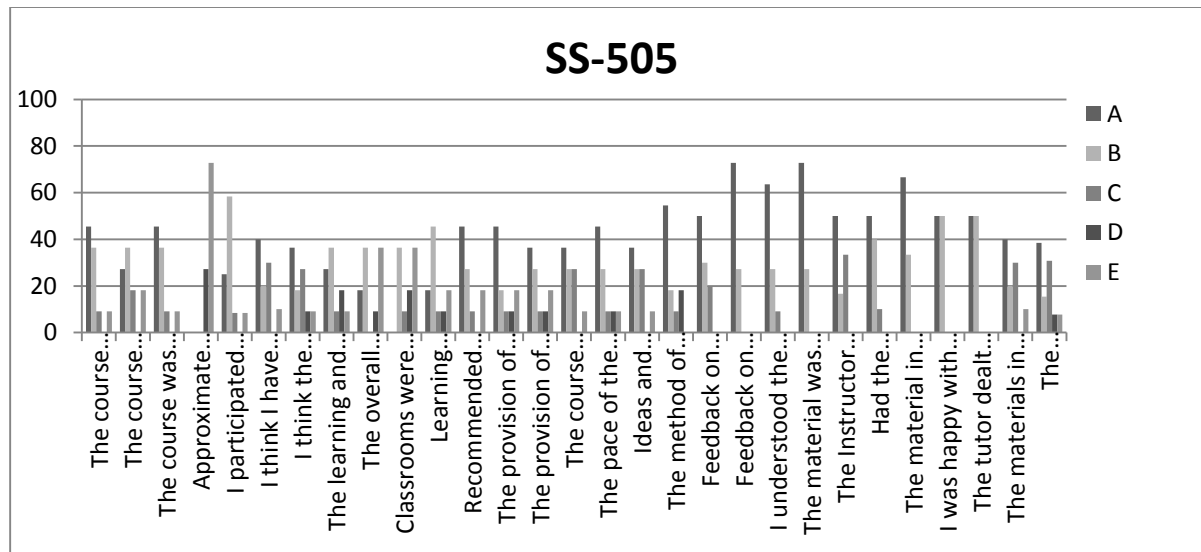


Figure-15: Course Evaluation SS-505, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Evaluation (SS-507)

Comments/suggestions

The course helped to improve our knowledge soil formation processes and soil morphology.
Course contents were well organized.

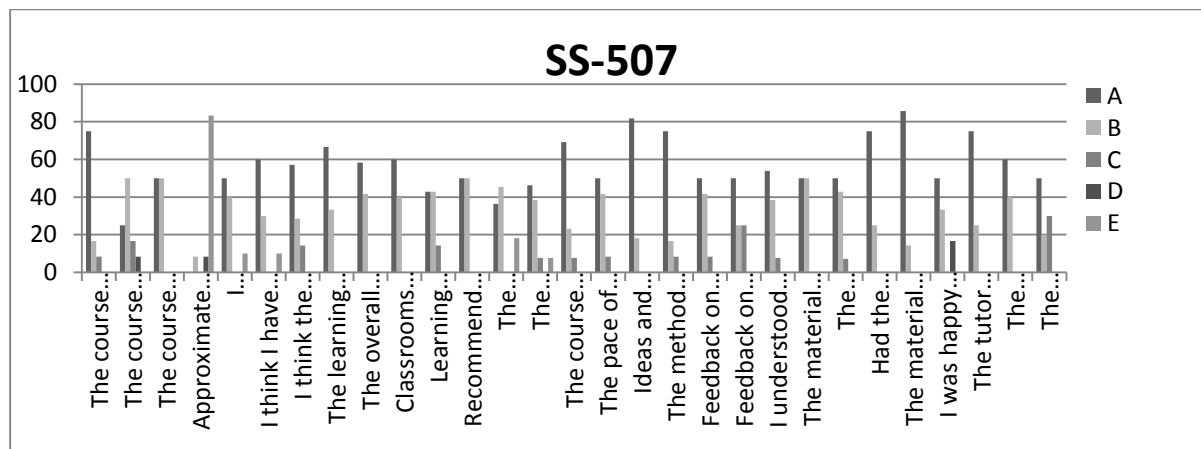


Figure-16: Course Evaluation SS-507, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-509)

Comments/suggestions

Course knowledge was quite updated. Soil classification is difficult course. I liked this course as it was interesting and informative.

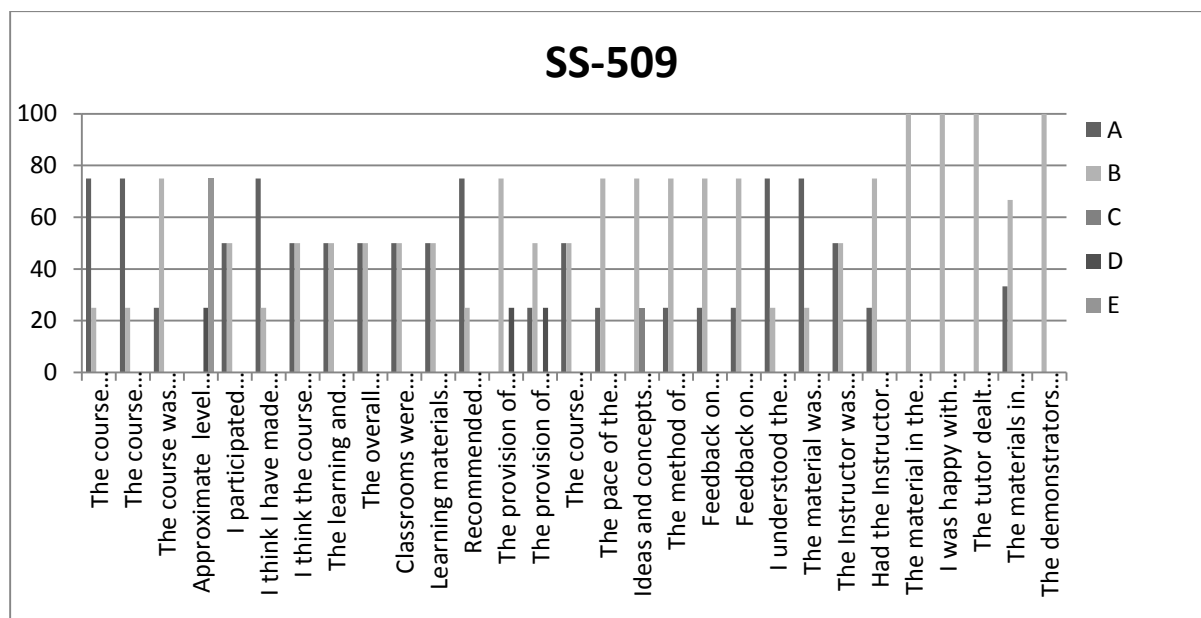


Figure-17: Course Evaluation SS-509, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-601)

Comments/suggestions

The course was well structure and organized. Course was quite lengthy.

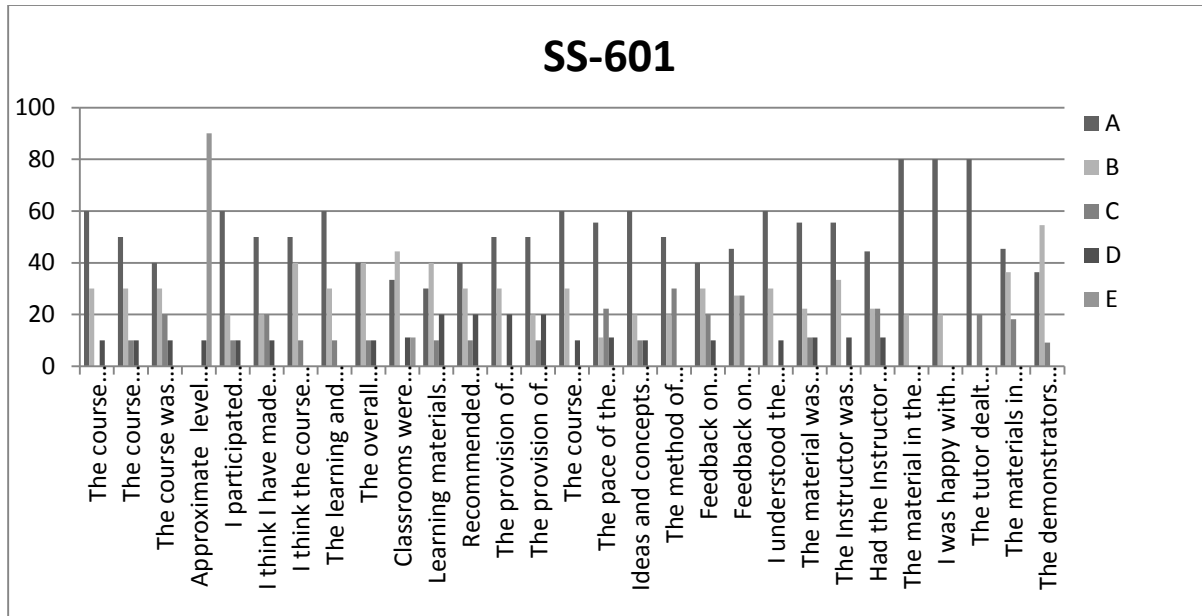


Figure-18: Course Evaluation SS-601, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-603)

Comments/suggestions

Course was difficult, though teacher made it easy. Course was completed in time.

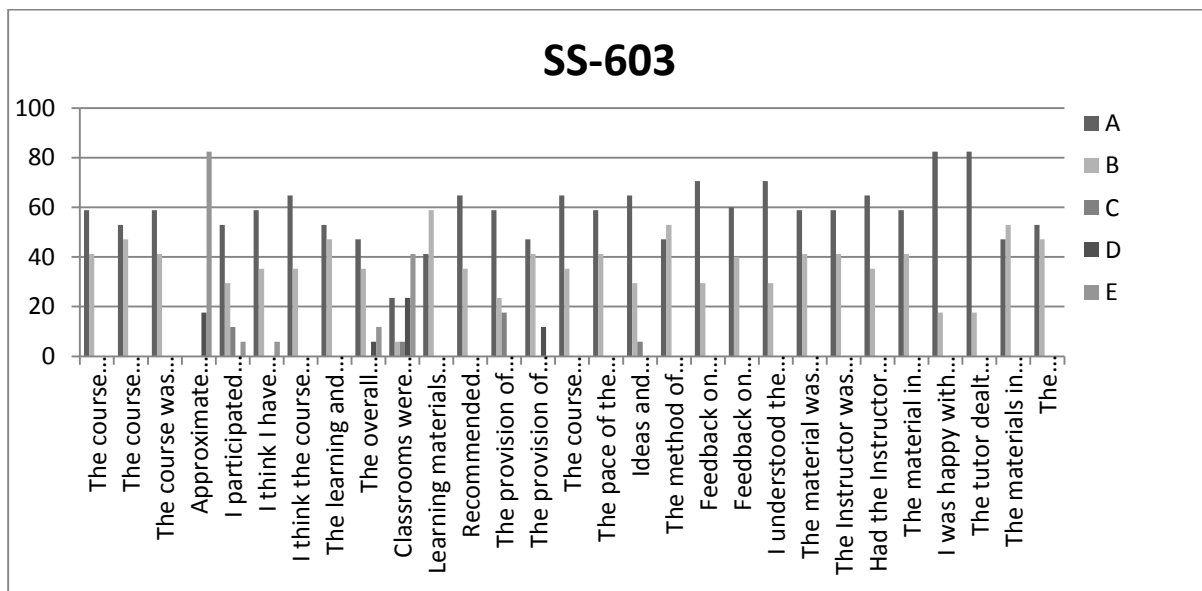


Figure-19: Course Evaluation SS-603, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-605)

Comments/suggestions

The course was informative and useful. I enjoyed the learning of this course.

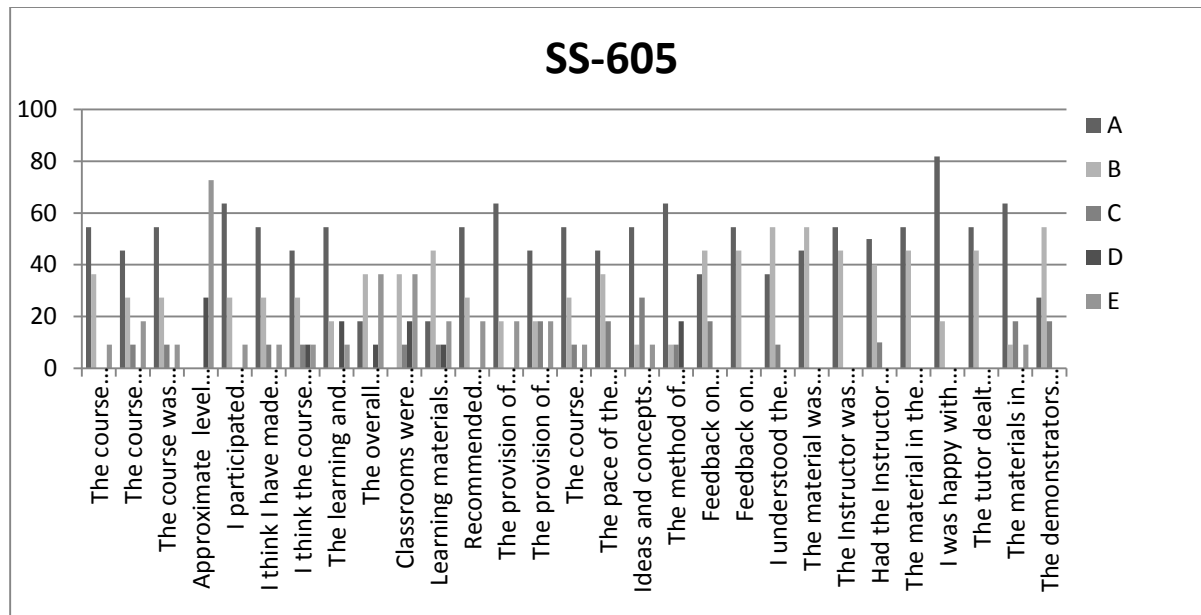


Figure-20: Course Evaluation SS-605, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-607)

Comments/suggestions

This is useful but difficult. The course is well planned and contents are advanced.

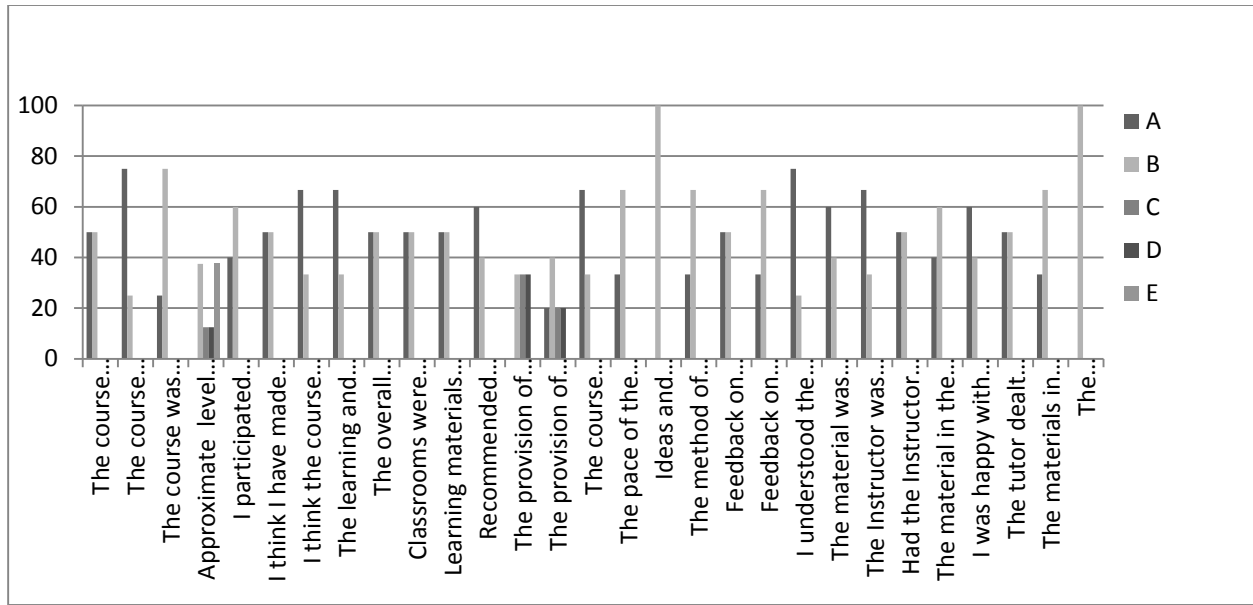


Figure-21: Course Evaluation SS-607, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-609)

Comments/suggestions

I found the course interesting, well updated and useful. The course is quite demanding.

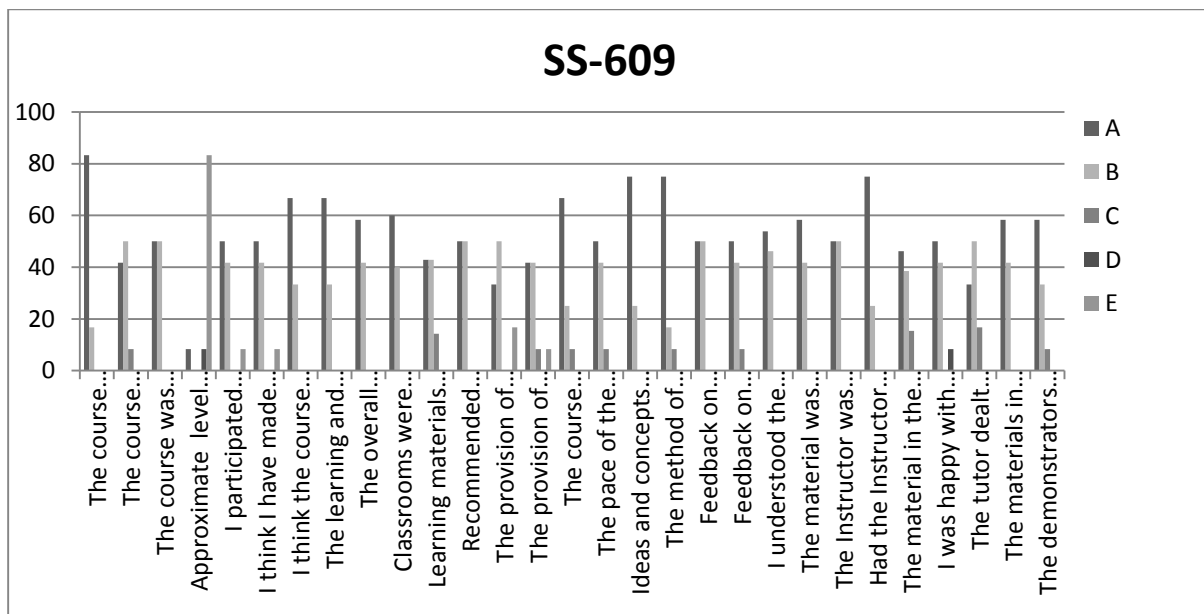


Figure-22: Course Evaluation SS-609, Fall 2010

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Spring 2011 Teacher Evaluation

Dr. M. Tariq Siddique (SS-502)

Comments/suggestions

Teacher is very hardworking and dedicated. He is enthusiastic both about the subject he taught and about teaching.

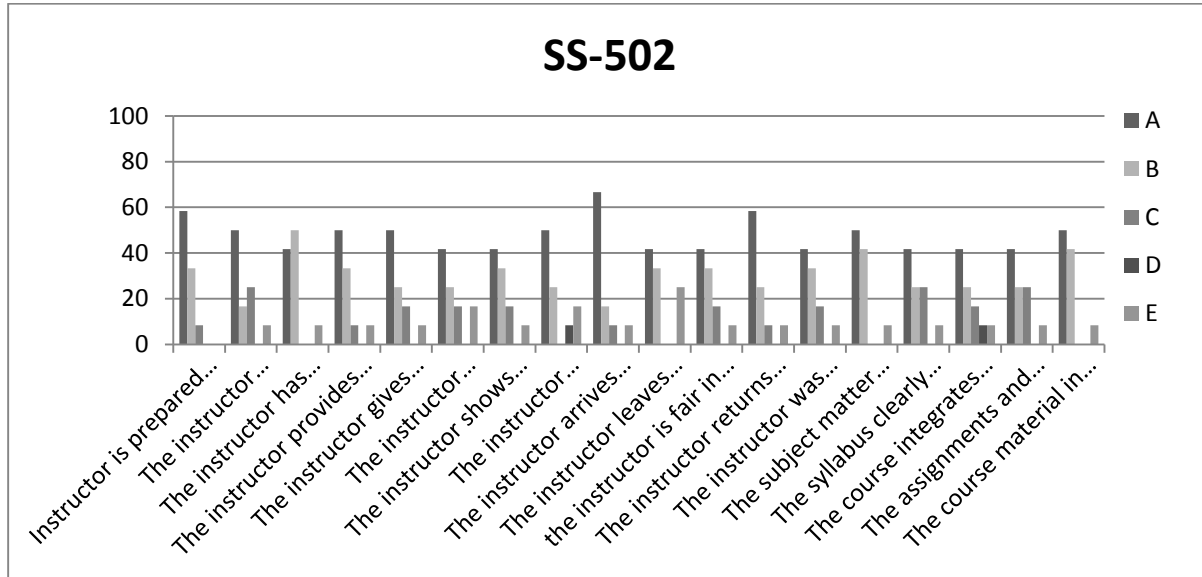


Figure-23: Teacher Evaluation SS-502, Spring 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Mr. Arshad Nawaz (SS-506)

Comments/suggestions

He is very enthusiastic and student friendly teacher. He is very polite.

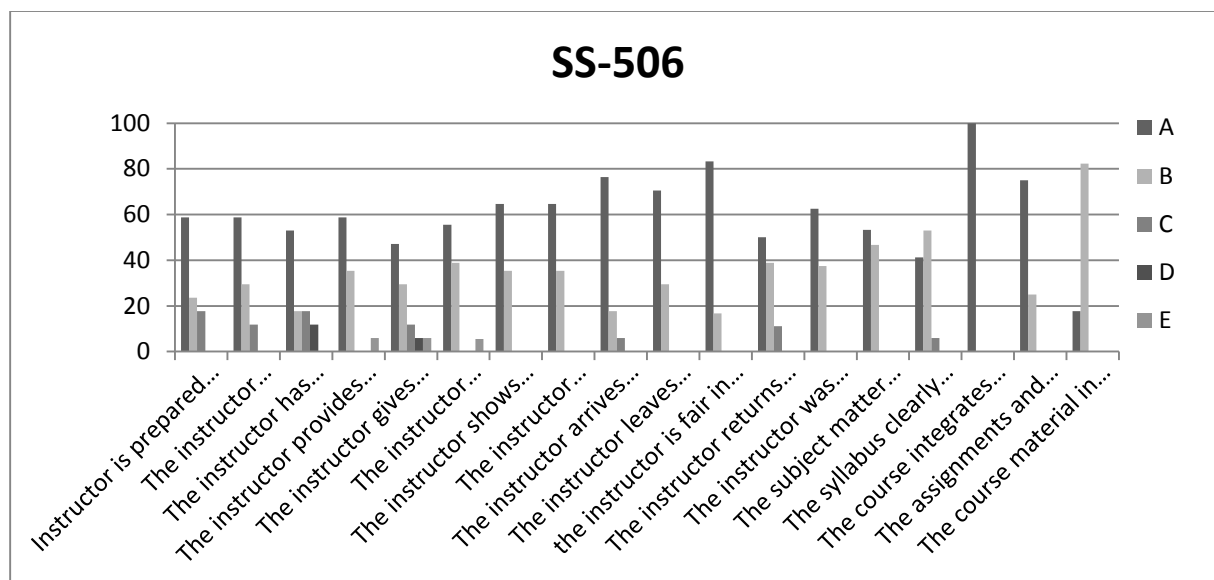


Figure-24: Teacher Evaluation SS-506, Spring 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. M. Akmal (SS-508)

Comments/suggestions

This teacher explained the case studies in an easily understandable way. His passion and enthusiasm for teaching and for the subject made his classes lively and helpful.

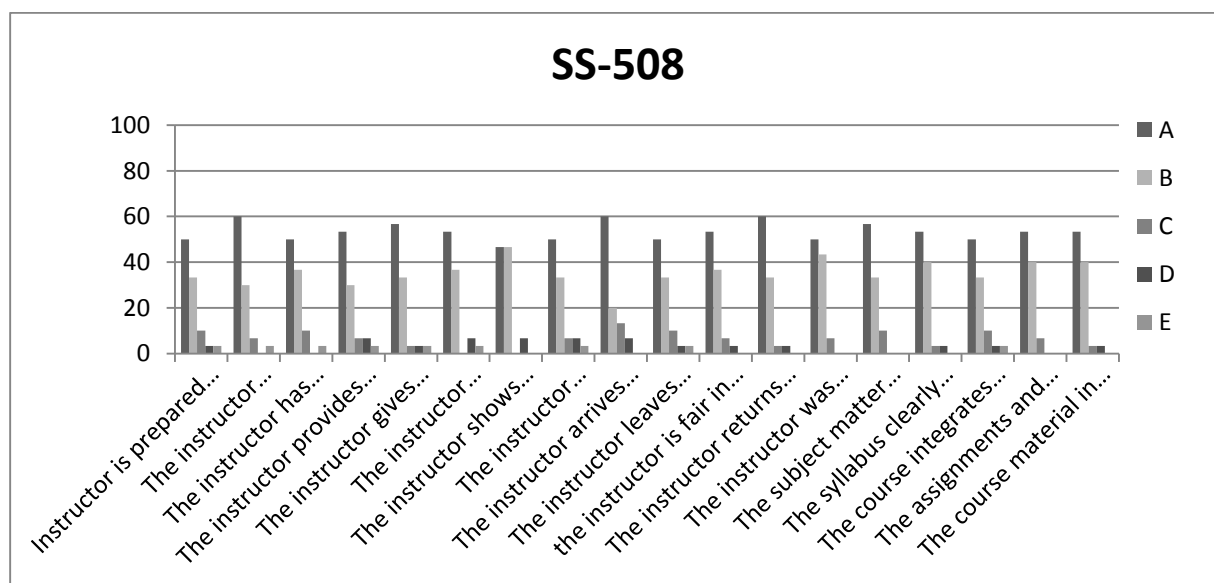


Figure-25: Teacher Evaluation SS-508, Spring 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Rifat Hayat (SS-510)

Comments/suggestions

He is hardworking and punctual teacher. His ways of teaching is so impressive and give advance information about the course. His positive, cheerful attitude made learning easier and more interesting.

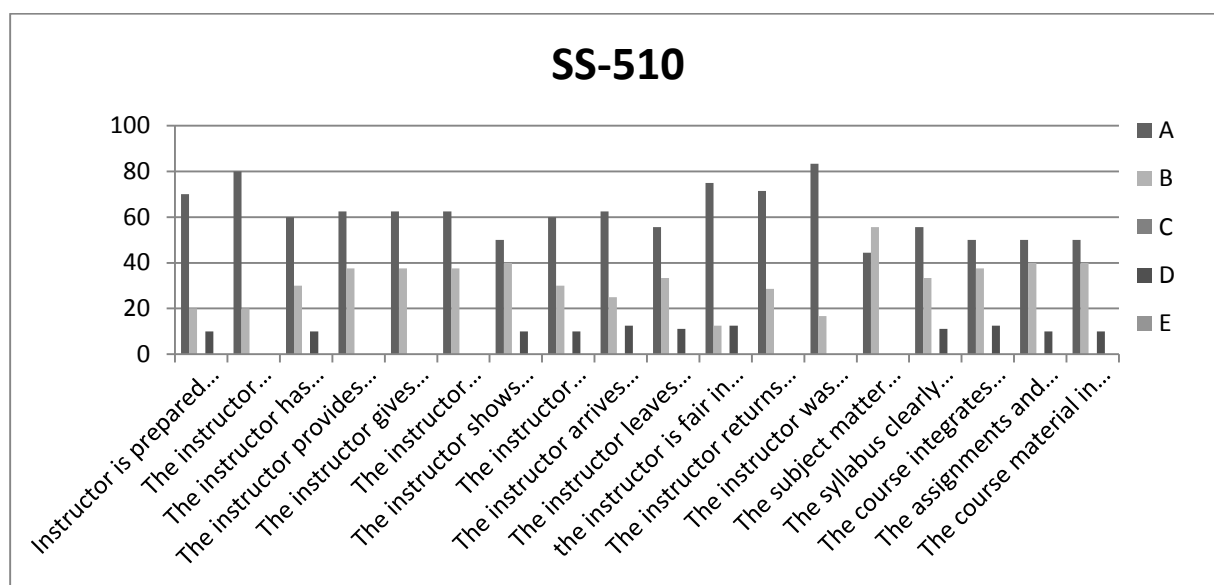


Figure-26: Teacher Evaluation SS-510, Spring 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

(SS- 602)

Comments/suggestions

He is hardworking and punctual teacher. His way of teaching is impressive. Positive, cheerful attitude made learning easier and more interesting.

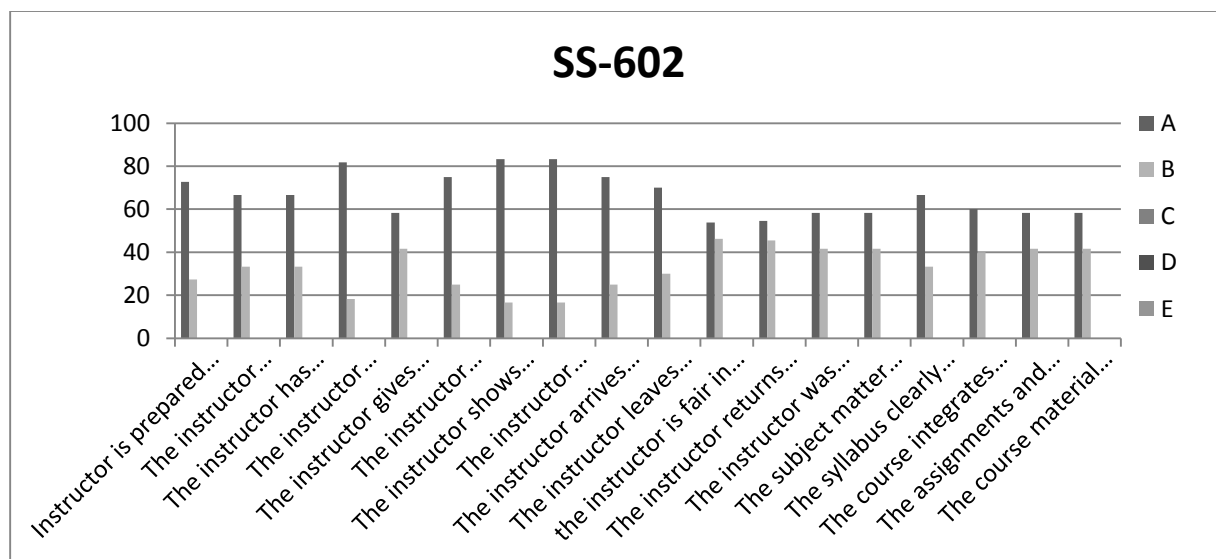


Figure-27: Teacher Evaluation SS-602, Spring 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation

Course Evaluation (SS-502)

Comments/suggestions

This course was very well planned out and thorough in the materials. I learned much of information from this course. We found interesting and enlightening because it contains practical and useful knowledge about salt affected soil and their management.

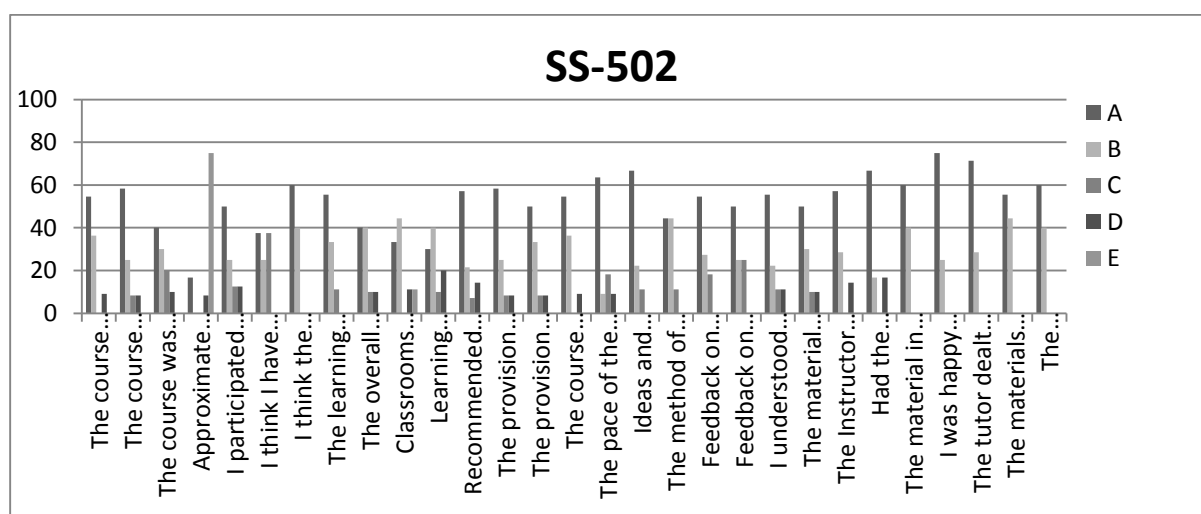


Figure-28: Course Evaluation SS-502, Spring 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Comments/suggestions (SS-506)

This course provided useful information regarding soil and water conservation technologies as well as soil erosion and its management techniques. During this course overall environment of classroom was conducive to learn.

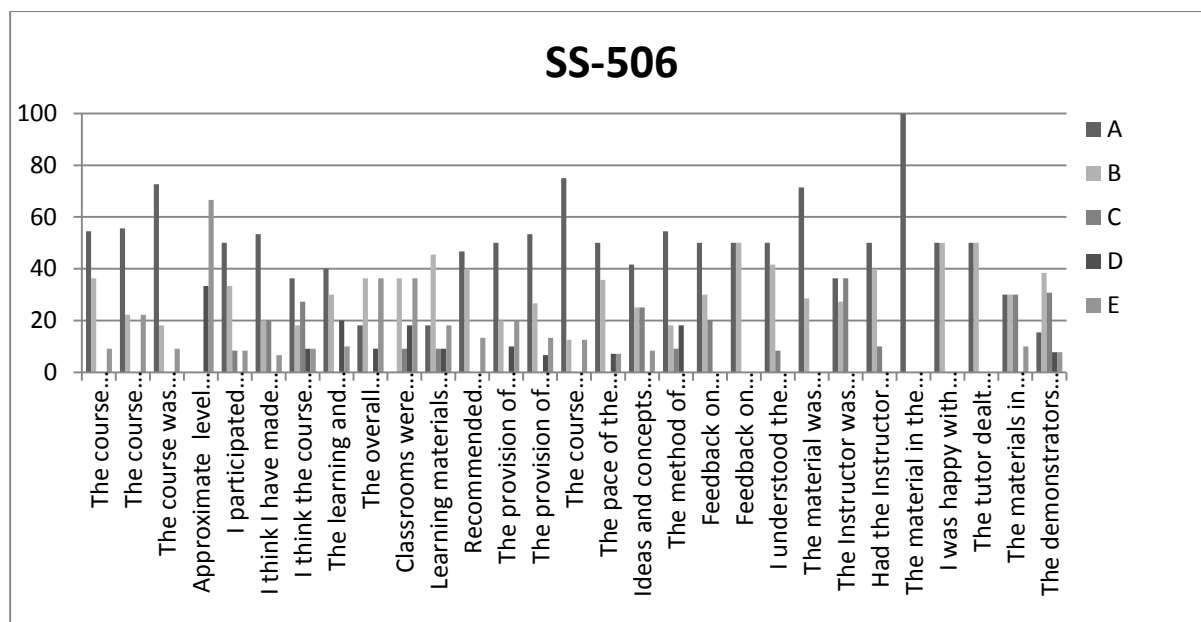


Figure-29: Course Evaluation SS-506, Spring 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Comments/suggestions (SS-508)

This whole course was useful for practical work because in this course we learnt basic techniques commonly used in lab and gain practical knowledge with the interesting concepts and materials covered in class. The lectures of this course provided valuable information. I got much of knowledge from this pure practical course.

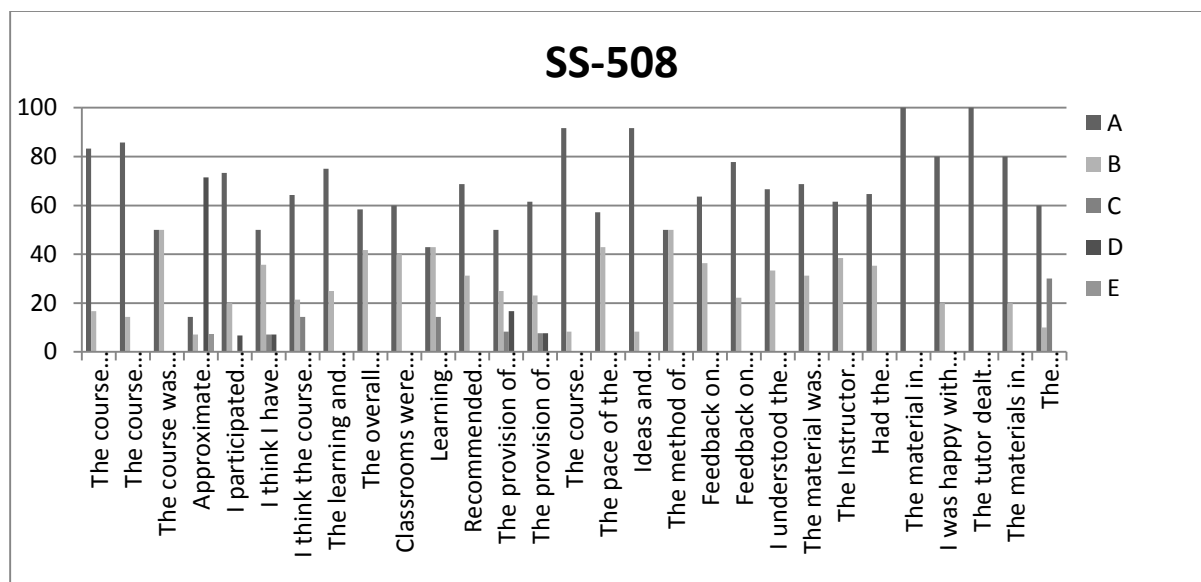


Figure-30: Course Evaluation SS-508, Spring 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Comments/suggestions (SS-510)

This was very interesting and valuable course. All the concepts of this course were informative and practical. We found this course easy to follow because this course inspired me much more as compared to others. Course related to recent issues and achievement in the field soil microbiology. I learned a lot in this course.

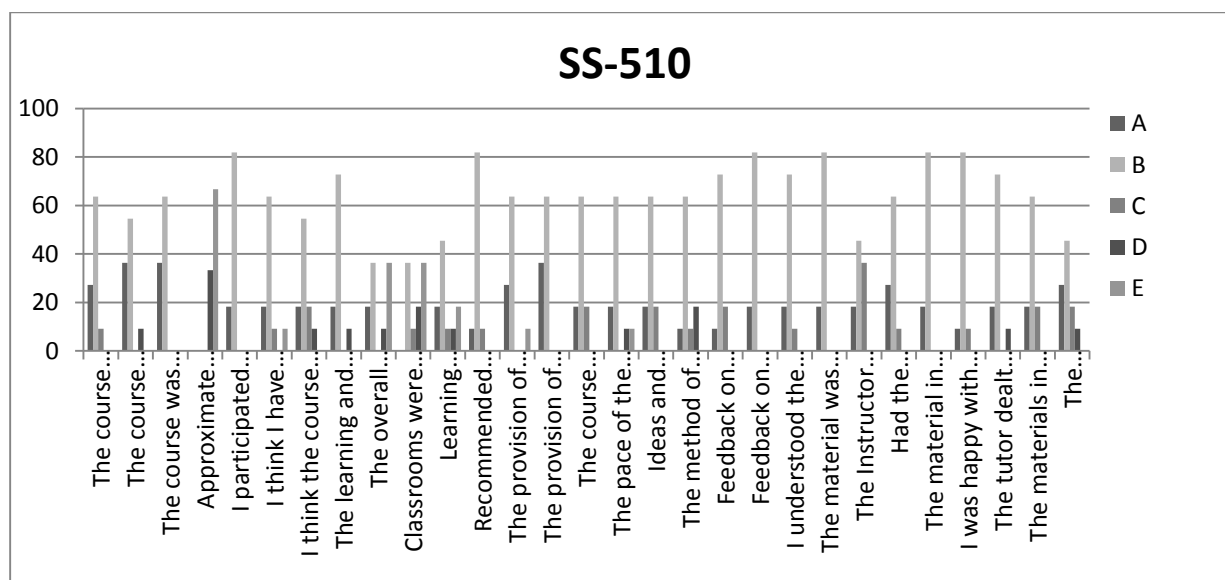


Figure-31: Course Evaluation SS-510, Spring 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Comments/suggestions (SS-602)

The course was made informative by several laboratory visits. Basic knowledge of laboratory techniques was well known in this course. It was a totally practical and research oriented work. We got valuable information during the course.

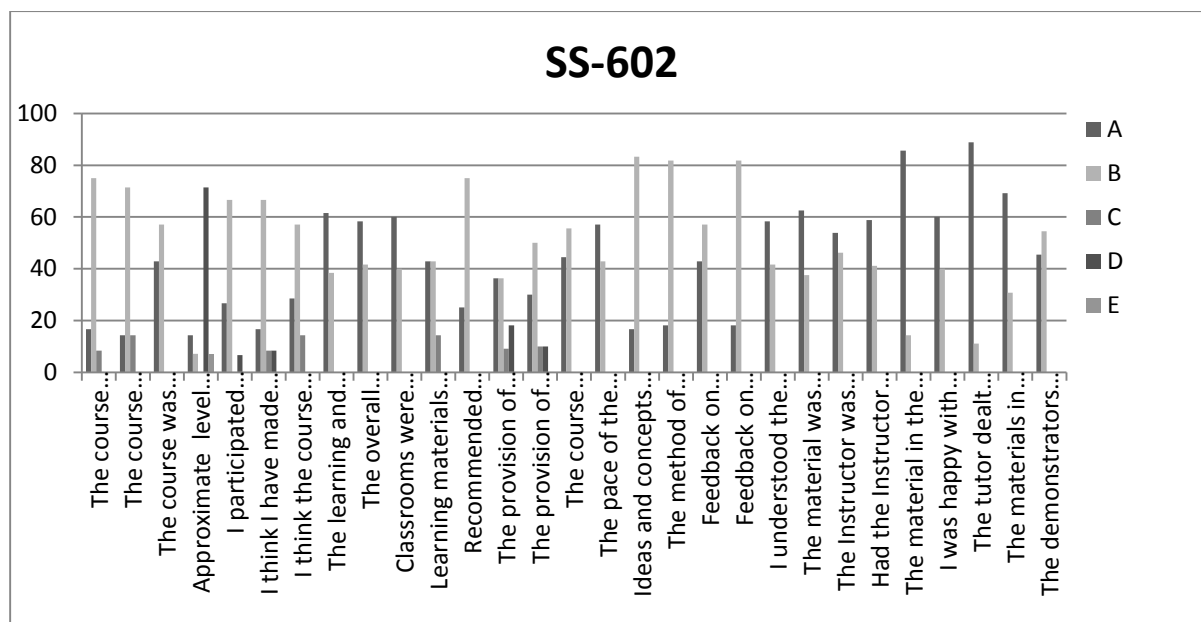


Figure-32: Course Evaluation SS-602, Spring 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Fall 2011

Teacher Evaluation

Dr. Muhammad Akmal (SS-301)

Suggestions/comments

He clearly taught what was applicable to understand the subject. His teaching style is so impressive and easily understandable. He always showed a great attitude towards students and easily accessible. He reaches the class on time.

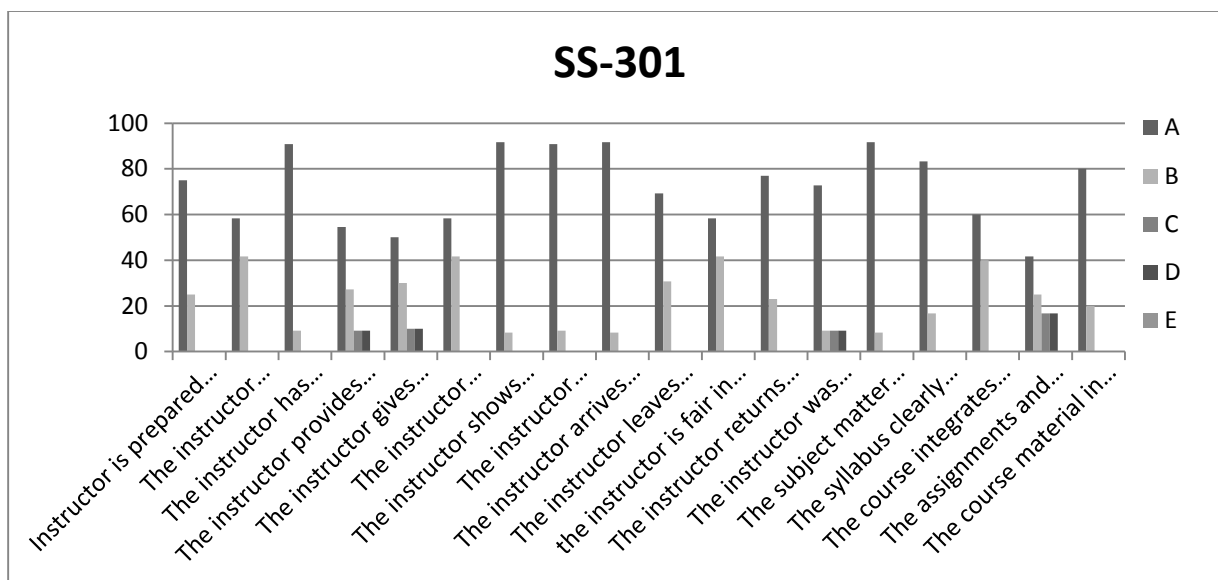


Figure 33: Teacher Evaluation SS-301, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. S Sohail Ijaz (SS-401)

Suggestions/comments

He is interesting character for all the students. He made himself accessible for every student. He seemed to really care about students learning. Very concerned about student's well-being in the course.

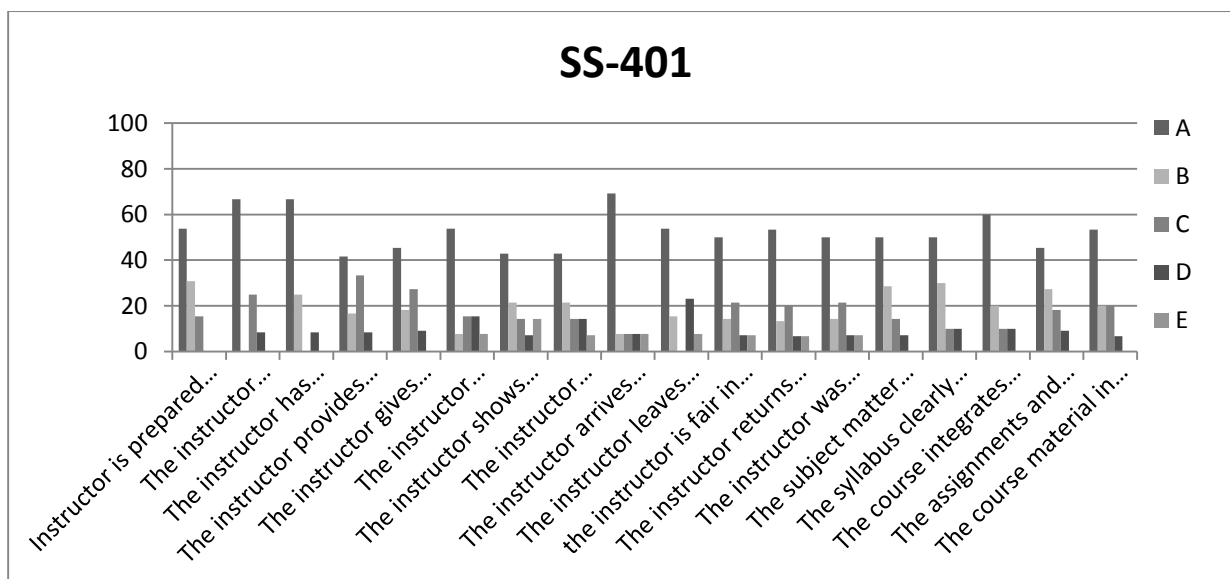


Figure-34: Teacher Evaluation SS-401, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Muhammad Akmal (SS-501)

Suggestions/comments

He is available to every student outside of class and in his office. He seemed to really care about students learning.

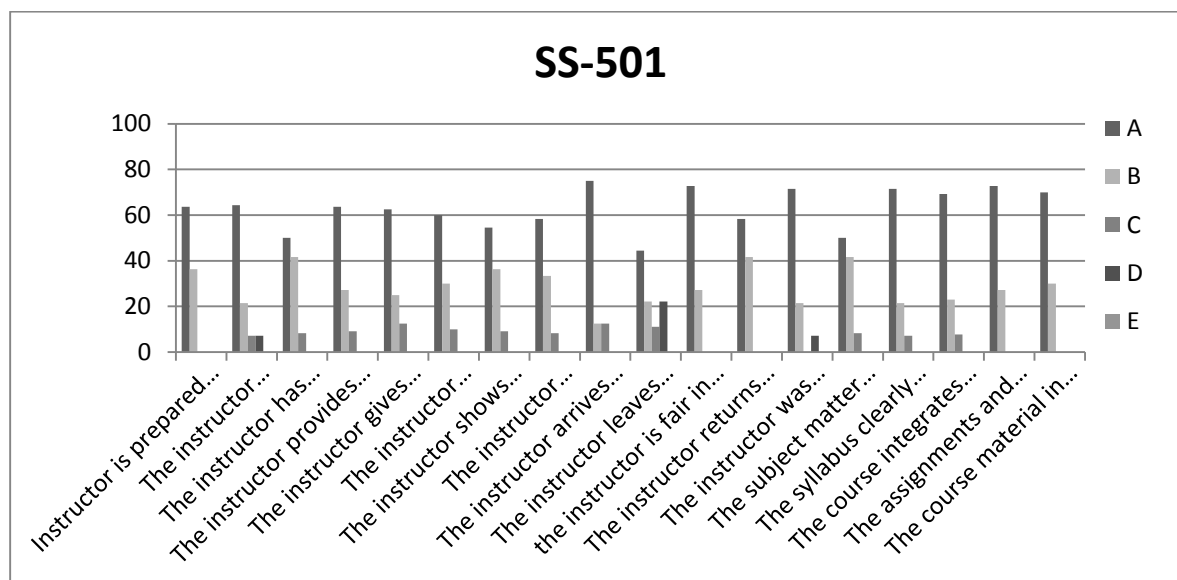


Figure 35: Teacher Evaluation SS-501, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Qaiser Hussain (SS-503)

Suggestions/comments

Teacher always made sure students understood concepts. He is available for question and discussion outside the class. He cares about our learning and our opinions. He always considers as well wisher to all students.

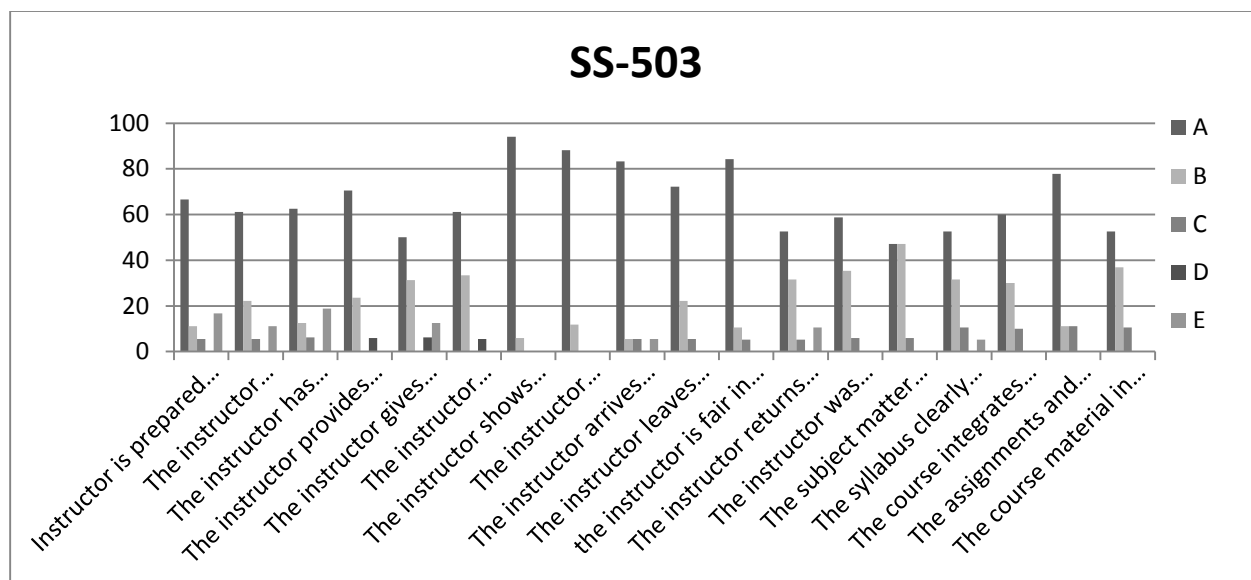


Figure 36: Teacher Evaluation SS-503, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. M. Tariq Siddique (SS-505)

Suggestions/comments

He is caring teacher. His attitude was very positive with all students. Instructor was very concerned with student problems. He was responsive to any suggestions of students.

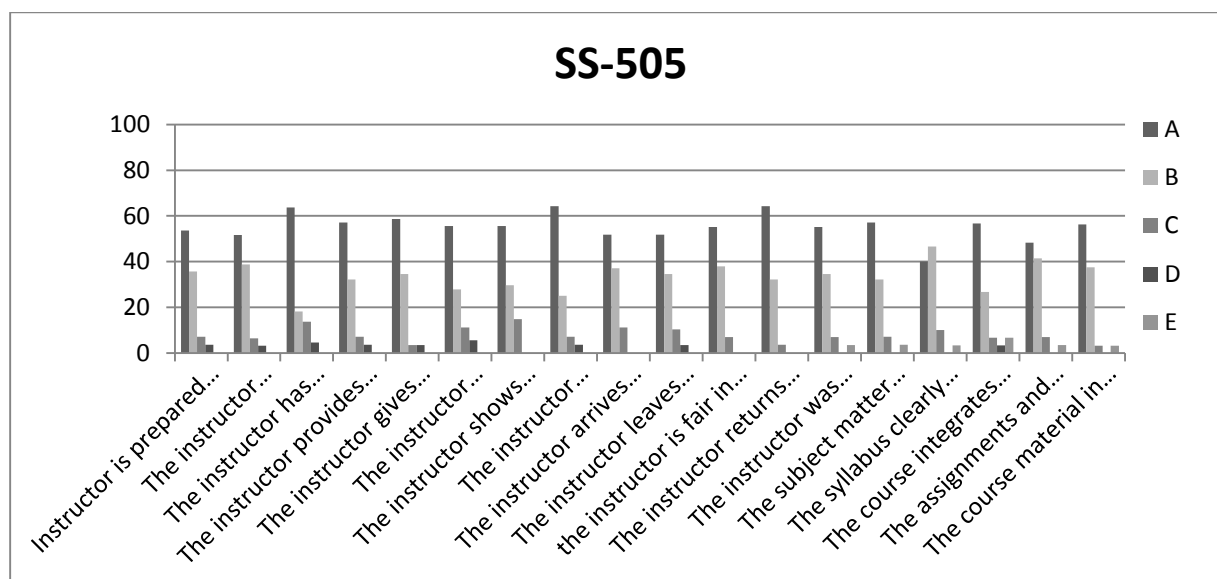


Figure-37: Teacher Evaluation SS-505, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Mr. Arshad Nawaz (SS-507)

Suggestions/comments

Instructor was very concerned with student understanding. He was available every time. He was responsive to any suggestions of students. His attitude was very positive with all students.

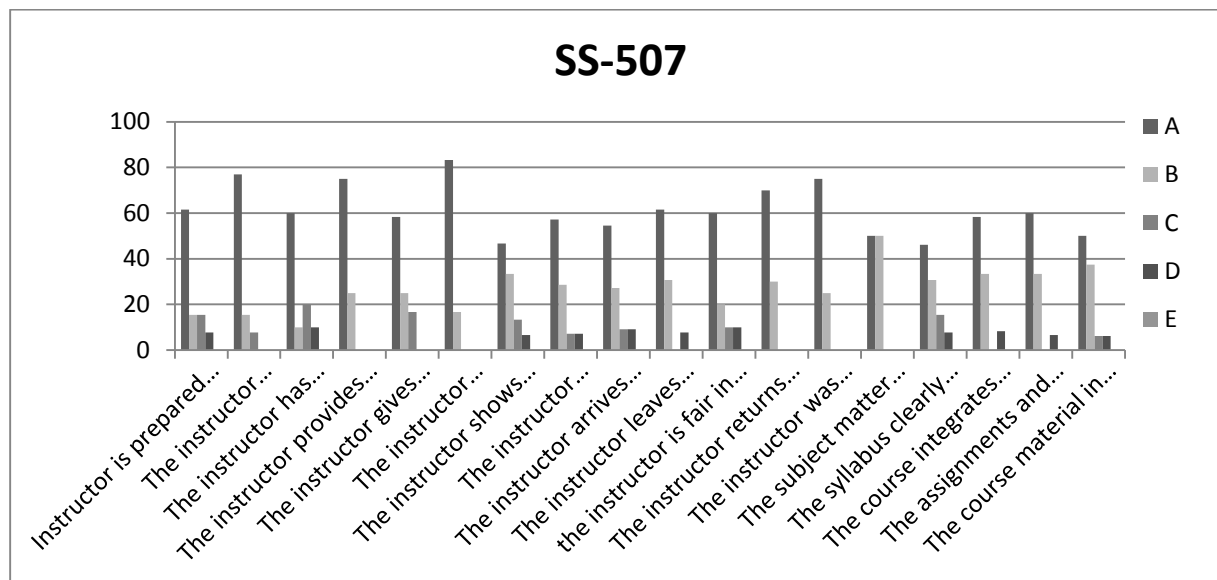


Figure-38: Teacher Evaluation SS-507, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Ghulam Jilani (SS-601)

Suggestions/comments

This professor did good job of explaining course content and making it interesting and enjoyable. Good straight forward explanations. His style of teaching is really great.

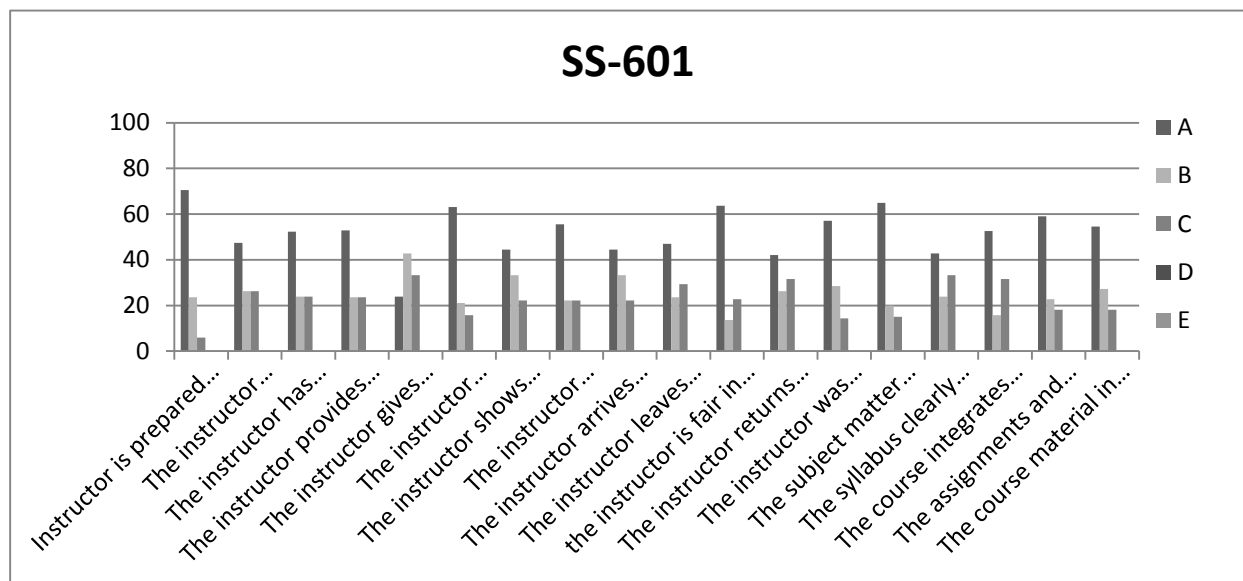


Figure-39: Teacher Evaluation SS-601, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Prof. Dr. Riaz Ahmad (SS-603)

Suggestions/comments

I highly like his teaching method. He always reaches class in time and creates a best environment for study during class. We got lot of information about course.

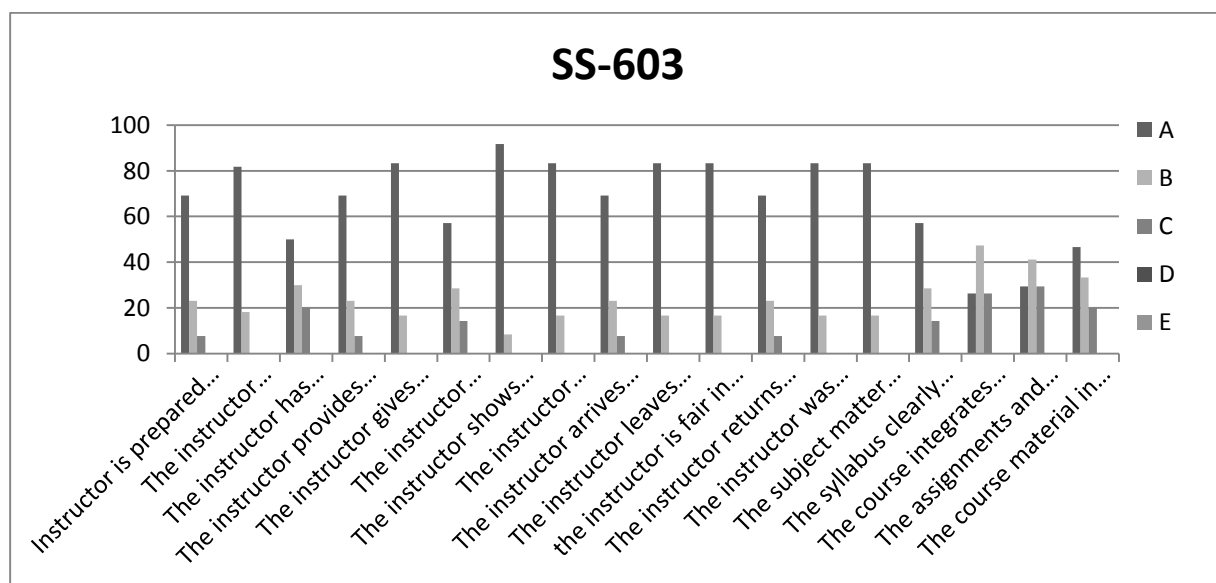


Figure-40: Teacher Evaluation SS-603, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Mr. Tanveer Iqbal (SS-605)

Suggestions/comments

He was very friendly, and always wanted to help. He was extremely receptive to the students. Teacher had very engaging lectures. He explained clearly and effectively.

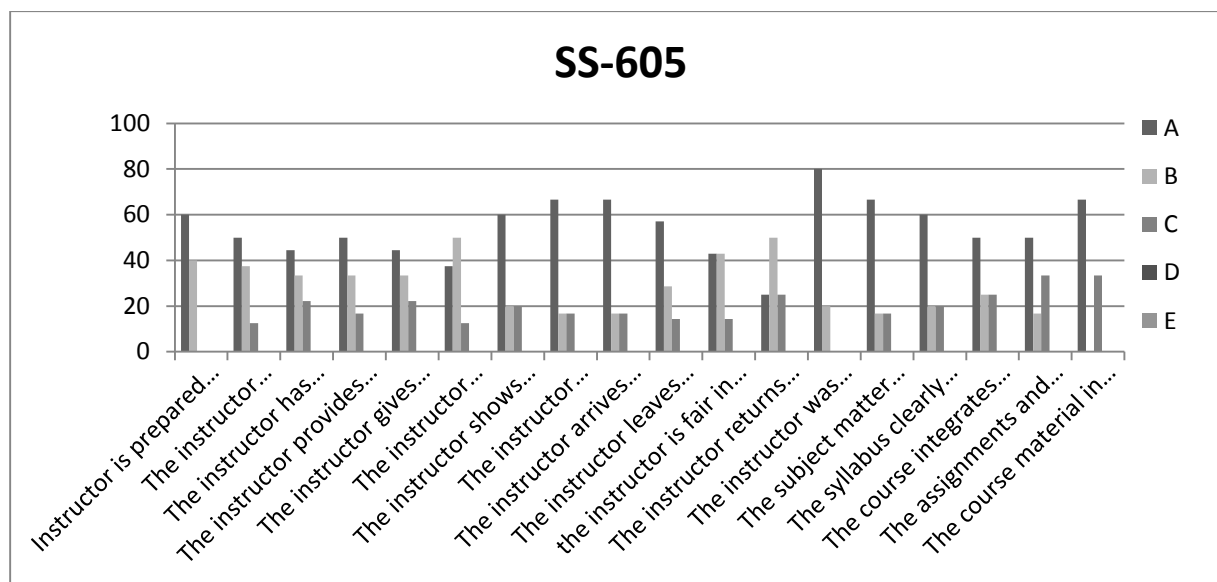


Figure-41: Teacher Evaluation SS-605, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation

Comments/suggestions (SS-301)

This course was very interesting and conceptual. This course inspired me much. Course was easy and understandable. This was informative course. New ideas related to the course. Sufficient and recent advance knowledge was presented in the class.

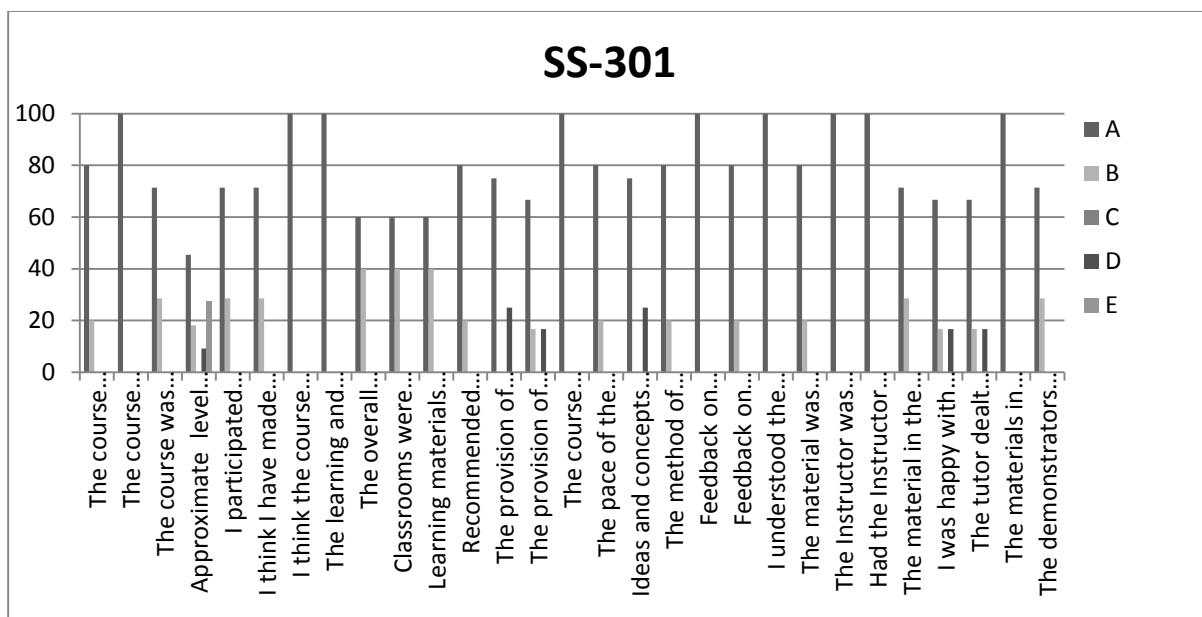


Figure-42: Course Evaluation SS-301, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Comments/suggestions (SS-401)

This Course is very informative about laboratory techniques. This course is difficult but interesting because in laboratory techniques much of time is consuming. Lectures and assignment were given on time.

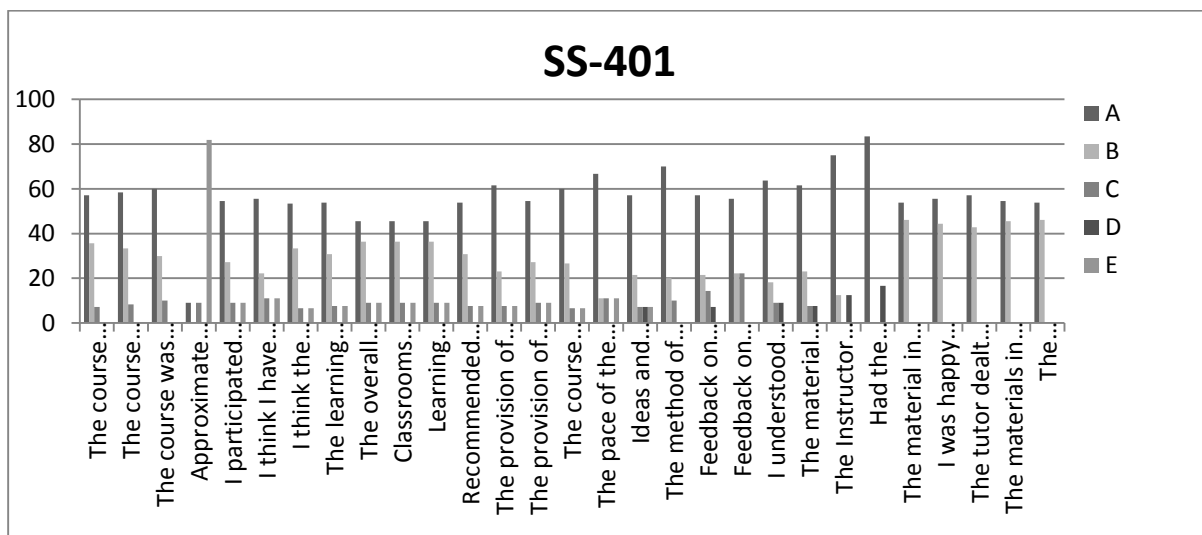


Figure-43: Course Evaluation SS-401, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Comments/suggestions (SS-501)

This Course is very interesting, understandable and informative about physical properties of soil. Course is easy and entertaining. More field tours, more emphasis should be on Pakistan.

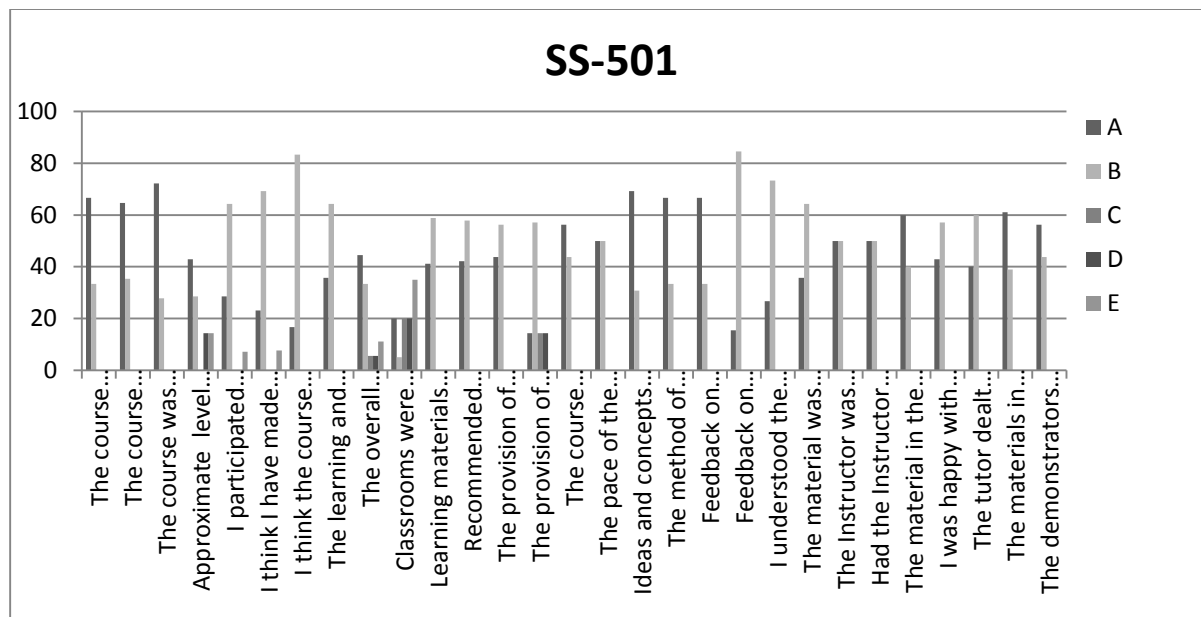


Figure 44: Course Evaluation SS-501, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Comments/suggestions (SS-503)

This course was difficult but interesting. This course gives the information about chemical properties of soil. Instructor provided a clear overview of course content. He established a nice relationship between theory and practice. He completed the whole course in time.

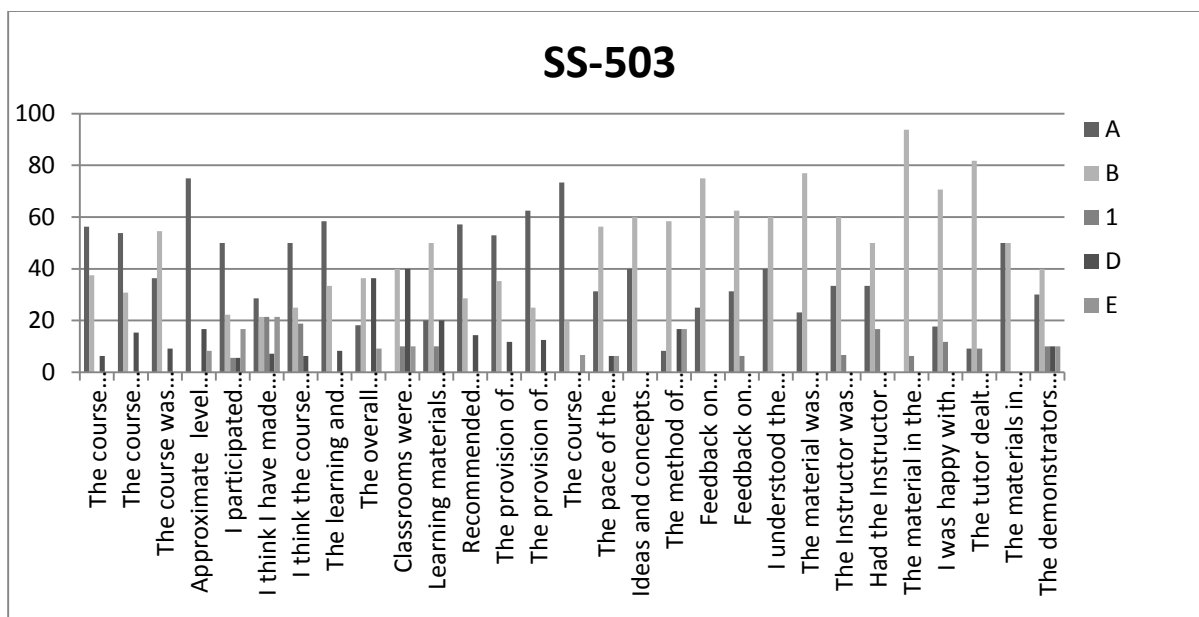


Figure-45: Course Evaluation SS-501, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Comments/suggestions (SS-505)

Teacher organized course content clearly. This course was understandable and informative. Lectures, assignments, notes and practical material were given in proper way.

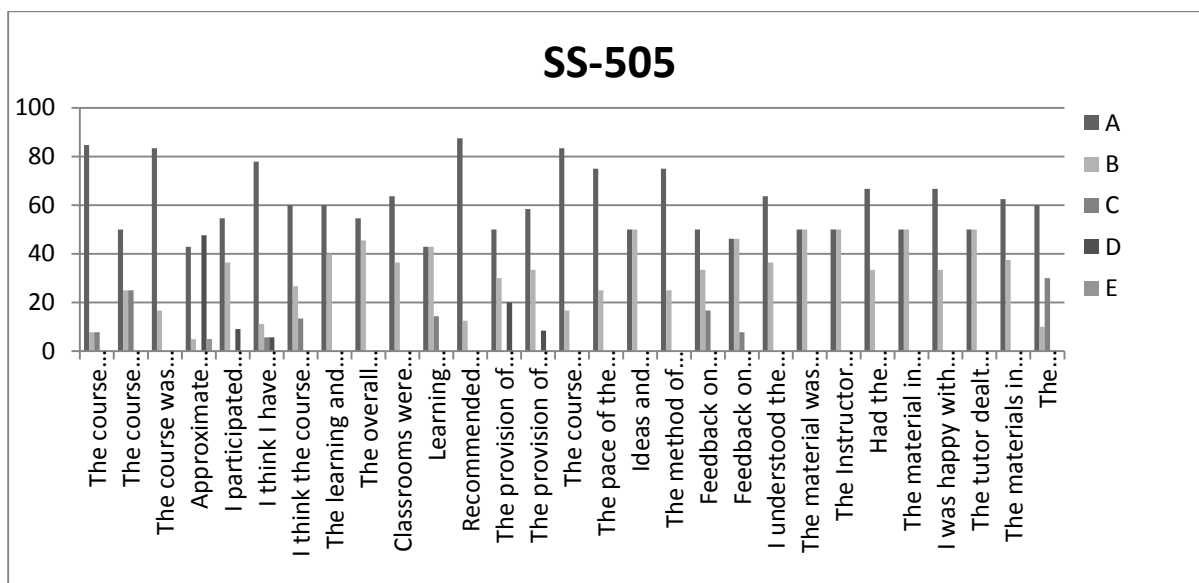


Figure-46: Course Evaluation SS-505, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Comments/suggestions (SS-507)

This course was interesting. Questions and discussion about the course was on regular basis. Teacher organized course content clearly.

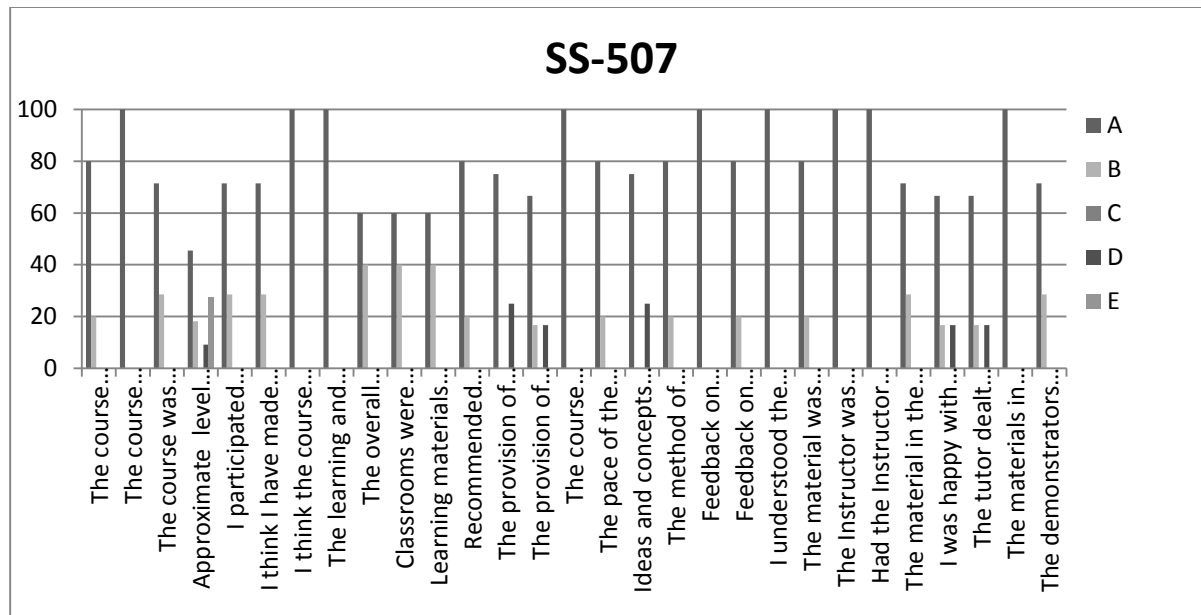


Figure-47: Course Evaluation SS-507, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Comments/suggestions (SS-601)

This course was very informative and understandable. I really got some new and valuable information about different soil processes and reactions. The whole course was managed properly.

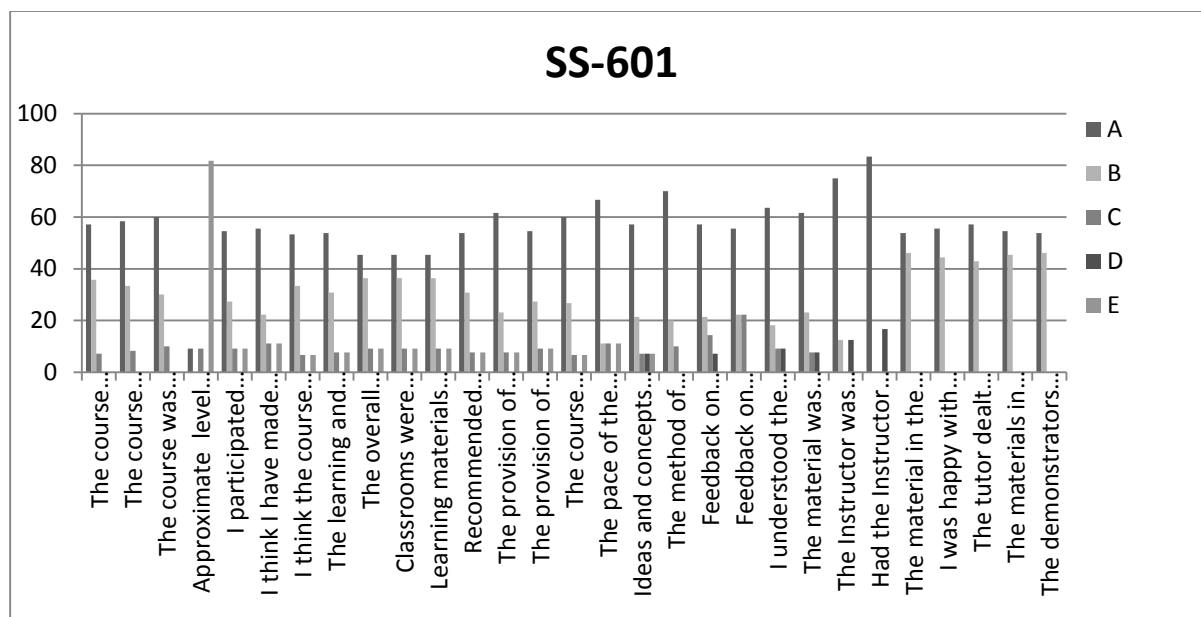


Figure-48: Course Evaluation SS-601, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Comments/suggestions (SS-603)

Course contents were well designed and completed in time. This course was very interesting and gave the information about soil and water status and their related environmental problems. Teacher was most enthusiastic about this course. He gave the chance to all students to participate in discussion.

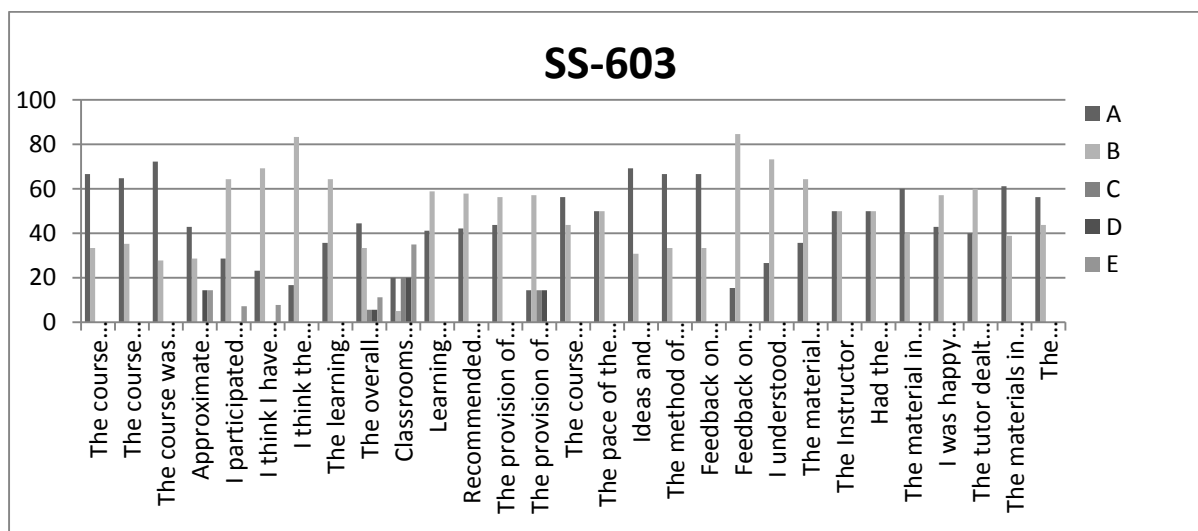


Figure-49: Course Evaluation SS-603, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Comments/suggestions (SS-605)

The best aspects of this course included the interesting materials covered in the course, and how latest innovative soil and plant techniques are being used in the field of soil and plant analysis. I found this course very practicable. The whole course was managed properly and well organised materials.

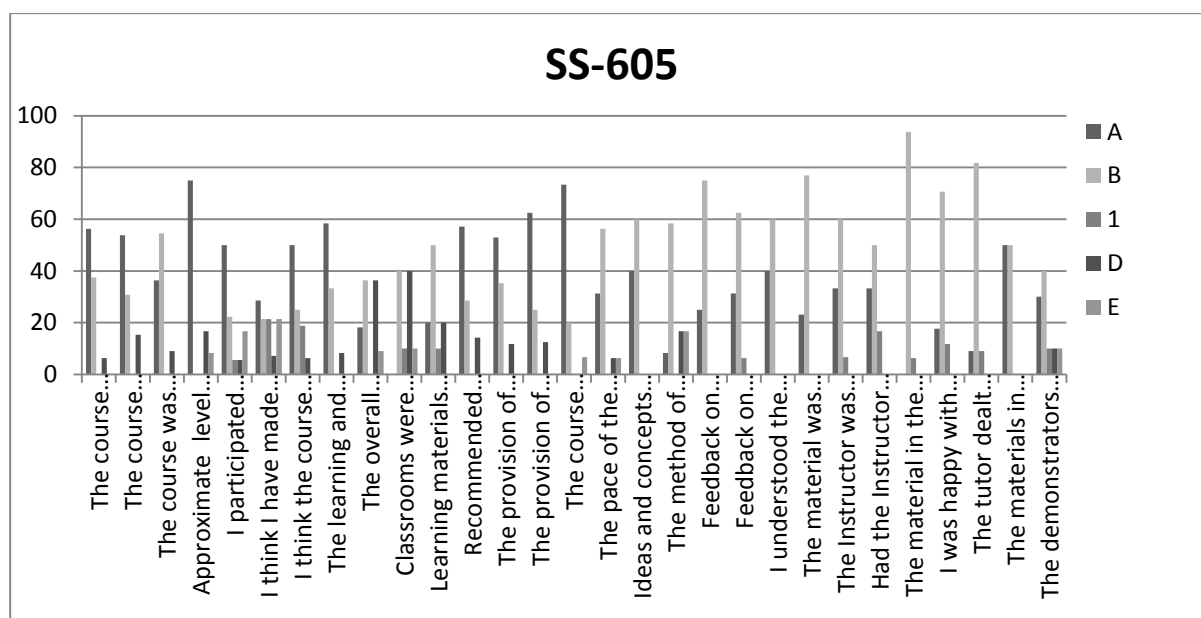


Figure-50: Course Evaluation SS-605, Fall 2011

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Spring 2012

Teacher Evaluation

Dr. Muhammad Akmal (SS-402)

Comments/suggestions

He was enthusiastic both about the subject he taught and about teaching. His enthusiasm made learning the material easier. Instructor was polite and friendly towards students.

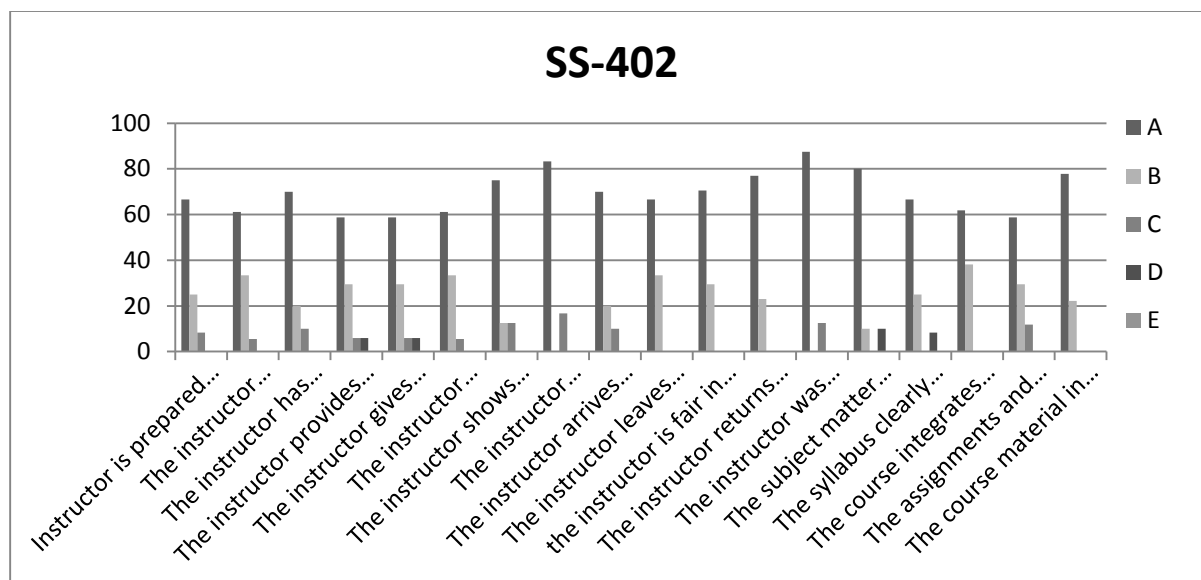


Figure-51: Teacher Evaluation SS-402, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Qaiser Hussain (SS-508)

Comments/suggestions

Teacher is very hardworking and dedicated. He is regular in class and his method of teaching is very good. Instructor was so polite, thank you for being so positive, and for being excited to answer our questions and also open discussion.

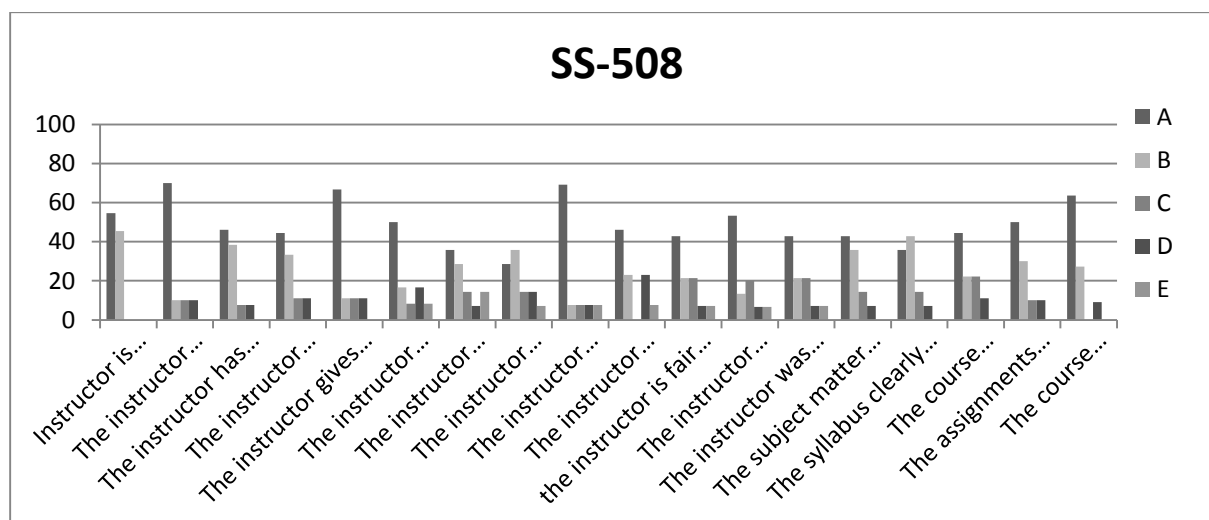


Figure-52: Teacher Evaluation SS-508, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. M. Tariq Siddique (SS-502)

Comments/suggestions

Instructor is very nice and humble. His lectures were informative and full of knowledge.

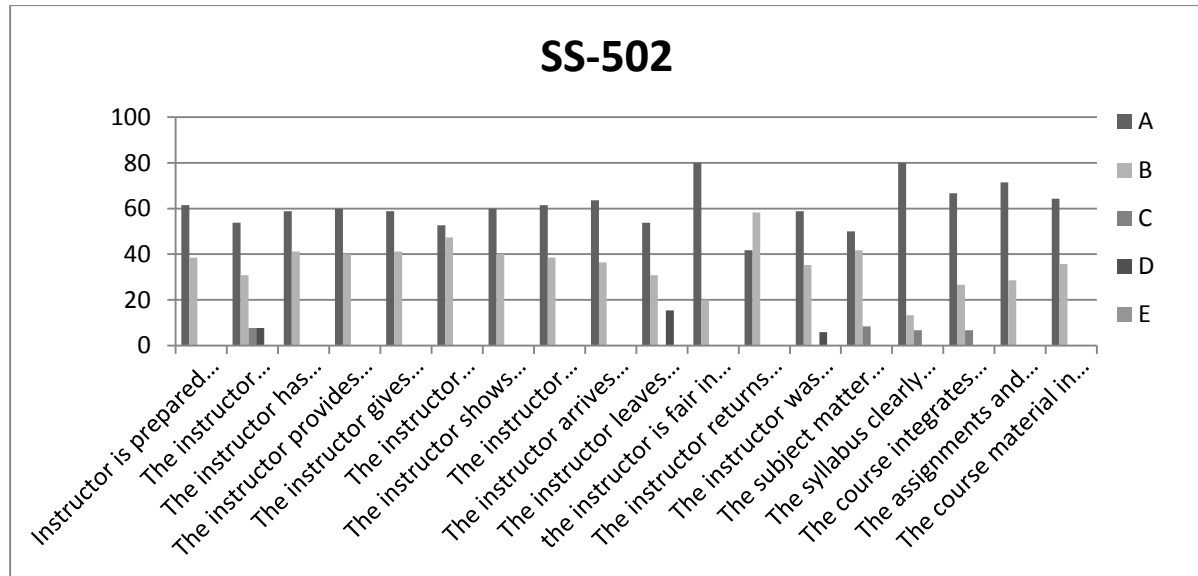


Figure-53: Teacher Evaluation SS-502, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Arshad Nawaz (SS-504)

Comments/suggestions

Teacher is friendly with students and his communication skill is impressive. He encourages the students to participate actively in class.

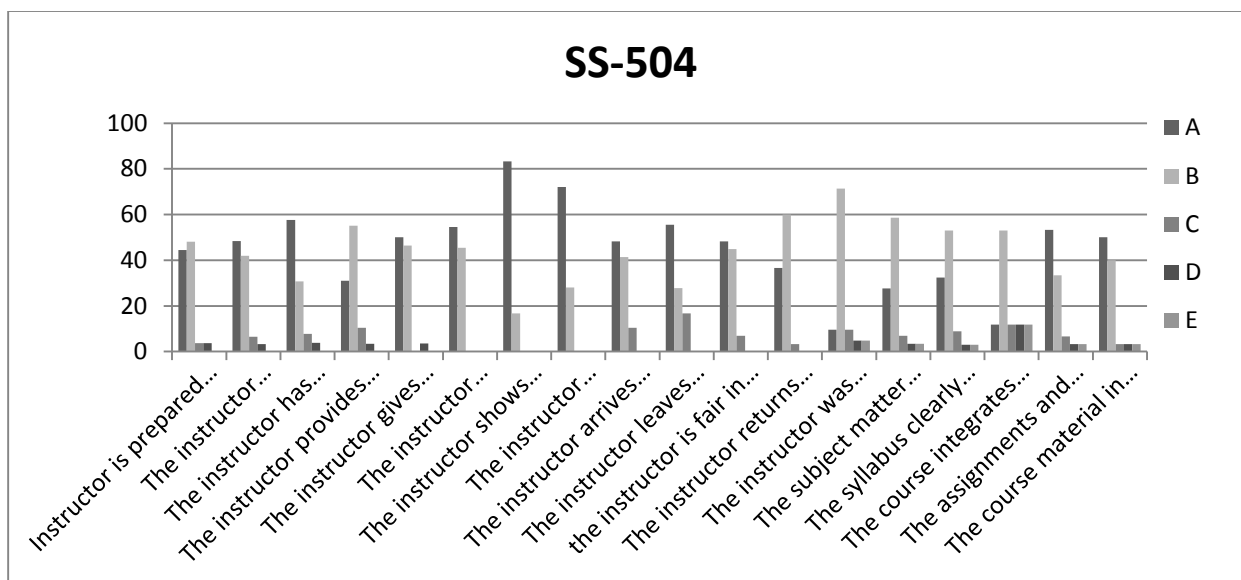


Figure-54: Teacher Evaluation SS-504, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Mr. Arshad Nawaz (SS-506)

Comments/suggestions

His teaching style is student friendly. He always provides a friendly environment for question and discussion with students.

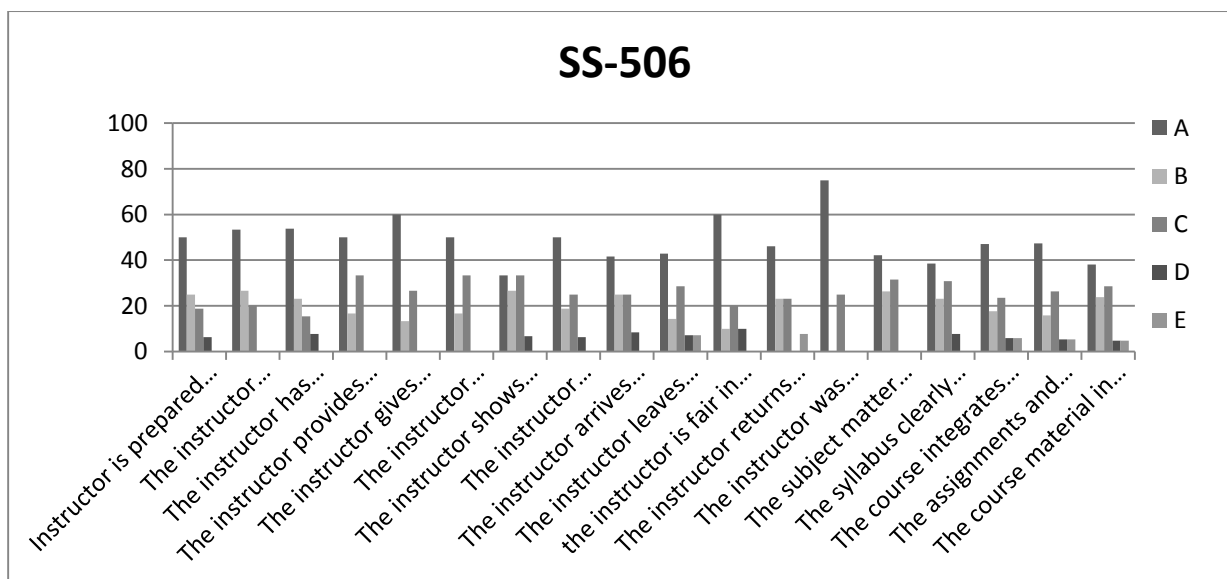


Figure-55: Teacher Evaluation SS-506, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Khalid Saifullah Khan (SS-602)

Comments/suggestions

His teaching style is amazing. His organization, clarity, and grasp of the material were impressive. He has a good hold of class.

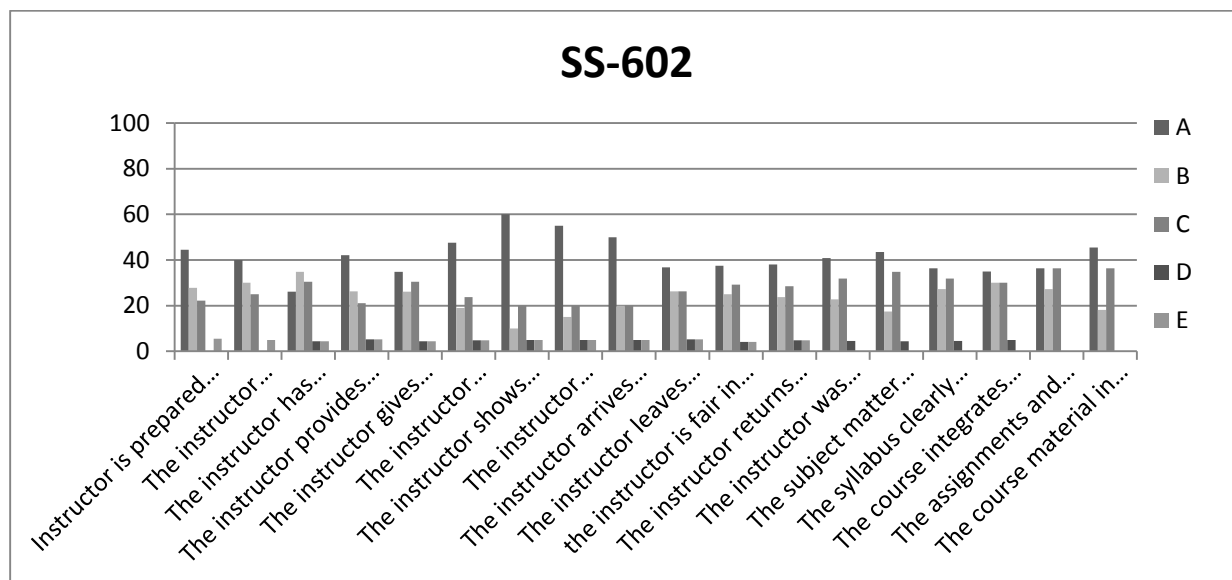


Figure-56: Teacher Evaluation SS-602, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. M. Tariq Siddique (SS-604)

Comments/suggestions

He is hardworking and friendly teacher. He provides such a learning environment in which every student can participate in open discussion.

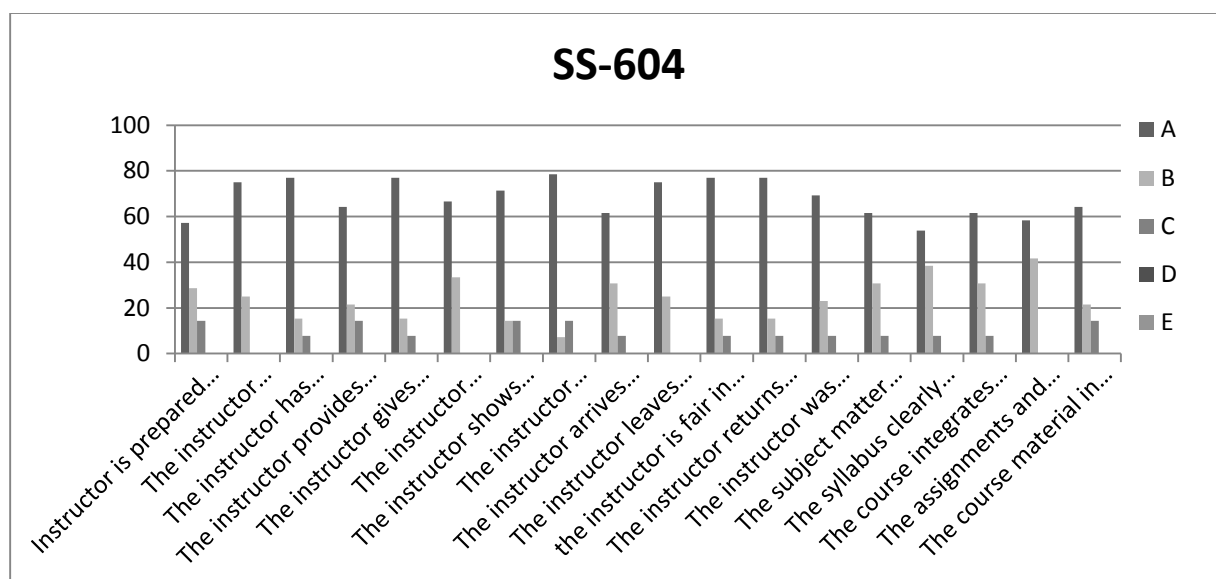


Figure-57: Teacher Evaluation SS-604, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Muhammad Umer (SS-606)

Comments/suggestions

Instructor is very keen on student learning, strove to be available. His teaching style is effective. He is hardworking and friendly teacher.

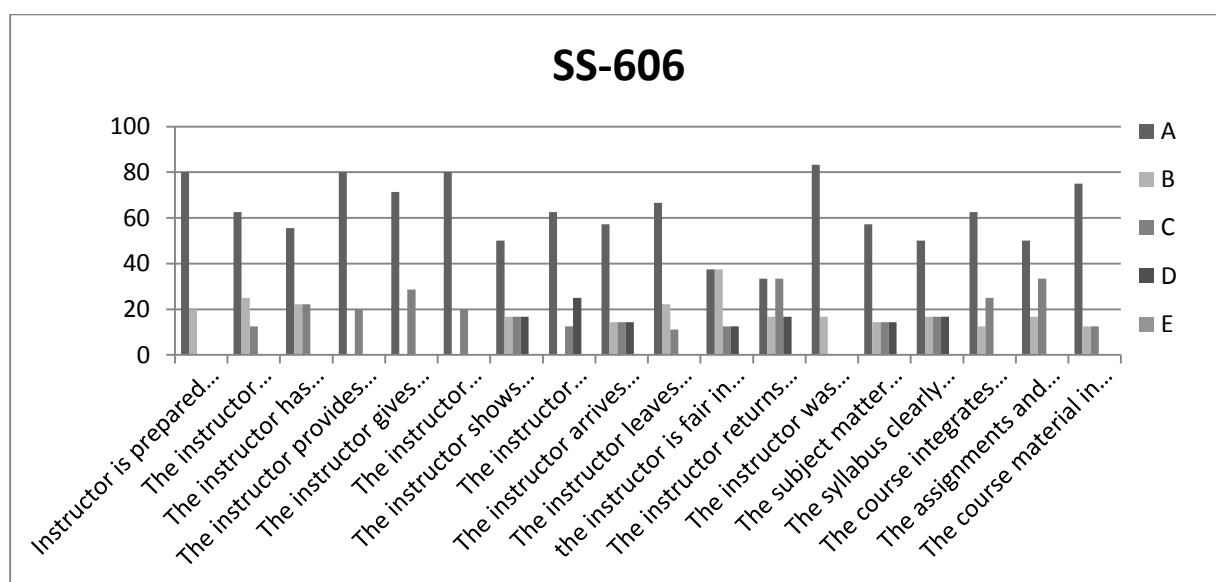


Figure-58: Teacher Evaluation SS-606, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Dr. Rifat Hayat (SS-608)

Comments/suggestions

He has a good hold of class. He is hardworking and friendly teacher. His method is so impressive which inspired all the students.

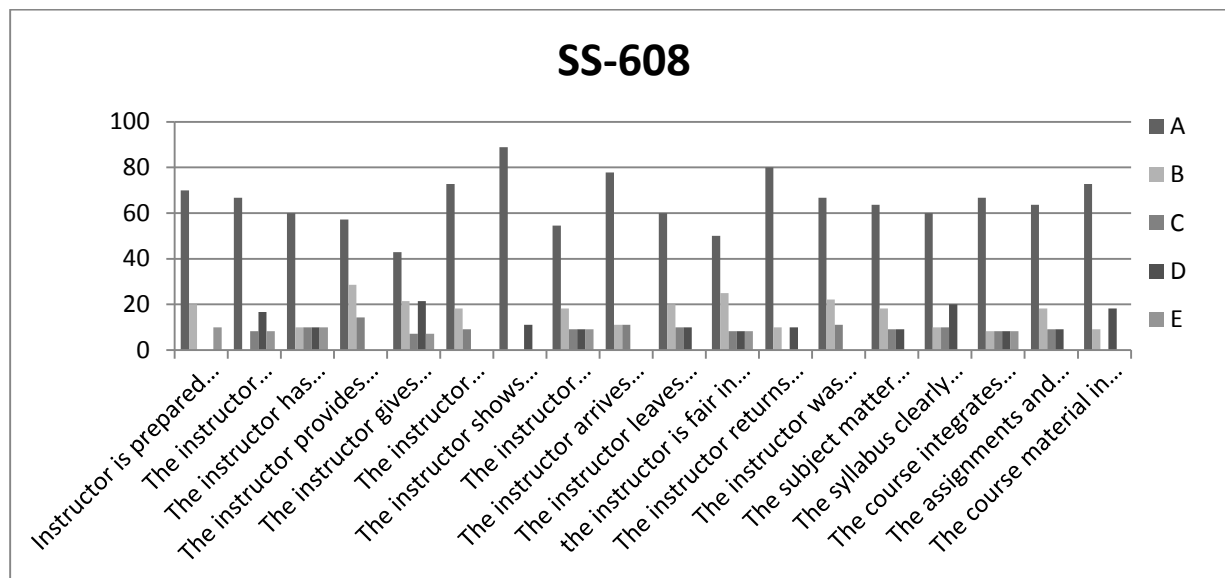


Figure-59: Teacher Evaluation SS-608, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation

Course Evaluation (SS-402)

Comments/suggestions

The course was interesting and well organized. Additional learning material was provided which actually further improved subject knowledge.

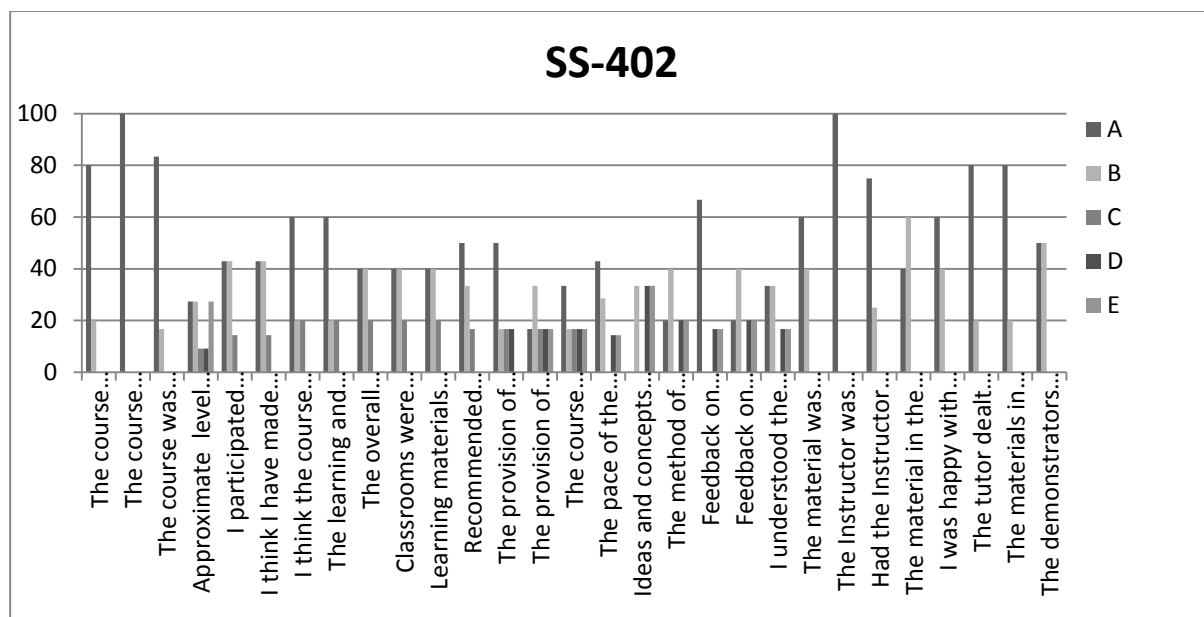


Figure-60: Course Evaluation SS-402, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-508)

Comments/suggestions

The course was completed timely. This course improved our knowledge regarding basic laboratory techniques, however course contents need to be updated with latest knowledge.

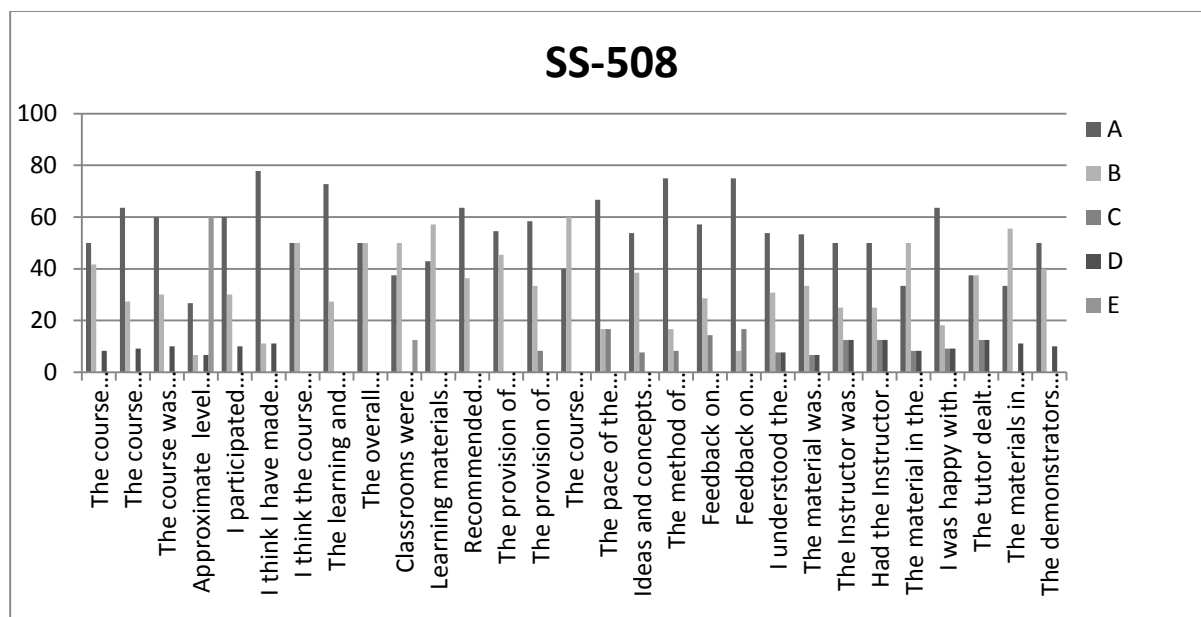


Figure-61: Course Evaluation SS-508, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-502)

Comments/suggestions

The course was completed timely. This course improved our knowledge regarding salt affected soil and their reclamation methods. This course was managed properly.

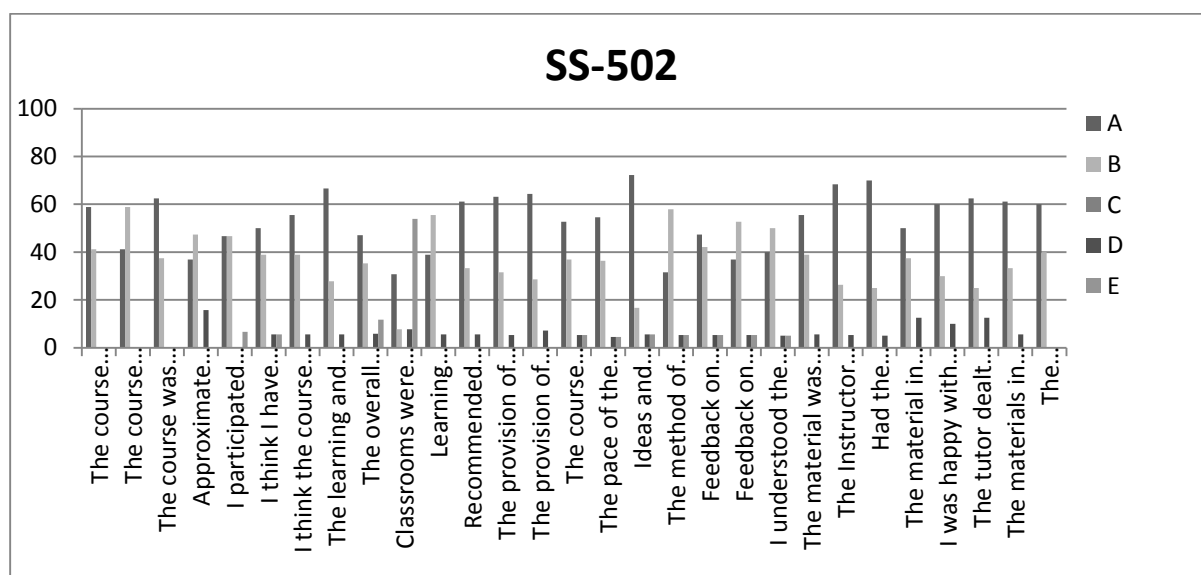


Figure-62: Course Evaluation SS-502, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-504)

Comments/suggestions

The course was interesting and informative. This course made me inspired. The course was completed timely.

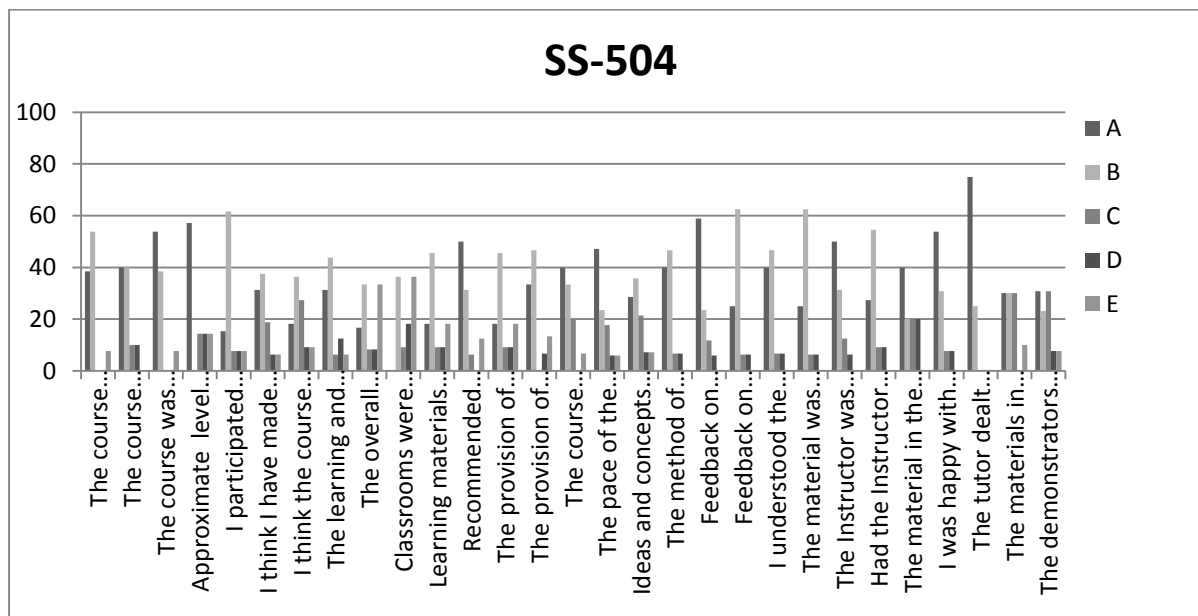


Figure-63: Course Evaluation SS-504, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-506)

Comments/suggestions

The course was managed properly. The entire course was completed timely. The course was understandable and easy. This course effectively improved our knowledge about water conservation practices and management in context of Pakistan.

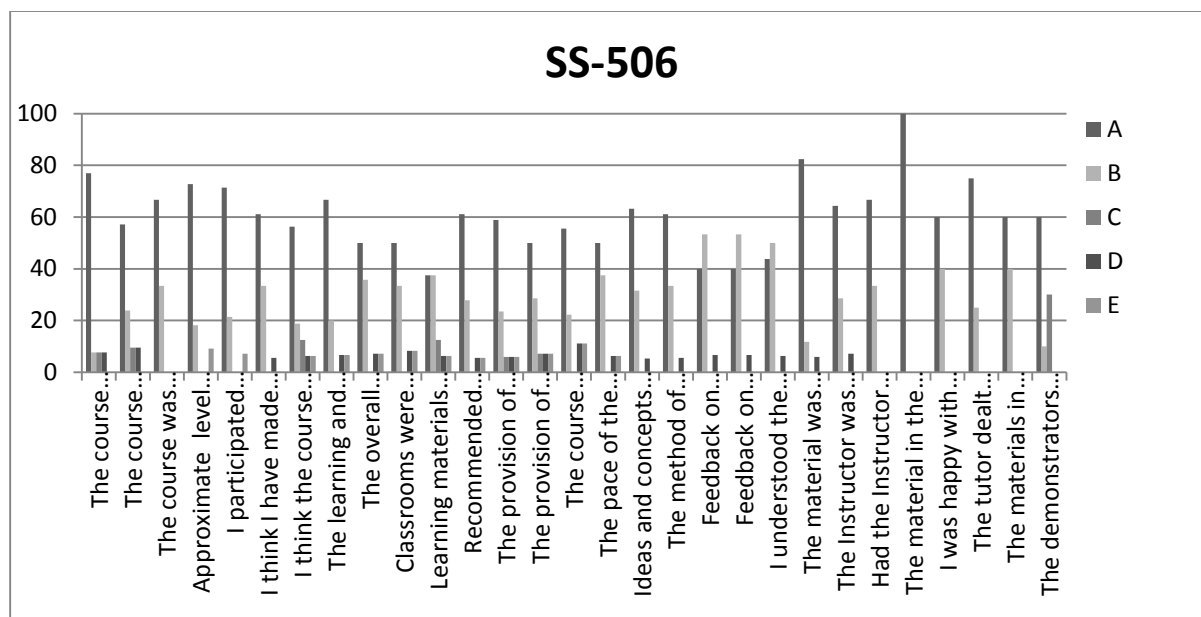


Figure-64: Course Evaluation SS-506, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-602)

Comments/suggestions

The course was easily manageable. All the assignment and lectures were accessible. The course contents need to be updated with new knowledge regarding the advanced nuclear techniques in soil research.

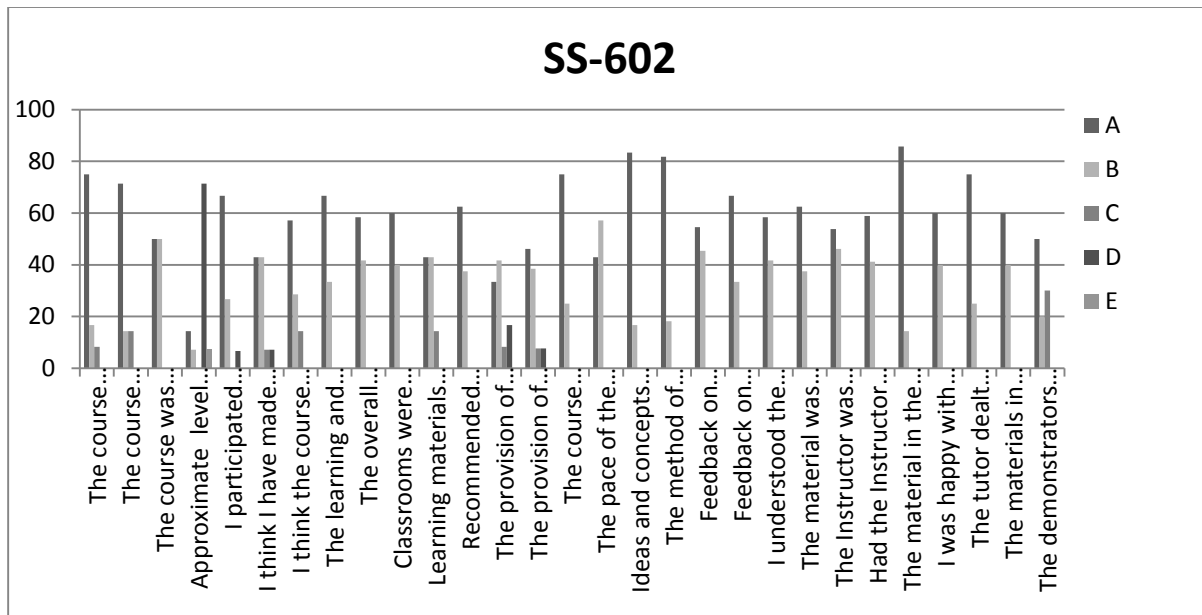


Figure-65: Course Evaluation SS-602, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-604)

Comments/suggestions

This course improved our knowledge regarding wind erosion and their management technique.

This course tells about the status of wind erosion in Pakistan.

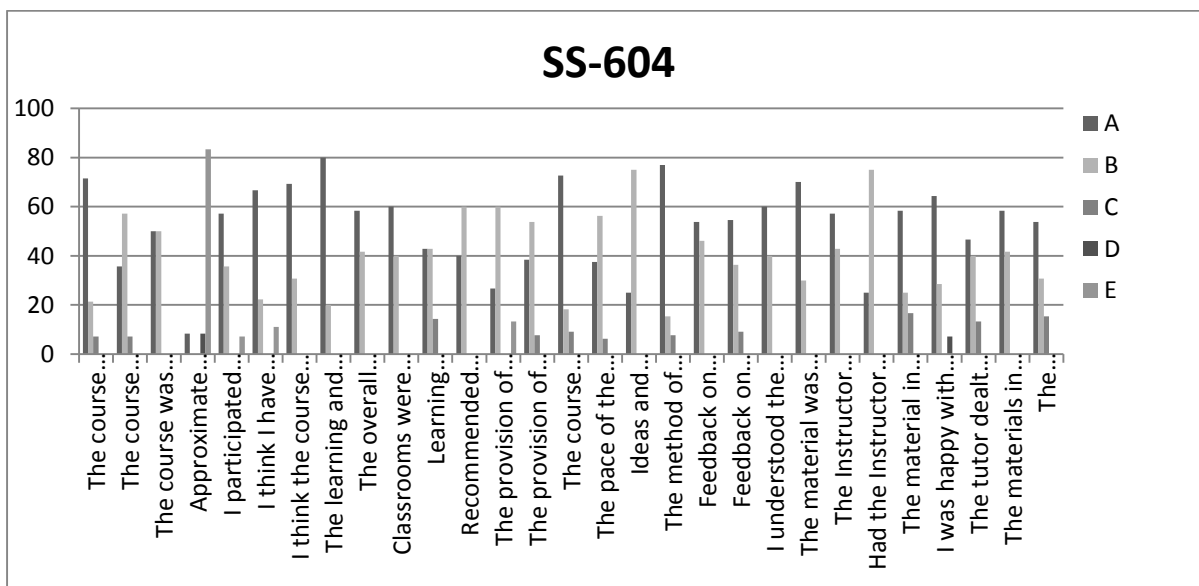


Figure-66: Course Evaluation SS-604, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-606)

Comments/suggestions

The course was completed timely. This course was interesting and informative but course contents need to be updated with latest knowledge. The course is very important from research point of view. I learned effectively from this course that how to plan and execute the independent research project.

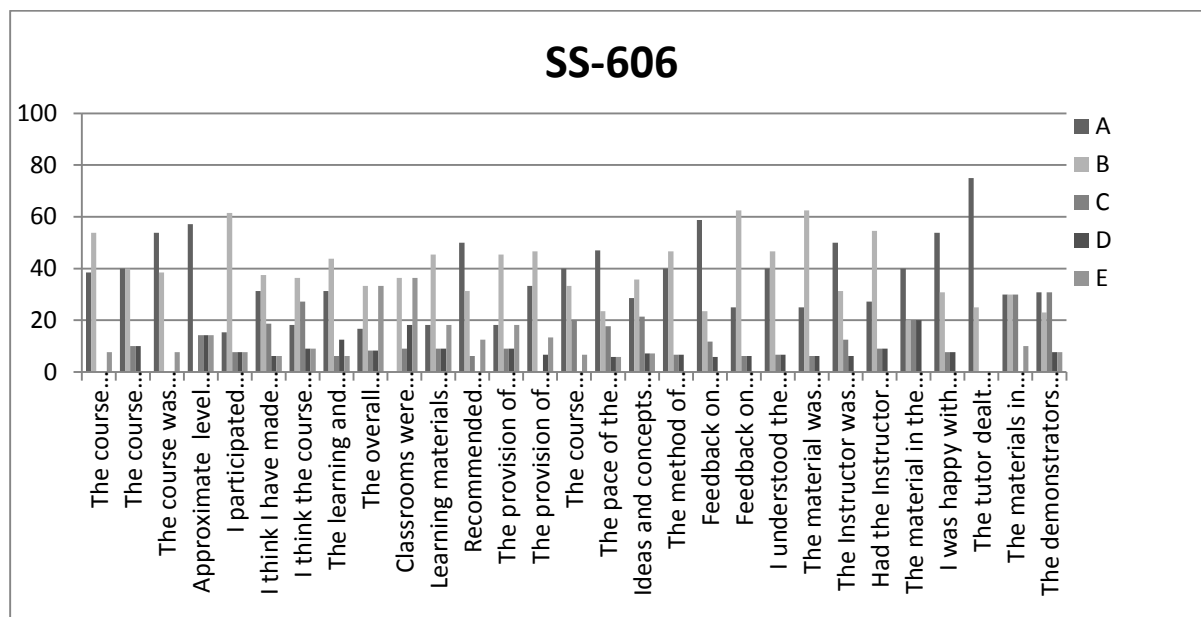


Figure-67: Course Evaluation SS-301, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

Course Evaluation (SS-608)

Comments/suggestions

The course was completed timely. This course was quite informative to how we write a research proposal and research related articles

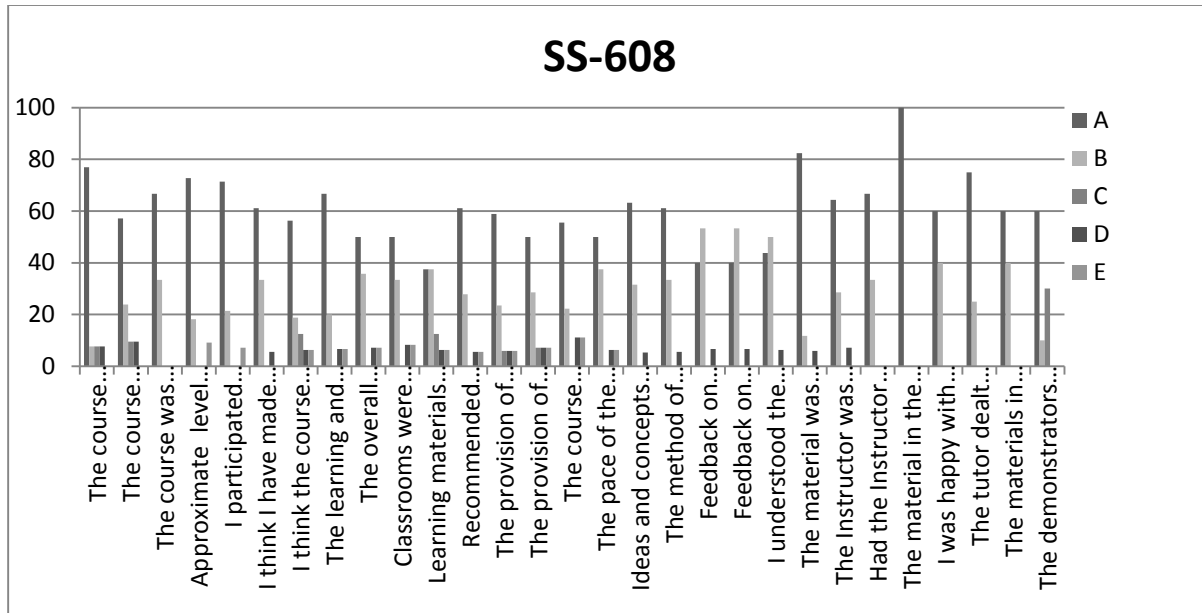


Figure-68: Course Evaluation SS-608, Spring 2012

A = Strongly Agree, B = Agree, C = Uncertain, D = Disagree, E = Strongly Disagree

**Faculty Course Review Report
(Proforma 2)**

The evaluation showed that the faculty is satisfied with curriculum. Evaluation Questionnaire were filled by each faculty member regarding his course and then analyzed and presented in the table given below. The internal evaluation was done through with mid and final term examinations for all courses offered by department.

Table 3: Faculty course review report

Course code	Title	Credit value	Class	Semester	Assessment Methods	Grades					Course Instructor
						A	B	C	D	E	
SS 301	Introduction to Soil Science	3(2-2)	1st	Fall 2010	Mid term and final exam.	26	29	28	7	10	Dr. M. Akmal
SS 501	Physical Properties of Soils	3(2-2)	5 th	Fall 2010	Mid term and final exam.	38	41	19	2	0	Dr. M.Azhar Naeem
SS 503	Chemical Properties of Soils	3(2-2)	5 th	Fall 2010	Mid term and final exam.	38	21	34	5	2	Dr. Shahzada Sohail Ijaz
SS 505	Soil Fertility and Fertilizers	3(2-2)	5 th	Fall 2010	Mid term and final exam.	12	40	43	6	0	Dr. M. Tariq Siddique
SS 509	Introduction to soil Classification	3(2-2)	5 th	Fall 2010	Mid term and final exam.	34	21	38	2	6	Dr. Muhammad Akmal
SS 601	Soil Microbiology and Biochemistry	4(3-2)	5 th	Fall 2010	Mid term and final exam.	86	14	0	0	0	Dr. Ghulam Jillani
SS 603	Soil and Water Pollutions	3(2-2)	5 th	Fall 2010	Mid term and final exam.	28	45	27	0	0	Dr. Riaz
SS 607	Nuclear Techniques in Soil Research	3(2-0)	5 th	Fall 2010	Mid term and final exam.	28	29	43	0	0	Dr. Khalid Saifullah Khan
SS 609	Project planning and Scientific writing	2(1-2)	7 th	Fall 2010	Mid term and final exam.	9	16	58	17	0	Dr. Safdar Ali
SS 502	Salt Affected Soil & Their Management	3(2-2)	6 th	Spring 2011	Mid term and final exam.	24	30	46	0	0	Dr. M.Tariq Siddique
SS 506	Water Conservation and Non Conventional Erosion Control	3(3-0)	6 th	Spring 2011	Mid term and final exam.	21	68	11	0	0	Mr. Arshad Nawaz
SS	Instrumentation and	2(0-4)	6 th	Spring	Mid term	5	38	45	8	4	Dr.

508	Library Techniques			2011	and final exam.						Muhamma d Akmal
SS 510	Introduction to Soil Microbiology	3(2-2)	6 th	Spring 2011	Mid term and final exam.	28	38	34	0	0	Dr. Riffat Hayat
SS 301	Introduction to Soil Science	3(2-2)	1 st	Fall 2011	Mid term and final exam.	31	34	28	7	0	Dr. M. Akmal
SS 401	Instrumentation and Library Techniques	2(0-4)	6 th	Spring 2011	Mid term and final exam.	5	38	45	8	4	Dr. Shahzada Sohail Ijaz
SS 501	Physical Properties of Soils	3(2-2)	5 th	Fall 2011	Mid term and final exam.	41	45	14	0	0	Dr. Muhamma d Akmal
SS 503	Chemical Prperties of Soils	3(2-2)	5 th	Fall 2011	Mid term and final exam.	37	41	23	0	0	Dr. Qaiser Hussain
SS 505	Soil Fertilty and Fertilizers	3(2-2)	5 th	Fall 2011	Mid term and final exam.	12	40	43	6	0	Dr. M. Tariq Siddique
SS 507	Soil Genesis and Morphology	3(2-2)	5 th	Fall 2011	Mid term and final exam.	35	60	5	0	0	Mr. Arshad Nawaz
SS 601	Biochemistry of Soil Processes	3(2-2)	7 th	Fall 2011	Mid term and final exam.	53	45	2	0	0	Dr. Ghulam Jillani
SS 603	Soil and Water Pollutions	3(2-2)	7 th	Fall 2011	Mid term and final exam.	28	45	27	0	0	Dr. Riaz
SS 605	Methods of Soil and Plant Analysis	4(2-4)	7 th	Fall 2011	Mid term and final exam.	47	24	28	0	0	Mr.Tanveer Iqbal
SS 402	Soil and Water Conservation	2(2-0)	2 nd	Spring 2012	Mid term and final exam.	29	43	20	6	2	Dr. M. Akmal
SS 508	Instrumentation and Library Techniques	2(0-4)	6 th	Spring 2012	Mid term and final exam.	13	45	30	12	0	Dr. Qaiser Hussain
SS 502	Salt Effected Soil & Their Management	3(2-2)	6 th	Spring 2012	Mid term and final exam.	18	36	46	0	0	Dr. M.Tariq Siddique
SS 504	Introduction to soil Classification	3(2-2)	6 th	Fall 2011	Mid term and final exam.	42	54	4	0	0	Mr. Arshad Nawaz
SS 506	Water Conservation and Non Conventional Erosion Control	3(3-0)	6 th	Spring 2012	Mid term and final exam.	46	54	0	0	0	Mr. Arshad Nawaz
SS 607	Nuclear Techniques in Soil Research	3(2-2)	6 th	Fall 2011	Mid term and final exam.	28	29	43	0	0	Dr. Khalid Saifullah Khan
SS 604	Wind Erosion and its Control	3(3-0)	6 th	Spring 2012	Mid term and final exam.	59	24	17	0	0	Dr. M. Tariq Siddique

SS 606	Soil Survey and Land Evaluation	3(2-2)	6 th	Spring 2012	Mid term and final exam.	23	65	12	0	0	Dr. Muhamma d Umer
SS 608	Project Plannaing, Execution and Scientific Writing		4(0 -8)	Spring 2012	Mid term and final exam.	88	12	0	0	0	Dr. Rifat Hayat

SURVEY OF GRADUATING STUDENTS (Proforma 3)

Survey of graduating students was conducted through Performa 3 before the award of degree. The results exhibited that most of the students were very satisfied and satisfied with regards to various questions. They were particularly satisfied with the infrastructure, environment and curriculum of the department. Percent response to the individual questions is presented in Figure below.

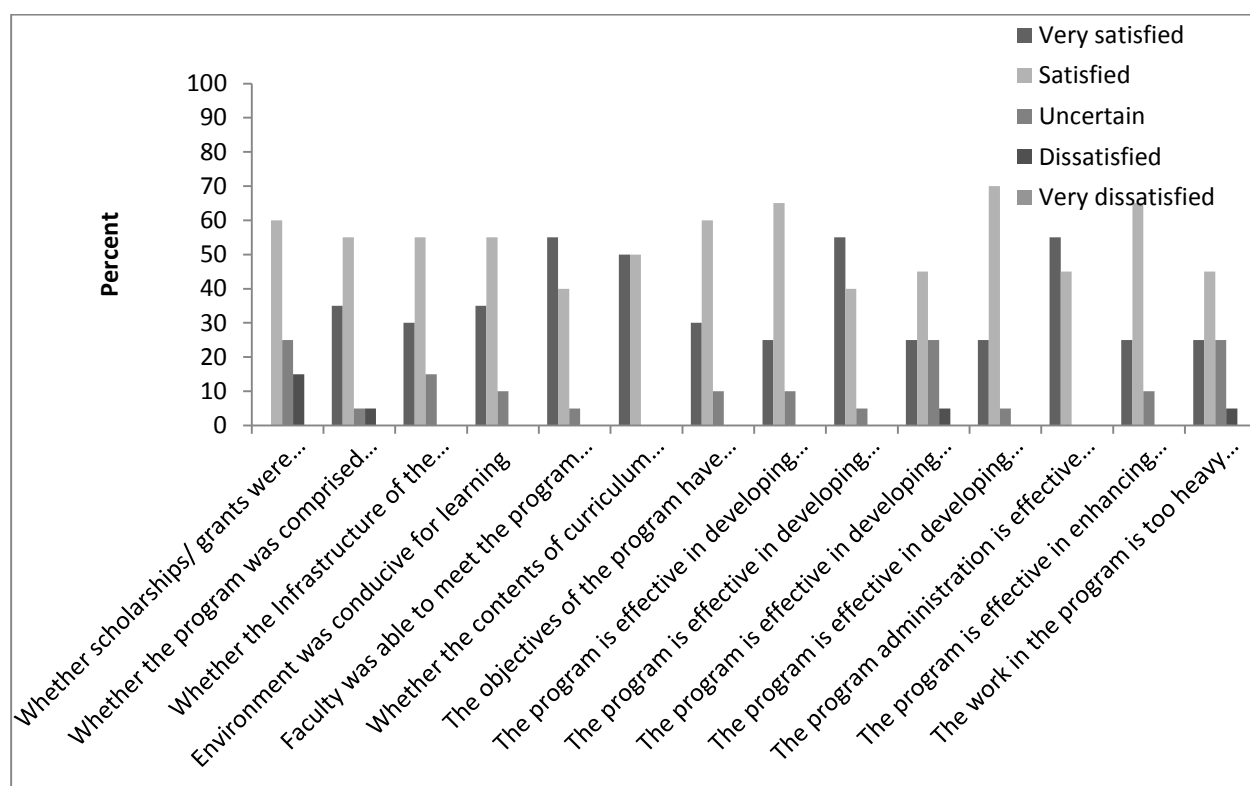


Figure 69. Graduating students' survey results

ALUMNI SURVEY RESULTS (Proforma 7)

Feedback of alumni was acquired through Proforma-7 (Fig. 67). Majority of the the alumni were of the view that the knowledge regarding science and professional discipline provided to them was satisfactory. They also appreciated the departmental efforts regarding ability to link theory to practical, oral and written communication skills and compliance with ethical values. Question wise results are shown in the graph below.

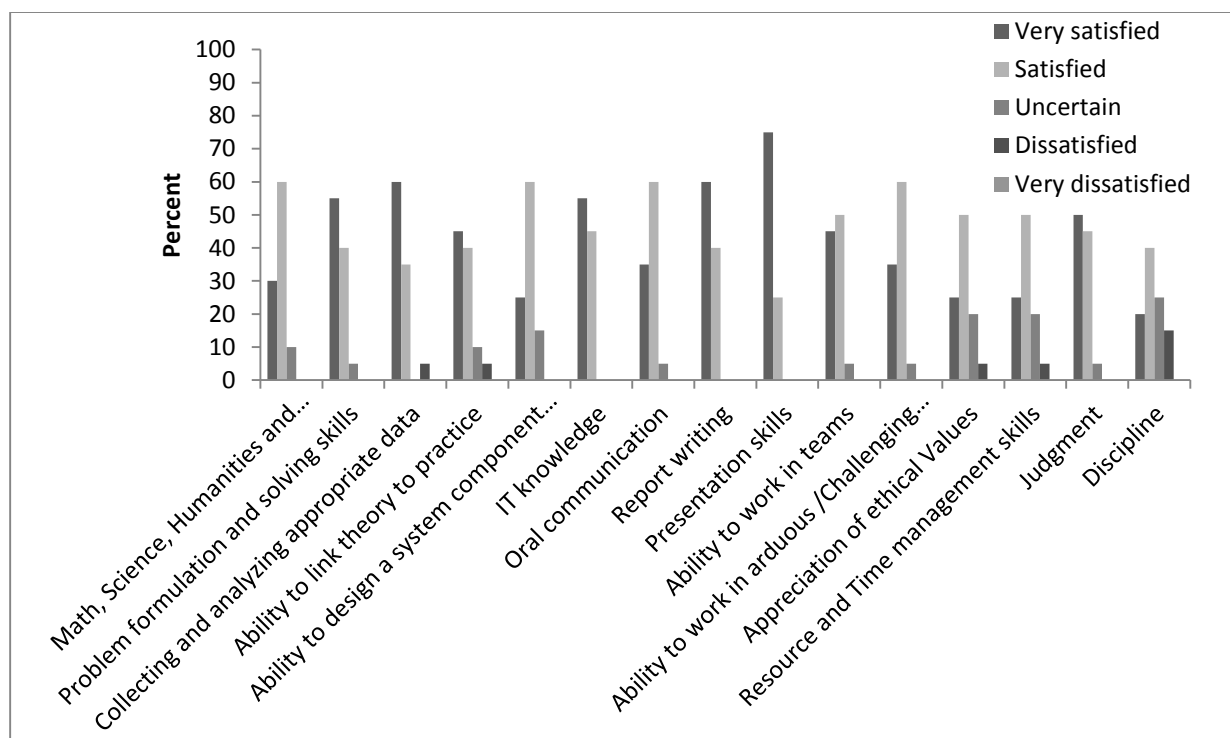


Fig. 70. Alumni survey results

EMPLOYER SURVEY

(Proforma 8)

To obtain employer's point of view about the performance of former students in their organizations, survey was conducted through proforma 8. Majority of employers were of the view that the students that graduated from PMAS-AAUR had very good knowledge of science, ability to link theory to practical, report writing skills, oral presentation and problem solving skills. Overall Figure below indicates good performance of the university graduates.

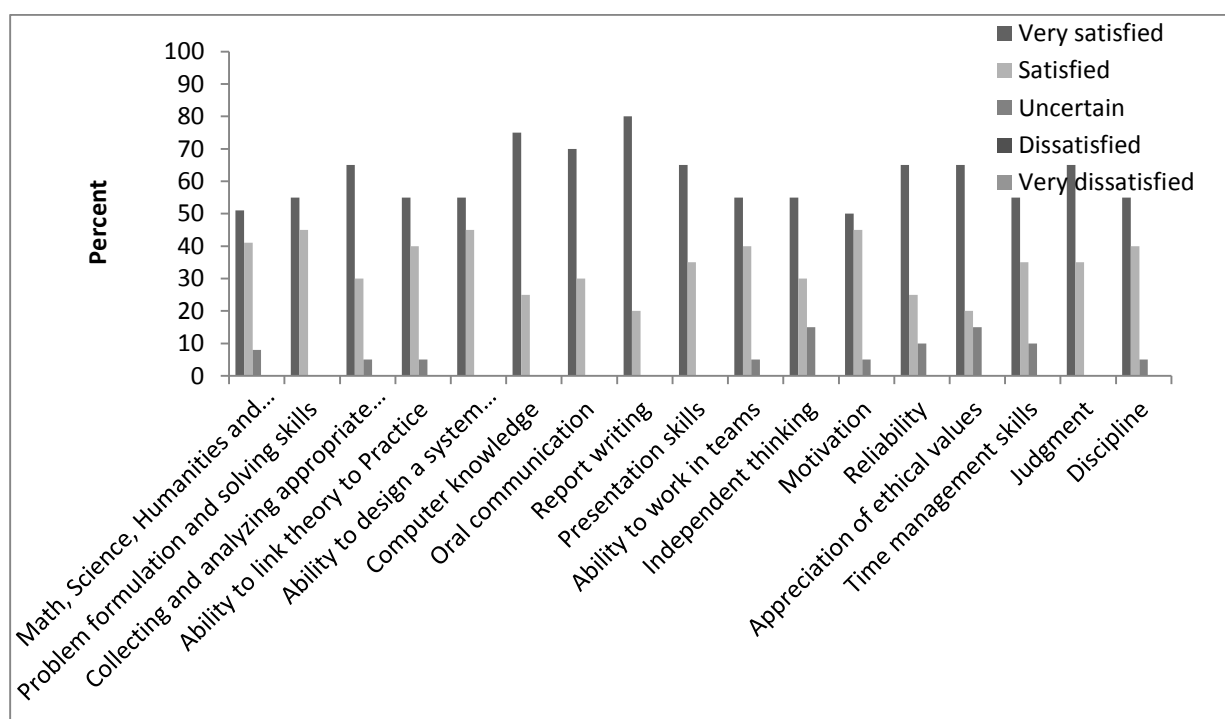


Fig. 71. Employer survey

Standard 1.3: The department must assess its over all performance periodically

Skills and Capabilities:

Students develop ability to apply knowledge of Soil Science & SWC and work as professionals to build confidence and communicate effectively in writing, oral and demonstration. They use modern tools, techniques and skills for their profession, to formulate and design the experiments/projects and to work effectively in a team, to address soil related problems.

Strength of the Department:

The main strength of the department is the availability of highly qualified teachers, experienced in soil management with respect to agriculture production. Majority of the faculty members have degrees from abroad and are experts in their fields. Number of national and international research project are being run by faculty members.

Weakness Identified in the Program:

Department lacks the facilities of lecture rooms according to the number of courses offered by the department. Facility of green house & wire house is lacked; its availability will help the students to conduct their research projects based on pot experiments more smoothly and successfully with quality out put data.

Major Future Improvement Plans:

- Use of update audio visual aids along with modern teaching tools, with access to latest information for quality education in the field of soil science.
- Availability of update published metrial with reference to advisory services. i.e. brochures, pamphlets and hand outs.
- Continual renovation of laboratories with latest sophisticated instruments for quality out put research.
- Modernize the process to equip and enable the research students to tackle day to day research oriented issues.
- Capacity building of the faculty through national and international linkages and trainings.

Standard 1.4: The department must assess its overall performance periodically using quantifiable measures

The evaluation process indicated high efficiency of system and satisfactory impact of outcomes (Table 4). Almost all the graduate and post graduates got jobs in various organizations (provincial department, universities, research organizations, banks and private firms).

Table 4: Quantitative assessment of the department

Sr. #	Particular	No.	Remarks
1	B. Sc. (Hons.) Soil Science degrees awarded	297	
2	M. Sc. (Hons.) Soil Science degrees awarded	138	
3	Ph. D. (Soil Science) degrees awarded	17	
4	Postdoc awarded	Nil	
5	Teacher : Student ratio		Fulfills HEC criteria
6	Technical : Non technical ratio		Fulfills HEC criteria

Table 5: Present performance measures for research activities

Name	International Journal Publications (with Impact Factor)	Projects
Dr. Safdar Ali, Professor	12	4
Dr. M. Saleem Akhtar	22	1
Dr. M. Azhar Naeem, Associate Professor	-	-
Dr. Ghulam Jilani, Associate Professor	34	1
Dr. Khalid Saifullah, Associate Professor	19	1
Dr. Muhammad Akmal, Assistant Professor	9	1
Dr.M.Tariq Siddique, Assistant Professor	6	1
Dr S Sohail Ijaz Assistant Professor	3	1
Dr. Qaiser Hussain, Assistant Professor	11	1
Mr. Arshad Nawaz, Lecturer	11	1
Mr. Tanvir Iqbal, Lecturer	2	1
Dr. Rifat Hayat, Lecturer	12	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.

Criterion 2:

CURRICULUM DESIGN AND ORGANIZATION

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

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 comprises of all faculty members and two members from NARC, is responsible for updating the course contents. 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 and final approval is sought from university sandicate.

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 the department offers three degree programs: B.Sc. (Hons) Agri. Major in Soil Science, M.Sc (Hons) and Ph.D in Soil Science

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 Cumulative Grade Point Average (GCPA) for obtaining the degree is 2.50. To remain on the roll of the university a student shall be required to maintain the following minimum GPA/CGPA in each semester (Table 6).

Table 6: Minimum CGPA in each semester required to remain on roll

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

Examination and Weightage:

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 prescribed as under:

Mid Examination	30%
Assignments	10%
Final Examination	60%

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 7: Scheme of studies for B.Sc. (Hons) Agriculture

Course No.	Course Title	Credit Hours
First semester		
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		
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		
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		
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		
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		
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 Develop	2(1-2)
Seventh semester		
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 Develop.	2(1-2)
Eighth semester		
SS-602	Internship Including Report writing and Presentation	15(0-30)

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

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

Group	Outcome		
	HRD	Priority of Research	Integrated Approach
Soil Fertility and Microbiology	+++	+++	+++
Soil Chemistry and Mineralogy	+++	+++	+++
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 must be stressed within the program's core material

Table 9: Theoretical background, problem analysis, solution design withing program

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
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
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

The courses taught to address the core issue of the program to understand back ground of the area, its inherent problems and solutions to overcome through well thought curriculum, teaching field visits and practical classes.

Standard 2.3: The curriculum must satisfy major requirement of the program

The major requirements of the program are achieved through lecture, practical classes, field demonstrations, visits to research instituetes and participation in the seminars, workshops and congresses.

Standard 2.4: The curricurm must satisfy general education of arts, professional and other discipline requirement of the program

These requirements of the program are achieved by regulatory body named directorate of student's affairs. This body orgnises different program related to arts and other activities.

Standard 2.5: 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.

Standard 2.6: 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. Assignments are given to BSc (Hons) Agri. 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.

Criterian 3:

LABORATORIES AND COMPUTER FACILITIES

There are 3 laboratories in the department. The facilities and shortcomings of these laboratories are listed as under:

Facilities:

Among three reserch laboratories, one is for for practical demonstration to undergraduate students, other two are for postgraduate studenst activities. One additional smal laboroatory is for micronutrient and heavy metal analytical work.

Shortcomings:

The undergraduate laboratory is also used as class room/examination hall as and when required, 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, reports write up, review of literature and preparation of publications. One addiontional laboratroy for undergraduate practical is very much needed. The safety measures in the laboratories need a comprehensive revision plan to addres the issues in case of emergency.

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" has been 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. The laboratories have highly sophisticated equipment therefore this is imperative to have Lab. Technician in the department.

Institutional Facilities:

The departmental library has 360 books relevant to the programs. However, there is no specific room and sitting arrangement for use of these books.

Institutional Support:

Space limitation is the major constraint in the development and strengthening of discipline. Due to unavailability of class rooms, classes are also taken in the laboratories.

Standard 3.3: Computing Infrastructure and Facilities

Computing facilities support: Students of B.Sc. program have access to computer facilities at central library level.

Computing infrastructure: Computers with internet facilities are available to all faculty members and postgraduate students.

Safety Arrangements: Safety arrangements and security plan at department level need to update to address the issues in case of emergency. Revision plan for fire extinguishers for laboratories is also required.

Criterion 4:

STUDENT SUPPORT AND GUIDANCE

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.

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

- For student counseling, regular monthly meetings are organized by the head of the department.
- Access to visit the teachers through out the working hours is allowed and encouraged.
- Participation of the research students in the monthly meetings is mandatory.
- Information desk of the department helps the students in communication and process of relevant documents for their admission, enrollment of semesters and other pre requisites for submission of documents to the Director Advanced Studies.
- Tutorial system is established to guide the undergraduate students. Three resource faculty members have been engaged as tutor.
- Director Students Affairs also play a major role in personality growing and solving problems of the students.
- Directorate of Students Resource Center also contributing to guide the graduate and post graduate student to explore the financial opportunities and jobs.
- Continual efforts and steps are being taken by the management of the department to guide the student's belong to undergraduate and post graduate programe.
- Directorate of sports helps a lot in grooming the students through healthy activities.

Criterion 5:

PROCESS CONTROL

It includes admission of students in different programmes, registration procedures, recruitment of faculty members, teaching and delivery of course material, and completion and evaluation of programmes.

Standard 5.1: Program Admission Criteria

Admission criteria set by Higher Education Commission is followed for all admission programs including B.Sc. (Hons) studies.

Standard 5.2: Process of Registration

The registration process is formalized by registrar office and registration number is issued to the students.

Standard 5.3: Recruitment of Faculty

For Recruitment of faculty members, guidelines are set and issued by HEC are followed.

Standard 5.4: Teaching and Delivery of Course Material

- Curriculum for undergraduate and post graduate studies is revised when required under the guidelines of HEC.
- Teachers use all audio visual tools during lectures to enhance the processes of learning.
- Photocopies of required specific material for reading purpose are handed over to the students during lectures.
- In reference to relevant subject, list of books is also provided to the students.

Standard 5.5: Completion of Program Requirements

The controller of examinations announces calendar schedule for mid and final examination. Examination evaluation program include assignments, quiz, tour activities, mid and final exams according to the requirement of each program. Students Evaluation Program is as under:

In theory, weightage to each component of examination is as prescribed here under:

Midterm Examination 30%

Assignments 10%

Final Examination 60%

Table 10: Grade points

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.

Criterain 6:

FACULTY

Standard 6.1: There must be enough full time faculty who are committed to the program to provide adequate coverage of the program areas/courses with continuity and stability. The interests and qualifications of all faculty members must be sufficient to teach all courses, plan, modify and update courses and curricula. All faculty members must have a level of competence that would normally be obtained through graduate work in the discipline. The majority of the faculty must hold a Ph.D. in the discipline.

Full Time Faculty

Professors	2
Associate Professors	3
Assistant Professors	5
Lecturers	2
Total:	12

Table 11: Full time faculty

Name	Position	Qualification	Specialization
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	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 & Plant Nutrition
Dr. S. Sohail Ijaz	Assistant Professor	Ph. D	Soil and Water Conservation
Dr. Rifat Hayat	Assistant Professor	Ph. D.	Soil Biology/BNF
Dr. Qaiser Hussain	Assistant Professor	Ph. D.	Soil Microbiology
Arshad Nawaz Ch	Lecturer	M. Sc.	Soil fertility and Organic
Tanveer Iqbal	Lecturer	M. Sc.	Soil fertility and Organic

Table 12: 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/Mineralogy	5	01	02
Total:	38	12	10

Standard 6.2: All faculty members must remain current in the discipline and sufficient time must be provided for scholarly activities and professional development. Also, effective programs for faculty development must be in place.

- Professional training and availability of adequate research and academic facilities are provided to the faculty members according to the available resources.
- 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 facilities.
- Faculty evaluation program is run twice a year, during each semester and students do help to evaluate them.

Faculty Resume (Proforma 9)

Name: Dr. Mohammad Saleem Akhtar	
Personal	Department of Soil Science & SWC University of Arid Agriculture Murree Road Rawalpindi 03335128370
Experience	May 23, 2007 to present: Professor of Soil Science (BS-21), Arid Agriculture University Rawalpindi November 2005 to May 22, 2007: Senior Soil Scientist, Pak. Agri. Res. Council. Research on improvement of soil management techniques for enhancing agricultural production and environmental quality June 2003 to October 2005: <u>Humboldt Research Fellow University of Karlsruhe, Karlsruhe, Germany</u>. Modeling heavy metal ions transport through soil to improve predictions on soil and groundwater quality. November 2000 to June 2004: Senior Soil Scientist, Pakistan Agric. Research Council. November 1999 to November 2000, <u>Visiting Scientist Cornell University, New York, USA</u> Modeling of phosphorus transport through soils July 1998 to November 1999, Senior Soil Scientist, Pakistan Agricultural Res. Council February 1998 to July 1998, Visiting <u>Scientist Cornell University (ABEN/SCAS) Ithaca, New York</u>. Modeling of adsorbing and non-adsorbing solute transport through soils May 1993 to May 1998, Senior Scientific Officer, PARC, Soil management, reclamation of degraded soils. Soil potassium availability to plants with respect to mineralogy October 1989 to May 1993, Scientific Officer, PARC, Soil management, industrial by-product use for reclamation of degraded soils. Potassium availability August 1985 to September 1989, Graduate Student, Texas A&M University College Station Texas USA. Soil mineralogy and K quantity/intensity relation in Pakistan soils” February 1982 to August 1985 Soil Scientist, PARC, Islamabad. Increase in crop production through soil and fertilizer management, reclamation of degraded lands.
Honor and Awards	Alexander von Humboldt fellowship 2003-2005, Institute of Mineralogy and Geochemistry University of Karlsruhe, Germany Certificate of Participation in 16 weeks Goethe Institute, Schwäbisch Halle, Germany, Certificate of Accomplishment by PARC and BSTID-U.S. A.I. D Certificate of Excellence for Young Scientists by Soil Science Society Pakistan 1993.
Memberships	Soil Science Society of Pakistan – life member Pakistan Botanical Society Member of Regional Fellows of Alexander von Humboldt Scholarship

Graduate Students Postdocs Undergraduate Students Honour Students	Role of Fe-oxides for predicting phosphorus sorption in calcareous soils, Mehrunisa Memon, Karlsruher Mineralogische und Geochemische Heft, Institute für Mineralogie und Geochemie, Universität Karlsruhe (TH) Germany Change in distribution of Selenium forms with soil development in loess. Ambreen Afzal MSc.(Hons.) Soil Science, 2012 Soil organic carbon fraction distribution in a loess toposequence. Muhammad Arsalan Azam MSc.(Hons.). Soil Science, 2012 Phosphorus fractions as influenced by weathering in the Estuary Plain soils. Mr. Sohail Jamil. MSc. (Hons.) Department of Soil Science, PMSA-Arid Agriculture University Rawalpindi. 2011 Arsenic speciation in compost leachate by hydride-generation atomic absorption spectrophotometry. Mr. Shah Rukh. MSc. (Hons.) Department of Soil Science PMSA-Arid Agriculture University Rawalpindi. 2011 Phosphorus fractionation in a loess toposequence. Mr. Muhammad Imran. MSc. (Hons.) Department of Soil Science PMSA-Arid Agriculture University Rawalpindi. 2010 Phosphorus adsorption and Langmuir equation parameters in relation with soil characteristics. Mr. Ayaz Mehmood. MSc. (Hons.) Department of Soil Science PMSA-Arid Agriculture University Rawalpindi. 2009 Role of Fe-oxides for predicting phosphorus sorption in calcareous soils. Mrs. Mehrunisa Memon PhD dissertation, Institute Mineralogy and Geochemistry. University of Karlsruhe, Germany. 2008 Quantification of low concentration of Iron oxides in soil. Mrs. Mehrunisa Memon MS Mineralogy and Geochemistry. Institute Mineralogy and Geochemistry. University of Karlsruhe, Germany. 2005 Micaceous mineral weathering as affected by long-term fertilizer management practices in sugarcane based cropping system. Mr. Mohammad Waheed MSc. (Hons.) Department of Soil Sci., Uni. Arid Agriculture, Rawalpindi 1998
Service Activity	Peer review services for several intl. journals Project evaluation for many funding agencies Theses and job application review of other institutions Resource person for training and workshops Soil/ plant analytical facilities for students of sister departments.
Brief Statement of Research Interest	Soil management for efficient water use in arid areas , Plant nutrient (P,K) fixation and release processes in soil, Modelling solute transport in soils and assessment of soil contamination
Publications	<u>International and National Journal with Impact Factor</u> M.S. Akhtar, D. Steuben, S. Norra, M. Memon. 2011. Soil structure and flow rate-controlled molybdenum, arsenate and chromium(III) transport through field columns, Geoderma 161 Page 126-137, IF2.176. M. Memon, M. Jamro, K.S. Memon, M.S. Akhtar. 2012. Micronutrient availability assessment of tomato grown in Taluka Badin Sindh. Pakistan Journal of Botany, 44(2): 649-654 0.947 M. Memon M.S. Akhtar K.S. Memon, D. Steuben. 2011. Phosphorus form in the Indus river alluvial and shale and limestone derived residual soil Asian Journal of Chemistry, 23(5):1952-1962, 0.217 Memon, M., M. S. Soomro, M. S. Akhtar. 2011. Drinking water quality assessment in southern Sindh (Pakistan). Environmental Monitoring

	Assessment 177(1): 39-50. IF 1.436 A. Mehmood M. S. Akhtar, R. Hayat, M. Memon. 2010. Phosphorus adsorption parameters in relation to soil characteristics. Journal Chemical Society Pakistan 2(2): 129-139. IF 0.194 M. S. Akhtar, M. Memon. 2009. Biomass and nutrient uptake by rice and wheat: A three-way interaction of K, NH₄ and soil type Pakistan Journal of Botany 41(6): 2965-2974. IF 0.947 M.M. Hassan, M. Rashid, M. Saleem Akhtar, E. Rafiq. 2010. Nitrate and phosphate leaching from Aridisols and Entisols: Laboratory studies and field observations Soil Sediment Contamination 19(3):261-266 IF 0.808 M. Saleem Akhtar and Joe B. Dixon, Mineralogical characteristics and potassium quantity/intensity relation in three Indus River Basin soils. Asian Journal of Chemistry 21(5) 3427-3442, 2009, 0.247 Memon, M., K.S. Memon, M. Saleem Akhtar, D. Stüben. 2009. Characterization and quantification of iron oxides occurring in low concentration in soils. Communication in Soil Science Plant Analysis. 40(1): 162-178, IF 0.432 M. Saleem Akhtar, G. Nabi, M. M. Hassan, Does No-till wheat sowing in a Rice-wheat cropping sequence cause surface-soil compaction Eurasian Soil Science 41(11) 1205-1212, 2008, IF0.194 M.M. Hassan, M. Saleem Akhtar, G. Nabi, 2008. Boron and zinc transport through intact columns of calcareous soils. Pedosphere 18(4): 524–532, IF0.978 M.M. Hassan, M. Saleem Akhtar, P.J. Gregory. 2007. Solute movement through intact columns of Cryoturbated Upper Chalk. Hydrological Processes 22: 2086-2096. IF 2.068 M. S. Akhtar, T. Steenhuis, B. Richards, M. McBride. 2004. Chloride and lithium transport in large arrays of undisturbed silt loam and sandy loam soil columns. (ERRATUM) Vadose Zone Journal 3: 316, IF 2.133 M. S. Akhtar, B. Richards, P. Medrano, M. deGroot, T.S. Steenhuis. 2003. Dissolved phosphorus from undisturbed soil cores: Related to adsorption strength, flow rate, or soil structure? Soil Science Society America Journal, 67: 458-470. IF 1.866 M. S. Akhtar T. Steenhuis B. Richards M. McBride. 2003. Chloride and lithium transport in large arrays of undisturbed silty loam and sand loam soil columns. Vadose Zone Journal 2: 715-727. IF 2.133 Geohring, L. D. O. V. McHugh, M. T. Walter, T. S. Steenhuis M. S. Akhtar, M. F. Walter. 2001. Phosphorous transport into subsurface drains by macropore after manure application: Implications for best manure management practices. Soil Science 66. IF 0.923 Rizwan Ali K. Bashir, R. Hayat, M Saleem Akhtar 2012. Effect of cadmium on soyabean (Glycine maxL) growth and nitrogen fixation. African Journal of Biotechnology 11:1886-1891. IF 0.573 G. Nabi, C. E. Mullins, M.B. Montemayer M. Saleem Akhtar 2001. Germination and emergence of irrigated cotton in Pakistan in relation to sowing depth and soil physical characters of the seedbed. Soil Tillage Research 59: 33-44. IF 2.100 M. Shafiq, A. Hassan, S. Ahmad, M. S. Akhtar. 1994. Water intake as influenced by tillage in rainfed of Punjab (Pakistan). Journal Soil Water Conservation 49: 302- 305. IF 1.407
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	M.M. Hassan A. Rashid, M. S. Akhtar. 1993. Phosphorous requirement of corn and sunflower on calcareous soils of Pakistan. <i>Communication in Soil Science Plant Analysis</i> 24: 1529-1541. IF 0.432. (B) International and National Journals (without impact factor) M. S. Akhtar J. B. Dixon. 1989. Mineralogy and potassium quantity/intensity relation in alluvial soils of Pakistan <i>Sciences Géologiques, Mémoire</i> 85. 185-193 M. S. Akhtar, U. Mohrlok, D. Stüben. 2009. A simple model for simulation of adsorbing and nonadsorbing solute transport through field soils. <i>Hydrol. Earth Syst. Sci. Discuss.</i> 6:5631-5664 M. S. Akhtar B. H. Niazi. 1986. Nutrient dynamics during the reclamation of calcareous saline sodic soil with by product hydrochloric acid. <i>Geobios (Jodhpur)</i> 15: 145-150. M. S. Akhtar and J. B. Dixon. 1993. Mineralogy and mineral properties of surface soils from the Indus plain of Pakistan. <i>Clay Research</i> 12:22-32. Yousaf, M., S. Ali, M. Waheed, M. S. Akhtar. 2009. Dynamics of clay mineralogy with profile depth in relation to long-term potassium fertilizer application to sugar cane crop. <i>Pakistan Journal of Scientific Industrial Research</i> 52: 32-36. K. Shaikh, K.S. Memon, M. Memon M.S. Akhtar. 2007. Changes in mineral composition and bioavailable potassium under long-term fertilizer use in Cotton-Wheat System. <i>Soil Environment</i> 26: 1-9. M. M. Hassan, M. S. Akhtar and G. Nabi. 2006. Boron and zinc sorption and transport in calcareous soils. <i>Soil and Environment</i>, 25: 17-27. M. M. Hassan, M. S. Akhtar, S.M. Gill and G.Nabi. 2003. Simulation of chloride transport based on descriptive soil structure. <i>Pakistan Journal Scientific and Industrial Research</i> 46: 424-431 M. S. Akhtar and D. A. Jenkins. 1999. Mineralogical characterization of glauconitic sandstone from Chichali formation of Surgar Range. <i>Pakistan Journal Scientific and Industrial Research</i> 42:215-219 S. Qureshi, M. S. Akhtar, K. S. Memon. 1996. Mineralogical composition of two Sindh alluvial soils in relation to K availability <i>Pakistan J. Soil Science</i> 11:27-38 M.M. Hassan M. S. Akhtar. 1992. Calcite in the semi-arid soils of Pakistan: I. Comparison of quantification methods for determining calcite in the semi-arid soils of Pakistan. <i>Pakistan Journal of Soil Science</i> 7:11-18 Awan, Z.I., M. Irshad, M. S. Akhtar. 1998. Potassium fixation in relation to soil parent material and weathering stage. <i>Pakistan J. Soil Science</i> 15:106-115 Sattar, A., M. S. Akhtar. 1996. Potassium quantity/intensity parameters in relation to soil parent material and weathering stage in Pakistan. <i>Pakistan Journal of Soil Science</i> 11:39-49 M. S. Akhtar, M. M Hussan. 1995. Profile development-pore size distribution relations in a loess soil as determined by Mercury Intrusion Porosimetry. <i>Pakistan Journal of Soil Science</i> 10:49-53 Awan, Z.I., M. Irshad, M. S. Akhtar. 1998. Potassium release characteristics of sand and silt in relation to soil parent material and weathering stage. <i>Pakistan Journal of Soil Science</i> 15:94-106 S. M. Gill, M. Saleem Akhtar, and Z. Saeed. 2000. Soil water use and bulk
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- Akhtar, M. S., G. Nabi, M. Mahmood ul Hussan, and Shahid. M. Gill. 2003. Soil physical and wheat root growth characteristics under long-term zero tillage in Rice-Wheat system. Proc. National Workshop on rice-Wheat system, Islamabad Dec. 2002. Rice-Wheat Consortium for the Indo-Gangetic Plains, New Delhi, India. pp. 55-61.
- (D) National Conference Proceeding Papers
- Jabbar, A., Akhtar, M. S., and M. Ali. 1994. Soil and water pollution by agrochemicals and industrial effluents in Faisalabad. Proc. 1st Intl. Conf. Environmental protection in developing countries Lahore Sep 26, 1994.
- Rafique, E., A. Rashid, and Akhtar, M. Saleem 1994. Nutritional disorders of sorghum crop in Chakwal district. p. 511-516. In N. Ahmad (ed.) In N. Ahmad (ed.) Proceeding of National Congress of Soil Science May 1992. Islamabad. Soil Science Society of Pakistan.
- Nizami, M. M. I., Akhtar, M. S., A. Rashid and J. Din. 1994. Soil diagnostic analysis for tea cultivation in Swat and Dir areas. p. 619-628. In N. Ahmad (ed.) Proceeding of National Congress of Soil Science May 1992. Islamabad. Soil Science Society of Pakistan.
- Ali, A., Akhtar, M. S., A. Rashid. 1994. Potassium ammonium interaction in Entic Chromustert and Udic Haplustalf soils. p.641-646. In N. Ahmad (ed.) Proc. 4th National Cong. Soil Sci. May 1992. Islamabad. Soil Science Soc. Pakistan.
- Akhtar, M. S., A. Ali, and Z. A. Ahmad. 1994. Micaceous mineral transformation and potassium availability under rice-wheat rotation. p. 189-196. In N. Ahmad (ed.) Proc. 4th National Cong of Soil Science May 1992. Islamabad. Soil Science Society of Pakistan.
- Akhtar, M. Saleem and J. B. Dixon. 1990. Mineralogy of alluvial pedons in relation to potassium chemistry. p 83-95. In M. Rafiq (ed.) Proc. 3rd Soil Science Congress. Society Soil Science of Pakistan.
- Akhtar, M. Saleem and J. B. Dixon. 1990. Mineralogy and K/Ca+Mg quantity/intensity relationships in selected alluvial pedons of Pakistan. p. 220-231. In M. Rafiq (ed.) Proc. 3rd Intl. Soil Sci. Cong. Society Soil Sci. Pakistan.
- Mahmood ul Hassan, M., A. Rashid, and Akhtar, M. Saleem 1994. Phosphorous fertilizer requirement of some benchmark soils of Pakistan. p. 327-332. In N. Ahmad (ed.) Proc. 4th National Congress of Soil Science, May 1992. Islamabad. Soil Science Society of Pakistan.
- Jabbar, A., M.S. Akhtar. 1991. Soil and aquifer pollution by agro-chemicals in Pakistan. Progressive Farming (Pakistan) 11(6):40-44
- (E) Book / Book Chapter
1. Akhtar, M. Saleem Soil Mineralogy. In E. Bashir and R. Bantel (eds.) Soil Science. National Book Foundation, 1996. Islamabad. pp. 67-110.
 2. Akhtar, M. Saleem Soils of Pakistan (under review).
- (F) Popular Articles (selected)
- Soil Conditioners: Use of good soil management techniques. In THE NEWS, Islamabad. June 10, 2002.

	Water quality and Irrigation Problems. In THE NEWS, Islamabad. June 24, 2002. Industrial and Sewage Wastewater Management Options: Disposal to Rivers verses Renovation through Land Application. COMSATS News & Views 1 p14-15, 2001. COMSATS Islamabad. Environmental degradation along national highways. In THE NEWS, Islamabad. March 26, 2007.
Research Grants and Contracts.	December 2008 to December 2011, Higher Education Commission research project "Characterization and Quantification of Soil Iron Oxides and their Effect on Phosphorus Sorption" Project Incharge May 1991 to September 1993, USAID-BOSTID competitive grant "Potassium ammonium dynamics in relation to soil mineralogy and implications for fertility management". June 1991 to June 1998, World Bank - ARP II "Soil Physics" project. Served as project National Agricultural Research Center, Islamabad, Pakistan. June 1991 to May 1995, World Bank - ARP II "Soil Physics". National Coordinator.
Other Res. creative accomplishments	Not available
Selected Professional Presentations	<u>(F) Oral/Poster Presentations in International Conferences</u> Estimation of Preferential Flow Based on Structure Analysis Using X-ray Tomographie of Large Soil Columns. Eos Trans. AGU, 87(52), Fall Meet. Supplementary Abstract Preferential flow of heavy metals through soils: Is it related to soil structure? Annual meeting of Soil Physics Commission of Soil Science Society of Germany (ZALF), Berlin 2004. Adsorption Coefficient from the Batch Experiment: Does it Reflect Retardation in Field Soil? Annual meeting of Mineralogical Society Germany (DMG), Karlsruhe 2004. Transport of a metal (Lithium) and a non-adsorbed tracer in a silty clay loam and a sandy loam soil. Intl. Conf. Bio-Geochemistry of Trace Metals. June 2003. Uppsala, Sweden, Observations and General Theory for preferential flow in unsaturated Soils. Preferential Flow Symp. Am. Soc. Agric. Engin. Jan. 2001. Uni. Maryland College Park. USA. Facilitated Transport of Sludge Soluble Heavy Metals Affected by Temperature and Micro-organisms. 2000, ASA-CSSA-SSSA Annual Meetings, Minneapolis, MN. Nov. 5-9, 2000. Transport of soluble reactive phosphorus through soils. # 2046. Northeast Ag./Biol. Engin. Conf. ASAE 11th Annual meeting, Ithaca, New York July 30- August 2, 2000. A Generalized Theory for Preferential Flow. 1999 Agronomy Abstracts. Micaceous mineral transformations and potassium availability under rice-wheat rotation. 10th Int. Clay Conference, Adelaide. Australia. 1993. Mineralogical characterization of a glauconitic sandstone from Chichali formation of Surgar range. 10th. Int. Clay Conference, Adelaide. Australia. 1993. Potassium availability as affected by soil mineralogy. Regional symposium on K-availability of soils in West Asia and North Africa: status and

prospective. June 19-23, 1993, Tehran. Iran.
 Clay mineralogy and K/Ca+Mg quantity/intensity relations in selected alluvial pedons of Pakistan. Third Int. Cong. Soil Science Society Pakistan, March 1990. Lahore.
 Clay Mineral relationships to Q/I parameters in three alluvial soils: A Statistical Approach. Assoc. Int. Pour Letude Des Argiles. 9th Int. Clay Conf. Strasbourg. Aug. 1989. France.
 Potassium mineralogy of selected soils profiles from the Indus river plain of Pakistan. Soil Science Soc. America. Annual meeting, California (USA) Dec. 1988.
 Pedogenic changes and mineral weathering in three alluvial soils of the Indus plain of Pakistan. Int. Soc. Soil Sci. VIIth Int. Work. Meet. Soil Microm. San Antonio, Texas, U.S.A. July 1988.
 Mineralogy of selected surface soils from the Indus valley of Pakistan. Clay Mineralogy Soc. Am. Annual Meeting. New Mexico. Oct. 1987. USA.

Name	Dr. Khalid Saifullah Khan
<i>Personal</i>	Department of Soil Science & SWC, PMAS-Arid Agriculture University, Shamsabad, Rawalpindi Cell No. 0300-9543958 email: khan_ks@yahoo.com
<i>Experience</i>	26-02-2005 to to-date Associate Professor, Soil Science, PMAS-AAUR 28-10-199 to 25-02-2005 Assistant Professor, Soil Science, PMAS-AAUR 26-10-1992 to 27-10-1999, Lecturer, Soil Science, BAC/PMAS-AAUR 01-01.1990 to 25-10-1992, Lecturer, Soil Science, Bahauddin Zakariya University, Multan 03-07-1989 to 31-12-1989, Assistant Research Officer, Ayub Agri. Res. Institute, Faisalabad.
<i>Memberships</i>	Life-Member of the Soil Science Society of Pakistan since 1989. Member of Alumni-Portal, Germany since 2003 Member of Humboldt Alumni Association since 2009.
<i>Honours and Awards</i>	Cultural Exchange Scholarship for Ph. D studies by the Ministry of Education, Islamabad, Pakistan and the State Education Commission of China in 1995. Certificate of Honour and Prize Money as an Excellent Ph. D Student at Zhejiang University, Hangzhou, China in 2007. Georg Forster Post-doctoral Fellowship from Alexander von Humboldt Foundation, F. R. Germany (August 2007 to December 2008). HEC Post-doctoral Research Fellowship from Higher Education Commission, Islamabad, Pakistan (March 2005 to February 2006). Short-term Research Fellowship from DAAD, F. R. Germany Research Productivity Award by Pakistan Council for Science and Technology in the years 2010 and 2011.
<i>Graduate Students</i>	Number of Students Supervised as Major Supervisor:

<i>Postdocs</i> <i>Undergraduate</i> <i>Students</i> <i>Honour Students</i>	M.Sc (Hons)Agri-Soil Science: 8 Ph.D Soil Science: 4 Member of Supervisory Committee: M.Sc (Hons)Agriculture: 20 Ph.D: 7
<i>Service Activity</i>	Incharge, Central Research Laboratory of the University from Oct. 1999 till present. Consultant, water quality and plant nutrition, Farmer Market (Pvt) Ltd. from June 2011 till present Member of the Faculty Board of Studies and University Academic Council Member, Departmental Board of Studies Water quality analysis for Koont Farm Lectures to Progressive Farmers at Lahore, Multan and Hyderabad on Zn nutrition of plants in collaboration with ICI Pakistan Ltd.
<i>Brief Statement of Research Interest</i>	Role of soil microbial biomass as a source/sink of plant nutrients. Studies on soil microbial processes leading to nutrient availability in soil-plant system. Improving phosphorus availability to crop plants through stimulation of soil microbial biomass and microbial metabolites Assessment of soil microbial biomass and soil enzymes as an index of soil quality
<i>Publications</i>	Khan, K. S. and R. G. Joergensen. 2006. Microbial C, N and P relationships in moisture stressed soils of Potohar, Pakistan. Journal of Plant Nutrition and Soil Science, 169: 494-500 (IF 2009: 1.595) Khan, K. S. and R. G. Joergensen. 2006. Decomposition of heavy metal-contaminated nettles (<i>Urtica dioica</i> L.) in soils differently subjected to heavy metal pollution by river sediments. Chemosphere, 65: 981-987 (IF 2010: 3.155) Khan, K. S., K. Chander, N. Lamersdorf and R. G. Joergensen. 2007. Sources of heavy metals and their long-term effects on microbial C, N and P relationships in soil. Water Air and Soil Pollution, 181: 225-234 (IF 2010: 1.765) Chander, K., G. Hartmann, R. G. Joergensen, K. S. Khan and N. Lamersdorf. 2008. Comparison of methods for measuring heavy metals and total phosphorus in soils contaminated by different sources. Archives of Agronomy and Soil Science, 54: 413-422. Khan, K. S., A. Gatteringer, F. Buegger, M. Schlöter, and R. G. Joergensen. 2008. Microbial use of organic amendments in saline soils monitored by changes in the ¹³ C/ ¹² C ratio. Soil Biology and Biochemistry, 40: 1217-1224 (IF 2010: 3.242) Rasul, G., K. S. Khan, T. Muller, and R. G. Joergensen. 2008. Soil-microbial response to sugarcane filter cake and biogenic waste compost. Journal of Plant Nutrition and Soil Science, 171:355-360 (IF 2010: 1.969) Khan, K. S., and R. G. Joergensen. 2009. Changes in microbial biomass and P fractions in biogenic household waste compost amended with inorganic P fertilizers. Bioresource Technology, 100: 303-309 (IF 2010: 4.365) Rasul, G., A. A. Khan, K. S. Khan, and R. G. Joergensen. 2009. Immobilization and mineralization of nitrogen in a saline and alkaline soil during microbial use of sugarcane filter cake amended with glucose.

	Biology and Fertility of Soils 45: 289-296 (IF 2010: 2.156) Khan, K. S., and R. G. Joergensen. 2009. Simultaneous measurement of S, macronutrients and heavy metals in the soil microbial biomass with CHCl_3 fumigation and NH_4NO_3 extraction. Soil Biology and Biochemistry 41:309-314 (IF 2010: 3.242) Khan, K. S., T. Mueller, J. Dyckmans, and R. G. Joergensen. 2010. Development of ergosterol, microbial biomass C, N and P after steaming as a result of sucrose addition and <i>Sinapis alba</i> cultivation. Biology and Fertility of Soils 46: 323-331. (IF 2010: 2.156) Khan, K. S. and R. G. Joergensen. 2010. Effects of Zn and P addition on the microbial biomass in a Zn deficient calcareous soil. Plant and Soil 335: 493-499. (IF 2010: 2.773) Akram, Z., S. U. Ajmal, K. S. Khan, R. Qureshi and M. Zubair. 2011. Combining ability estimates of some yield and quality related traits in spring wheat (<i>Triticum aestivum</i> L.). Pakistan. Pakistan Journal of Botany 43: 221-231. (IF 2010: 0.947) Khalid, R., K. S. Khan, and M. Gulfranz. 2011. Relationship of plant available sulphur with soil characteristics, rainfall and yield levels of oilseed crops in Pothwar, Pakistan. Pakistan Journal of Botany 43: 2929-2935 (IF 2010: 0.947) Indorf, C., J. Dyckmans, K. S. Khan and R. G. Joergensen. 2011. Optimisation of amino sugar quantification by HPLC in soil and plant hydrolysates. Biology and Fertility of Soils 47: 387-396 (IF 2010: 2.156) Khan, K. S. and R. G. Joergensen. 2012. Compost and phosphorus amendments for stimulations microorganisms and growth of ryegrass in a Ferralsol and Luvisol. Journal of Plant Nutrition and Soil Science 175: 108-114. (IF 2009: 1.595) Khan, K. S. and R. G. Joergensen. 2012. Relationships between P fractions and the microbial biomass in soils under different land use management. Geoderma 173-174: 274-281. (IF 2010: 2.176) Malik, M. A. and K. S. Khan. 2012. Phosphorus fractions, microbial biomass and enzyme activities in some alkaline calcareous subtropical soils. African Journal of Biotechnology 11: 4773-4781 (IF 2009: 0.565) Malik, M. A., P. Marschner and K. S. Khan. 2012. Addition of organic and inorganic P sources to soil- effects on P pools and microorganisms. Soil Biology and Biochemistry 49: 106-113. (IF 2009: 2.978) Tariq, A. S., Z. Akram, G. Shabbir, M. Gulfranz, K. S. Khan, M. S. Iqbal and T. Mahmood. 2012. Character association and inheritance study of different sorghum genotypes for fodder yield and quality under irrigated and rainfed conditions. African Journal of Biotechnology 11: 9189-9195 (IF 2009: 0.565) Khan, K. S., X. Castillo, F. Wichern, J. Dyckmans and R. G. Joergensen. 2012. Interactions of mustard plants and soil microorganisms after application of sugarcane filter cake and pea residues to an Andosol. Journal of Plant Nutrition and Soil Science 175: 931-938 (IF 2009: 1.595) Khalid, R., K. S. Khan, M. Islam, G. Shabbir, Z. I. Ahmad and M. Yousaf. 2012. Effect of different sulphur levels from various sources on Brassica napus growth and soil sulphur fractions. Journal of Chemical Society of Pakistan 34: 1023-1031 (IF 2009: 0.190)
Research Grants and Contracts	

<i>Other Research or Creative Accomplishments</i>	Nil
<i>Selected Professional Presentations</i>	Khan, K. S., K. Chander and R. G. Joergensen. 2004. Different sources of heavy metals and their long-term effects on microbial C, N and P relationships in soil. Presented at Eurosoil Conference, September 4-12, Albert Ludwigs University, Freiburg, Germany. Khan, K. S., and R. G. Joergensen. 2007. Microbial C, N and P relationships in moisture-stressed soils of Pothwar, Pakistan. Presented at Tropentag, October 9-12, Witzenhausen, Germany. Khan, K. S., and R. G. Joergensen. 2008. Changes in microbial biomass in biogenic waste compost in response to inorganic phosphorus amendments. Presented at the Workshop of Core Group of Soil Biology, German Society of Soil Science, February 28-29, Osnabruck, Germany. Khan, K. S., and R. G. Joergensen. 2008. Microbial use of organic amendments in saline soils monitored by changes in the $^{13}\text{C}/^{12}\text{C}$ ratio. Presented at Eurosoil, August 25-28, Viena, Austria. Khan, K. S. and R. G. Joergensen. 2008. Use of householdwaste compost for improving P availability in soil. Presented at Ist Alexander von Humboldt Conference, November 1, Witzenhausen, Germany. Khan, K. S. 2009. Soil Pollution – A big threat to agricultural productivity. Presented at Ist Alexander von Humboldt Kolleg International Conference, November 19-22, Dhaka, Bangladesh Khan, K.S. 2010. Collaboration in agricultural research for food security in South Asia. Presented at Alexander von Humboldt Kolleg International Conference, November 15-18, Kathmandu, Nepal.

Name: Dr Muhammad Tariq Siddque	
Personal	Department of Soil Science & SWC University of Arid Agriculture Murree Road Rawalpindi 03335128370
Experience	November 2010 to present: Associate Professor of Soil Science (BS-19), Arid Agriculture University Rawalpindi May 07, 2007 to November 2010: Assistant Professor of Soil Science (BS-19), Arid Agriculture University Rawalpindi August 2004 to May 2007: Assistant Agricultural Chemist, Soil & Water Testing Laboratories, Rawalpindi April 1984 to July 2004 : Assistant Research Officer January 2001 to February 2003: Visiting Scientist at University of Reading, UK. November 1995 to 2000: PhD Scholar at University of Reading, UK. March to June, 1989: Research Trainee at International Rice Research Institute, Philippines. Certificate of completion “The four month INSURF training course”.
Honor and Awards	World Bank Award for PhD studies in the University of Reading, UK. under ARP-II from November 1995 to 2000.

	of Animal and Plant Sciences 3, 26-29. Humair Ahmed, Muhammad Tariq Siddique, Safdar Ali, Azeem Khalid and Nadeem Akhtar Abbasi. 2012. Mapping of Fe and impact of selected physico-chemical properties on its bioavailability in the apple orchards of Murree region. <i>Soil and Environ.</i> 31 (1): Azeem Khalid, Sadia Batool, Muhammad Tariq Siddique, Zilli Huma Nazli, Riffat Bibi, Shahid Mahmood and Muhammad Arshad. 2011 Decolorization of Remazol Black-B azodye in soil by fungi. <i>Soil and Environ.</i> 30 (1): 1 – 6 Ahamad, A., M. T. Siddique, I. A. Hafiz and Ehsan-ul- Haq. 2010. Zinc status of apple orchards and its relationship with selected physico-chemical properties in Murree tehsil. <i>Soil and Environ.</i> 29 (2): Waheed. A., R. Khalid, T. Mahmood, M. T. Siddique and A. S. Javed. 2010. Quality of groundwater for irrigation in tehsil Taxila of district Rawalpindi, Punjab. <i>Soil and Environ.</i> 29 (2): Siddique, M., M. T. Siddique S. Ali and A. S. Javed. 2009. Macronutrient assessment in apple growing region of Punjab. <i>Soil and Environ.</i> 28 (2): 184 – 192. Chaudhry, E.H., Timmer, V., Javed, A.B., and Siddique, M.T. 2007. Wheat response to micronutrients in rain-fed areas of Punjab. <i>Soil & Environment</i> 26: 97-101. Niaz, A., Gill, M.A., Yasin, M., Siddique, M.T. and Sial, R. 2004. Phosphorus nutrition of wheat cultivars under deficient and adequate levels in solution culture. <i>Pakistan Journal of Science.</i> 56: 95-99. Sameen, A., Anjum, F.M., Niaz, A., Siddique, M.T. and Sial, R.A. 2004. Effect of fertilizer doses on the rheological and technological properties of different wheat genotypes. <i>Pakistan Journal of Science</i> 56, 48-56. Siddique, M.T. and Rashid, A. 1993. Response of kinnow fruit s to zinc fertilization. <i>Punjab Fruit J.</i> 46 (1-4): 32-38. Siddique, M.T., Rashid, A. and Saeed, M. 1992. Micronutrients status of soil s/plants of citrus growing areas in Punjab. <i>Punjab Fruit J.</i> 45 (1-4): 148-156. C: Bhatti, H.M., Rahid, M., Nadeem, M.Y. and Siddique, M.T. 1988. Micronutrient status of soils of the central Punjab. In Proceedings “Micronutrient in Soils and Crops in Pakistan”. pp 9-16. Bhatti, H.M., Rahid, M., Nadeem, M.Y. and Siddique, M.T. 1988. Micronutrient fertilization and wheat yields in Punjab. In Proceedings “Micronutrient in Soils and Crops in Pakistan”. pp 208-217. Bhatti, H.M., Rahid, M., Nadeem, M.Y. and Siddique, M.T. 1988. Effect of micronutrients fertilization on kharif crops. In Proceedings “Micronutrient in Soils and Crops in Pakistan”. pp 246-255. Bhatti, H.M., Rahid, M. and Siddique, M.T. 1988. Micronutrient research in Pakistan. In Proceedings “Managing Soil Resource”. pp. 65-74. Siddique, M.T., M. Rahid. And Ehsan, B.A. 1988. Efficiency of applied gypsum
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	for the improvement of salt affected soils under field conditions. In Proceedings "Managing Soil Resource". pp. 380-385. Siddique, M.T., Qurashi, R.H. and Abdullah, M. 1988. Growth response and chemical composition of kallar grass (<i>Lapochloa fusca</i>) under varied soil pH conditions. In Proceedings "Managing Soil Resource". pp. 423-427.
Research Grants and Contracts.	Soil and plant nutrient indexation of apple orchards of Murree region, grant Sponsored by the PMAS-Arid Agriculture University, Rawalpindi Soil characterization for plant available nutrients in arid region, grant sponsored by Punjab Govt. Micronutrient status of citrus orchards in Punjab, sponsored by Pakistan Agriculture Research Council, Islamabad.
Other Res. creative accomplishments	Not available
Selected Professional Presentations	

Name	Dr. Shahzada Sohail Ijaz
<i>Personal</i>	Father's Name: Ijaz Hussain Date of Birth: 01, August 1976
<i>Experience</i>	Assistant Professor Sept 15, 2008 to date Department of Soil Science & Soil and water conservation, PMAS-Arid Agriculture University Rawalpindi, Pakistan Research Associate Feb 19, 2007 to July 15, 2008 ALP Project "Impact of tillage systems, legume and mulch on soil profile moisture dynamics and wheat production" Department of Soil Science, University of Arid Agriculture, Rawalpindi, Pakistan Research Fellow Feb 01, 2003 to Aug 31, 2003 PSF Project entitled "Potential of mungbean and mashbean to fix nitrogen and benefit the subsequent wheat crop in Pothwar" Research Fellow Feb 01, 2001 to Dec 31, 2002 ACIAR Project 9762 entitled "Sustainable Legume Cereal Production Systems through Management of N₂- Fixation" University of Arid

	Agriculture, Rawalpindi, Pakistan.
<i>Honor and Awards</i>	1. Postdoctoral Research Fellowship 2. HEC Merit Scholarship for Ph. D (Merit Scholarship for Ph.D Studies in Science & Technology, 200 Scholarships Scheme) 3. Merit Scholarship (thrice) during B.Sc. (Hons) and M.Sc. (Hons) University of Arid Agriculture, Rawalpindi, Pakistan
<i>Memberships</i>	1. Soil Science Society of America (10 years) 2. Soil Science Society of Pakistan (Life member) 3. Pakistan Society of Agronomy (Life member) 4. Agronomy society of America (2 years) 5. Crop science society of America (2 years)
Graduate Students Postdocs Undergraduate Students <i>Honour Students</i>	PhD Soil Science 1. Asma Hassan, (In process). Soil organic carbon fractions as influenced by tillage systems and crop sequences. 2. Muhammad Sharif, (In process). Simulation of soil properties and crop yield under conventional and conservation tillage in dryland Pothowar. MSc. (Hons) Soil Science 1. Zahid Hussain Saleem. 2010. Pore size distribution and crop yield under minimum tillage. 2. Muhammad Rizwan. (In process). Quality of soil organic matter as influenced by different organic amendments. 3. Munir Abbas. (In process). Soil aggregate size distribution and associated polysaccharides under combination of biochar and other organic inputs.
<i>Service Activity</i>	1. Served as Incharge Research Fields, Department of Soil Science & SWC 2. Served as Member Faculty Board of FC&FC 3. Served as Tutor "tutorial group P"
<i>Brief Statement of Research Interest</i>	My main research interest is soil and water conservation in dryland areas. More specific research activities within this domain include use of conservation tillage for erosion control, <i>insitue</i> moisture conservation and carbon sequestration. Another tool we are currently using is soil carbon modelling for estimation of longterm management effects on soil, crop

	production and environment.
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<i>Publications</i>	1. Ijaz, S. S. and S. Ali. 2011. Replacing clean fallow with minimum tilled pulse legume in a subtropical dryland at Pothwar, Pakistan. <i>Agrociencia</i>, 45 (1): 43-53 (Impact factor 0.262) 2. Hayat, R., S. Ali, S.S.Ijaz, T. H. Chatha and M. T. Siddique. 2008. Estimation of N₂-fixation of mungbean and mashbean through xylem uriede technique under rainfed conditions” <i>Pak. J. Bot.</i> 40 (2): 723-734 (Impact factor 0.29) 3. Ali, S. S. Tariq and S.S. Ijaz. 2007. Improving nitrogen fixation capacity and yield of mungbean and mashbean by phosphorus management under rain fed conditions of Potwar. <i>Sarhad J. Agric.</i> 23(1):1027-1031 4. Ijaz, S.S. and S. Ali. 2007. Tillage and mulch effects on profile moisture dynamics fallow efficiency and rain fed wheat yield in Potwar. <i>Pak. J. Agric. Sci.</i> 44(1): 90-95 (Impact factor 1.240) 5. Ali, S., A. Munir, R. Hayat and S. S. Ijaz. 2005. Enhancing water use efficiency, nitrogen fixation capacity of mash bean and soil profile nitrate content with phosphorus and potassium application. <i>J. Agr.</i> 4(4): 340-344 6. Munir, A., S. Ali and S.S. Ijaz. 2005. Effect of phosphorous and potassium on yield and nitrogen fixation by mash bean. <i>Sarhad J. Agric.</i> 21 (4):667-670 7. Shehzadi, S., S. Ali, and S.S.Ijaz. 2003. Role of phosphorous and inoculation in nitrogen fixation by soybean selection NARC-6. <i>Pak. J. Soil Sci.</i> 22(1): 87-91 8. Ijaz, S. S., S. Ali and R. Hayat. 2002. Evaluation of some soybean selections for N₂- fixation capacity. <i>Pak. J. Soil Sci.</i> 21: 61-66.
<i>Research Grants and Contracts.</i>	Completed Project entitled “Potential of conservation tillage to reduce soil CO ₂ emission from Pakistani Inceptisol of sub humid subtropics” Funded by PMAS-AAUR 12/24/2009 to 12/24/2010 Amount 0.1 million
<i>Other Research or Creative Accomplishments</i>	N/A
<i>Selected Professional Presentations</i>	

Name	Dr Arshad Nawaz Chaudhry
<i>Personal</i>	Assistant Professor, Department of Soil Science & Soil and Water Conservation, Pir Mehar Ali Shah Arid Agriculture University, Rawalpindi, Pakistan.
<i>Experience</i>	May 31,2012 to date Assistant Professor

	June, 1997 to 2012 <i>Lecturer</i> Worked as a Scientist in the Project entitled “Recycling of Organic wastes for Sustainable Crop Productivity ALP Umbrella Project (AAU, RWP.Component–II). During 2001- 2006. Research Fellow January, 1995 – June, 1997 Served as Fellow Scientist at University of Arid Agriculture in Australian Center for International Agriculture Research (ACIAR) Project. October, 1993 – December, 1994 Worked as Fellow Scientist in Management of Heat, Moisture and other Physical Stress Factors (MAHMOS) under South Asian Vegetable Research Network Project at National Agriculture Research Centre, Islamabad
<i>Honor and Awards</i>	• Certificate of Professional Development awarded by Higher Education Commission under Professional Competency Enhancement Program for Teachers (PCEPT) during 2009.
<i>Memberships</i>	• Member, Soil Science Society of Pakistan. • Member, Academic Council of PMAS-AAUR.
Graduate Students Postdocs Undergraduate Students <i>Honour Students</i>	Comparison of Different Composts for Nutrient Composition to Maize Crop under Rainfed Condition. . Mr. Asim Pervaiz 2006 Comparison of Different Poultry Litter Composts and Chemical Fertilizers on Nutrient Composition of Maize Crop. Ms. Farzana Yasmeen, 2006 Responsive Efficiency of Plant Growth Promoting and Bioprotective Rhizobacteria to Wheat Crop at Different Levels of Fertilization Ms. Memona Khan. 2007 Co-Composting of Poultry Litter and Fast Food Restaurant Waste. Asim Hayat 2008. Assessment of Heavy Metal Availability During Co-Composting Of Poultry Litter And Vegetable Waste. Aamir Manzoor, 2010. Determination Of Quality And Effectiveness Of Co-Compost From Fast Food Waste And Poultry Litter For Crop Production. Naveed Ahmad,2011 Study On The Nutrient Release Pattern During Co-Composting Of Different Sources Of Fast Food Wastes

	With Poultry Litter Muhammad Azeem .2011. Influence of Co-Composting Of Wheat Straw and Poultry Litter On Heavy Metals Dynamics In Plant Soil System. M. Azeem Qureshi, 2013
Service Activity	Served as In charge Soil Science Laboratories in the Department of Soil Science and Soil and Water Conservation. Responsibilities include management of laboratories staff, purchase of Chemicals, Glassware and Scientific Equipments for use of soil analysis in the laboratories. Establishment of new laboratories and their maintenance for efficient working.

Brief Statement of Research Interest	Soil Science (Organic waste management).
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Publications	Muhammad Sarwar¹, Ghulam Jilani², Ejaz Rafique¹, Muhammad Ehsan Akhtar¹ and Arshad Nawaz Chaudhry², 2012, Impact of Integrated Nutrient Management on Yield and Nutrient Uptake by Maize under Rain-Fed Conditions. Pakistan Journal of Nutrition 11 (1): 27-33, 2012 Qi-Chun Zhang ^{a,1}, Imran Haider Shamsi ^{a,1}, Dan-Ting Xua, Guang-Huo Wanga, Xian-Yond Lin ^{a,*}, Ghulam Jilani ^{b,**}, Nazim Hussain ^c, Arshad Nawaz Chaudhry^b 2012. Chemical fertilizer and organic manure inputs in soil exhibit a vice versa pattern of microbial community structure, Applied Soil Ecology 57 (2012) 1-8. (Impact factor 2.39) Danish Iqbal ¹, Umer Habib¹, Nadeem Akhtar Abbasi ^{1*} and Arshad Nawaz Chaudhry² 2012, Improvement in postharvest attributes of zinnia (Zinnia elegans cv. Benary's giant) cut-flowers by the application of various growth regulators, Pak. J. Bot., 44(3): 1091-1094, 2012. (Impact factor 0.95). K. S. Wei*, W. L. Yang, G. Jilani**, W. J. Zhou, G.K. Liu, A. N. Chaudhry**, Z. Z. Cao and F. M. Cheng, 2012 Effect of High Temperature on the enzymatic activities and transcriptional expression of starch debranching enzyme (DBE) Multiple isoforms in developing rice endosperms. The Journal of Animal & Plant Sciences, 22(1): 2012, Page: 97-107 ISSN:1018-7081. (Impact factor 0.585) Muhammad Imran¹, Muhammad Javaid Asad¹, Muhammad Gulfraz¹, Rahmatullah Qureshi^{2,*}, Hina Gul¹, Nazish Manzoor¹ and Arshad Nawaz Ch.³, 2012, Hyper production of glucoamylase by aspergillus niger through solid state fermentation, Pak. J. Bot., 44(6): 2103-2110, 2012. (Impact factor 0.95). Muhammad Gulfraz, Muhammad Javaid Asad, Hira Tariq, Muhammad Imran, Alia Sadiq, Pervaiz Anwar, Rahmatullah Qureshi*, Hina Gul, Nazish Manzoor and Arshad Nawaz Ch., 2012, Extraction and purification of biodiesel from local algae of Pakistan, Pak. J. Bot., 44(3): 1091-1094, 2012. (Impact factor 0.95). Chaudhry, A.N., G. Jilani, M.A. Khan, T. Iqbal. 2009. Improved processing of poultry litter to reduce nitrate leaching and enhance its fertilizer quality. Asian Journal of Chemistry. 21 (7) : 4997-5003.(Impact factor 0.292) Jilani, G., S. Mahmood, A.N. Chaudhry, I. Hassan, M. Akram. 2008.
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	Allelochemicals: sources, toxicity and microbial transformation in soil – a review. <i>Annals of Microbiology</i>. 58(3): 351-357. (Impact factor 0. 427) Jilani, G., A. Akram, R.M. Ali, F.Y. Hafeez, I.H. Shamsi, A.N. Chaudhry, A.G. Chaudhry. 2007. Enhancing crop growth, nutrients availability, economics and beneficial rhizosphere microflora through organic and biofertilizers. <i>Annals of Microbiology</i> 57(2): 177-183. (Impact factor 0.427) Chaudhry, A.N., M.I. Latif, G. Jilani, A.A. Khan and T. Iqbal. 2005. Comparison of chemical fertilizer with organic manures by using effective microorganisms under maize cropping in rainfed areas. <i>Intl. J. Biol. Biotech</i>. 2(4): 1001-1006 Chaudhry, A.N., M.I. Latif, M.H. Rasheed and G. Jilani. 2005. Profitability increase in maize production through fertilizer management and defoliation under rainfed cropping. <i>Intl. J. Biol. Biotech</i>. 2(4): 1007-1012 Chaudhry, A. N., S.Ali and I. Hassan. 2002. Effect of different colored plastic mulches on yield and nutrients contents (NPK) of Tomato. <i>Asian Journal of Plant Sciences</i>. Vol. 1 No. 4: 388-389.
<i>Research Grants and Contracts.</i>	NA
<i>Other Research or Creative Accomplishments</i>	NA
<i>Selected Professional Presentations</i> Chaudhry, A.N. and G. Jilani. 2006. Evaluation of storage methods and composting of poultry litter for nitrate leaching and soil fertility. <i>In: Proc. Intl. Conf. ORBIT 2006 "Biological Waste Management – from Local to Global"</i>. Sept. 13-15, 2006, Weimar, Germany. pp. 141-147. Chaudhry, A.N., M.A. Khan, S. Ali, G. Jilani, M. Akmal, T. Iqbal, M. Islam and S.U. Khan. 2007. Nutrient composition of poultry litter as influenced by composting under various storage conditions. <i>In: R. Cossu, L.F. Diaz, R. Stegmann (eds.) Proc. SARDINIA 2007 - 11th Intl. Waste Manage. & Landfill Symp.</i>, Oct. 1-5, 2007, Cagliari, Sardinia, Italy. pp. 977-978. Jilani, G., S. Ali, A.N. Chaudhry, S.U. Khan, M. Akram, I.H. Shamsi and T. Iqbal. 2007. Biological treatment of agricultural wastes for composting and crop production. <i>In: R. Cossu, L.F. Diaz, R. Stegmann (eds.) Proc. SARDINIA 2007 - 11th Intl. Waste Manage. & Landfill Symp.</i>, Oct. 1-5, 2007, Cagliari, Sardinia, Italy. pp. 343-344. Iqbal, T., G. Jilani, A.N. Chaudhry, S. Fatima and M. Rasheed. 2007. Effect of excessive application of poultry litter on heavy metal content of soil under rainfed conditions and its management. <i>In: R. Cossu, L.F. Diaz, R. Stegmann (eds.) Proc. SARDINIA 2007 - 11th Intl. Waste Manage. & Landfill Symp.</i>, Oct. 1-5, 2007, Cagliari, Sardinia, Italy. pp. 347-348. Jilani, G., A.N. Chaudhry, I. Hassan, M. Akram, and M. Akmal. 2007. Biotransformation of allelochemicals by soil microorganisms. <i>Abst. Int. Conf. on "Role of Allelopathy in Sustainable Agriculture"</i>, March 22-24, 2007, University of Arid Agriculture, Rawalpindi, Pakistan. pp.	

Jilani, G., S.U. Khan, J.M. Xu, A.N. Chaudhry and M.A. Chaudhary. 2006. Composting dynamics of farm wastes under on-farm traditional and modern techniques. *In: Proc. Intl. Conf. ORBIT 2006 "Biological Waste Management – from Local to Global"*, Sept. 13-15, 2006, Weimar, Germany. pp. 255-263.

Name	Dr. Muhammad Akmal
Personal	Assistant Professor, Department of Soil Science, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi 46300, Pakistan E-mail: akmal@uaar.edu.pk, Cell # 0345-5973793
Experience	Since 19 October 2006 to date, Assistant Professor (Regular), PMAS- Arid Agriculture University Rawalpindi. From 27 April 2006 to 18 October 2006, Assistant Professor (HEC, Interim Placement), PMAS- Arid Agriculture University Rawalpindi.
Honor and Award	Chinese Cultural Exchange Scholarship Award for Ph.D. studies in 2002-2005. Excellent Member Award for the year 2003-2004 by the Green Zhejiang Organization, China. HEC Post-doc Fellowship for Colorado State University, USA, in year 2011.
Memberships	Soil Science Society of America Soil Science Society of Pakistan Pakistan Botanical Society Asian Network of Organics Recycling
Graduate Students Postdocs Undergraduate Students Honour Students	Year, Degree, Name 2008, M.Sc. (Honors), Waseem Hassan, 2009, M.Sc. (Honors), Idrees Haider, 2009, M.Sc. (Honors), Zaman Ali, 2010, M.Sc. (Honors), Israr Asghar, 2010, M.Sc. (Honors), Muhammad Sohail Altaf, 2011, M.Sc. (Honors), Muhammad Farooq Bashir,
Service Activity	Tutor for tutorial group meetings. Coordinator for time table and date sheet. Research lab incharge.
Brief Statement of Research Interest	Environmental Soil Chemistry Soil and Water Pollution Soil Microbiology and Biochemistry
Publications	M. Akmal, K. S. Khan, XU Jianming. 2004. Dynamics of microbial biomass in a rainfed soil under wheat cultivation. <i>Pedosphere</i> , 14: 53-62 Zhaojun Li, Jianming Xu, Akmal Muhammad, Guorui Ma. 2005. Effect of bound residues of metsulfuron-methyl in soil on rice growth. <i>Chemosphere</i> , 58: 1177-1183. Muhammad Akmal, Wang Haizhen, Wu Jianjun, Xu Jianming, Xu Defu. 2005. Changes in enzymes activity, substrate utilization pattern and diversity of soil microbial communities under cadmium pollution. <i>Journal of Environmental</i>

	Sciences, 17: 802-807. Muhammad Akmal, Xu Jianming, Li Zhaojun, Wang Haizhen, Yao Huaiying. 2005. Effects of lead and cadmium nitrate on biomass and substrate utilization pattern of soil microbial communities. <i>Chemosphere</i>, 60: 508-514. Zhaojun Li, Jianming Xu, Caixian Tang, Jianjun Wu, Akmal Muhammad, Haizhen Wang. 2006. Application of 16S rDNA-PCR amplification and DGGE fingerprinting for detection of shift in microbial community diversity in Cu-, Zn-, and Cd- contaminated paddy soils, <i>Chemosphere</i>, 62: 1374-1380. Defu Xu. Jianming Xu, Jianjun Wu, Akmal Muhammad. 2006. Studies on the phosphorus sorption capacity of substrates used in constructed wetland systems. <i>Chemosphere</i>, 63: 344-352. Yan He, Jianming Xu, Haizhen Wang, Qichun Zhang, Akmal Muhammad. 2006. Potential contributions of clay minerals and organic matter to pentachlorophenol retention in soils. <i>Chemosphere</i>, 65: 497-505. M. Akmal and X. Jianming. 2008. Dehydrogenase, urease and phosphatase activities as affected by Pb contamination in the Soil. <i>Soil & Environment</i>, 27: 1-4. Muhammad Akmal and Xu Jianming. 2009. Microbial biomass and bacterial community changes by Pb contamination in acidic soil. <i>Journal of Agriculture and Biological Sciences</i>, 1: 30-37. Mukhtar Ahmed, Fayyaz-ul-Hassan, M. Aqeel Aslam, Mustazhar Nasib Akram, M. Akmal. 2011. Regression model for the study of sole and cumulative effect of temperature and solar radiation on wheat yield. <i>African Journal of Biotechnology</i>, 10: 9114-1921. Muhammad Islam, Saleem Mohsin, Sher Afzal, Safdar Ali, Muhammad Akmal, Rizwan Khalid. 2011. Phosphorus and Sulfur Application Improves the Chickpea Productivity under Rainfed Conditions. <i>International Journal of Agriculture and Biology</i>, 13: 713-718. Muhammad Akmal, Muhammad Sohail Altaf, Rifat Hayat, Fayyaz-ul- Hassan, Muhammad Islam. 2012. Temporal changes in soil urease, alkaline phosphatase and dehydrogenase activity in rainfed wheat field of Pakistan. <i>The Journal of Animal and Plant Sciences</i>, 22: 457-462. Muhammad Islam, Muhammad Akmal, Muhammad Aslam Khan. 2013. Effect of phosphorus and sulphur application on soil nutrient balance under Chickpea (<i>Cicer arietinum</i>) monocropping. <i>Romanian Agricultural Research</i>, 30 Israr Asghar, Muhammad Akmal, Muhammad Ishtiaq, Mehwish Maqbool, Tanveer Hussain. 2013. Analysis of soil microbial biomass dynamics in rainfed wheat fields in arid zone of Pakistan. <i>Pakistan Journal of Botany</i>, 45: 389-399
Research Grants and Contracts.	2013, Impact of buctril super herbicide application on microbial and enzymatic activity in soil (3.016 millions), Pakistan Science Foundation (In Review)
Selected Professional Presentations	Presentation at Soil Science Society of America Annual Meeting, Cincinnati, Ohio, USA, 2012. 14th Congress of Soil Science, Lahore, Pakistan, 2012. 13th Congress of Soil Science, Faisalabad, Pakistan, 2010. 12th Congress of Soil Science, Peshawar, Pakistan, 2008. International Symposium on Cycling and Utilization of Organic Wastes,

	Hangzhou, China, 2004. 2nd International Conference on Soil Pollution and Remediation (SoilRem 2004), Nanjing, China, 2004. Third International Conference on Contaminants in the Soil Environment in the Australasia-Pacific Region, Beijing, China, 2003.
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Name: Dr. Qaiser Hussain	
Personal	Department of Soil Science & SWC University of Arid Agriculture Murree Road Rawalpindi 03314872466
Experience	September, 2011 to present: Assistant Professor of Soil Science (BS-19), Arid Agriculture University Rawalpindi September 2007 to July 2011, PhD Scholar, Nanjing Agricultural University, China. Rhizosphere microbial communities changes with rice cultivars and significance in greenhouse gases evolution in rice paddy October 2003 to June, 2008: Assistant Research Officer, Soil Fertility Lab . Soil and water samples collection from farmers' field and analyses and advisory services to farmer community for sustainable crop production.
Honor and Awards	University of Agriculture Faisalabad merit scholarship holder (Master degree). HEC overseas scholarship holder for PhD study in China 2007-2011 Excellent research award 2010-2011 and cash prize by Institute of resources, ecosystem and environment, Nanjing, China. Travel grant award from china national science foundation to present paper in European Geosciences Union, general assembly April 2-8, 2011 Vienna (Austria) Higher Education Commission (HEC) PhD approved supervisor 2011
Memberships	Soil Science Society of Pakistan European Geosciences Union (EGU), Austria Federation of European Microbiological Society (FEMS), England
Graduate Students Postdocs Undergraduate Students	Parameterization of CENTURY carbon model for simulation of soil organic carbon and wheat yield in dryland Pothwar. Mian Rehan Asghar (06-arid-62) M.Sc (Hons) Soil Science, 2012.
Service Activity	Peer review services for several intl. journals
Brief Statement of Research Interest	Microbial mechanisms of GHGs (CO ₂ , CH ₄ & N ₂ O) emission from agro-ecosystem, plant-microbe interaction in rhizosphere, carbon sequestration in agricultural land, use of biochar as soil amendment in agricultural lands for higher production and climate change mitigation in arid region.
Publications	<u>International and National Journal with Impact Factor</u> Hussain, Q, Liu, Y. Z., Jin, Z., Zhang, A., Pan, G., Li, L., Crowley, D., Zhang, X., Song, X.Y., Cui, L. Q. 2012. Microbial community dynamics

	and function associated with rhizosphere over period of rice growth. <i>Plant, Soil and Environment</i> 58, (2): 55–61. [I.F: 1.08] Zhang, A., Liu, Y., Pan, G., Hussain, Q., Li, L., Zheng, J., Zhang, X. 2012. Effect of biochar amendment on maize yield and greenhouse gas emissions from SOC-poor calcareous loamy soil from Central China Plain. <i>Plant and Soil</i> 351, 263–275. [I.F: 2.73] Song, X., Li, L., Zheng, J., Pan, G., Zhang, X., Zheng, J., Hussain, Q., Han, X., Yu, X., 2012. Sequestration of maize crop straw C in different soils: Role of oxyhydrates in chemical binding and stabilization as recalcitrance. <i>Chemosphere</i> 87:649–654. [I.F: 3.21] Abro, S. A., Tian, X., Hussain, Q., Talpur, M., Singh, U. 2012. Carbon Dioxide Emission from Maize Straw Incubated with Soil under Various Moisture and Nitrogen Levels. <i>Journal of Chemical Society of Pakistan</i> 34 (1), 22-27. [I.F: 1.38] Zhang, A., Bian, R., Pan, G., Cui, L., Hussain, Q., Li, L., Zheng, J., Zheng, J., Zhang, X., Han, X., Yu, X. 2012. Effects of biochar amendment on soil quality, crop yield and greenhouse gas emission in a Chinese rice paddy: A field study of 2 consecutive rice growing cycles. <i>Field Crops Research</i>. 127, 153–160. [I.F: 2.47] Liu, Y., Zhou, T., Crowley, D., Li, L., Liu, D., Zheng, J., Yu, X., Pan, G., Hussain Q., Zhang, X., Zheng, J. 2012. Decline in Topsoil Microbial Quotient, Fungal Abundance and C Utilization Efficiency of Rice Paddies under Heavy Metal Pollution across South China. <i>PLoS One</i> 7 (6)- e38858. [I.F: 4.09] Zheng J., Li, L., Pan, G., Zhang, X., Smith, P., Hussain, Q., 2012. Potential aerobic C mineralization of a red earth paddy soil and its temperature dependence under long-term fertilizer treatments. <i>Soil Use and Management</i> 28, 185–193. [I.F: 1.61] Raza, W., Hussain, Q., Shen, Q. 2012. Production, Regulation and Transportation of Bacillibactin in <i>Bacillus Subtilis</i>. <i>Journal of Chemical Society of Pakistan</i> 34, (4) 996-1002. [I.F: 1.38] Hussain, Q, Liu, Y. Z., Zhang, A., Pan, G., Li, L., Zhang, X., Song, X.Y., Cui, L. Q., Jin, Z. 2011. Variation of bacterial and fungal community structures in the rhizosphere of hybrid and standard rice cultivars and linkage to CO₂ flux. <i>FEMS Microbiology Ecology</i> 78,116–128. [I.F: 3.41] Hussain, Q, Liu, Y. Z., Jin, Z., Zhang, A., Pan, G., Li, L., Crowley, D., Zhang, X., Song, X.Y., Cui, L. Q. 2011. Temporal dynamics of ammonia oxidizer (amoA) and denitrifier (nirK) communities in the rhizosphere of a rice ecosystem from Tai-Lake region, China. <i>Applied Soil Ecology</i> 48, 210–218. [I.F: 2.37] Zhang, A. Cui, L., Pan, G., Li, L., Hussain, Q., Zhang, X., Zheng, J., Crowley, D. 2010. Effect of biochar amendment on yield and methane and nitrous oxide emissions from a rice paddy from Tai Lake plain, China. <i>Agriculture, Ecosystems and Environment</i> 139, 469-475. [I.F: 3.00] <u>Conference Papers/Abstracts</u> Hussain, Q., Pan, G., Smith, Pete. 2008. Rice Production and Climate Change: Environmental and Food Security Perspectives. <i>Proceedings of soil carbon sequestration and climate change mitigation in</i>
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	agriculture, Nanjing, P136-137. Zheng, J., Li, L., Pan, G., Zhang, X., Smith, P., Hussain, Q. 2010. Oxyhydrates-mediated C stability controls on aerobic mineralization of organic matter from a red earth paddy under different long-term fertilizations. Proceedings of organic matter stabilization and ecosystem functions, France. S5-P43, 183. Hussain, Q., Pan, G. 2011. Ammonia oxidizers (amoA) and denitrifiers (nirK) dynamics in the rhizosphere between hybrid and standard rice cultivars and linkage to N₂O emission. Geophysical Research Abstracts EGU General Assembly 2011, Vienna, Austria. Vol. 13, EGU2011-394. Hussain, Q., Pan, G., Crowley, D. 2012. Microbial Control of CH₄ emission for hybrid and standard rice cultivars. Proceedings of 14th Congress of Soil Science, Lahore Pakistan. <u>Manuscripts Submitted</u> Hussain, Q., Liu, Y., Zhang, A., Pan, G., Li, L. 2013. Dynamics of ammonia-oxidizing bacterial (AOB) and archaeal (AOA) populations in the rhizosphere of hybrid and standard rice cultivars submitted to Soil Biology and Biochemistry. Hussain, Q., Liu, Y., Jin, Z., Zhang, A., Pan, G., Li, L. 2013. Variation of ammonia-oxidizing bacteria and denitrifying communities in the rhizosphere of hybrid and conventional rice cultivars and linkage to N₂O emission submitted to Applied Environmental Microbiology. Hussain, Q., Liu, Y., Jin, Z., Zhang, A., Pan, G., Li, L. 2013. Variation of methanogens (mcrA) and methanotrophs (pmoA) in the rhizosphere of hybrid and conventional rice cultivars and linkage to CH₄ emission submitted to Environmental Microbiology
Research Grants and Contracts.	2012-2013, PMAS-Arid Agriculture University, Rawalpindi research project “Evaluation of biochar as useful soil amendment for improving soil quality and crop productivity” (0.155 million) Principal Invigilator.
Other Res. creative accomplishments	Not available
Selected Professional Presentations	<u>Oral/Poster Presentations in International Conferences</u> Rice Production and Climate Change: Environmental and Food Security Perspectives workshop about soil carbon sequestration and climate change mitigation in agriculture. 2008. Nanjing, China. Ammonia oxidizers (amoA) and denitrifiers (nirK) dynamics in the rhizosphere between hybrid and standard rice cultivars and linkage to N₂O emission. European Geosciences Union General Assembly. April 2-8, 2011. Vienna, Austria. Microbial control of CH₄ emission for hybrid and standard rice cultivars. The 14th Congress of Soil Science. March 12-15, 2012, Lahore, Pakistan.

Standard 6.3: All faculty members should be motivated and have job satisfaction to excel in their profession.

The faculty members are motivated and have job satisfaction which is acquired through provision of short term/ long term training abroad and by pay restructuring. The results of faculty surveys summarized and given in annexure-III illustrate the faculty input.

Table 13: Faculty survey (Proforma 5)

Sr. #	Parameter	Dr. Safdar Ali	Dr. M. Saleem Akhtar	Dr. M. Azhar Naeem	Dr. Ghulam Jilani	Dr. Khalid Saifullah	Dr. Muhammad Akmal	Dr. M. Tariq Siddique	Dr. S. Sohail Ijaz	Mr. Arshad Nawaz	Mr. Tanveer Iqbal	Dr. Rifat Hayat
1	Your mix of research, teaching and community service	A	A	A	A	A	B	A	A	B	A	A
2	The intellectual stimulation of your work	B	A	A	B	A	B	A	A	B	A	B
3	Type of teaching/research you currently do.	A	B	B	A	A	B	B	A	B	B	B
4	Your interaction with students	A	A	A	A	A	A	A	A	B	A	A
5	Cooperation you received from colleagues	A	C	A	B	B	B	B	A	B	B	A
6	The mentoring available to you	B	D	C	B	C	C	D	A	B	B	A
7	Administrative support from the department	B	C	B	B	C	B	D	B	B	B	A
8	Providing clarity about the faculty promotion process	B	E	A	B	E	C	C	B	B	C	B
9	Your prospects for advancement	A	C	A	B	C	B	C	A	B	A	B

	and progress through ranks											
10	Salary and compensation packages	A	B	A	B	B	B	B	B	B	B	A
11	Job security and stability at the department	A	A	A	A	A	B	A	A	B	A	A
12	Amount of time you have for yourself and family	A	E	D	C	C	B	D	A	B	B	B
13	The overall climate at the department	B	B	B	B	B	B	B	A	B	B	A
14	Whether the department is utilizing your experience and knowledge	A	C	B	B	C	B	C	B	B	B	A
15	What are the best programs/ factor currently available in your department that enhance your motivation and job satisfaction.	Head of the Institution and Research Projects		Practical Work	-nil-	Head of the institution and research projects	Department may be upgraded to institute	Teaching and support to students				
16	suggest programs/factors that could improve your motivation and job satisfaction	N. A.		Teaching through participation	Encouragements, Awards and Remarks	Department may be upgraded to institute	Appreciation	Upgradation of department to institute				

Legends:

A: Very Satisfied B: Satisfied C: Uncertain

D: Dissatisfied E: Very Dissatisfied Criterion 7:

Criteria 7:

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. The department has a wide range of latest equipments to update the laboratory facilities. Renovation of laboratories has been completed for smooth running of laboratory work.

Power breakdown affects the efficiency and life of equipments and computers. Lack of technical laboratory supporting staff (Laboratory technician) also affects the efficiency of smooth running of the laboratory equipment.

Standard 7.2: Library Facilities

The University Central Library has a good collection of books for the use of students and faculty members. In additions to that, department itself owns a library which fulfils the demands of the students and the faculty members. However lack of hard copies of journals in the central library is the major concern.

Standard 7.3: Class Room and Faculty Offices

All faculty members have their own offices, however, the class rooms for the students are not enough to accommodate all the students belong to different programs of the department.

Criterion 8:

INSTITUTIONAL SUPPORT

Standard 8.1: Support and Financial Resources

The department has institutional support for financial expenses. In addition to that some faculty members have research projects funded by the university and some faculty members have mega research projects financed by HEC and PSF. Research grants for young faculty members are also provided by the university. Abroad trainings of faculty members are a permanent feature for capacity building.

Standard 8.2: High Quality Graduate Students and Research Scholars

The intake of B.Sc. (Hons) students is once in a year. A detail of the students enrolled during the past two years is given in the following Table.

Table 14: Enrollment in B. Sc. (Hons) Program through 20010-2012

Degree	20010-11	2011-12
B.Sc. (Hons)	25	23

ANNEXURE

DETAILED COURSE CONTENTS OF SCHEME OF STUDIES SOIL SCIENCE & SWC FOR B.SC PROGRAM

THEORY:

PRACTICAL:

BOOKS RECOMMENDED:

- Bashir, E. and R Bantel. 2001. Soil Science. National Book Foundation, Islamabad.
- Brady, N. C. and R R Weil. 2002. The Nature and Properties of Soils. 13th ed. Prentice-Hall, Inc., Upper Saddle River, NJ, USA.
- Foth, H. D. 1990. Fundamentals of Soil Science. 8th ed. John Wiley and Sons, NY, USA.
- 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.
- 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.
- Singer, M. J. and D N Munns. 1996. Soils: An Introduction.3rd ed. Prentice-Hall, Inc. Upper Saddle River, NJ, USA.
- 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. Modified Universal Soil Loss Equation. 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:

- Arakeri. 1987. Principles of Soil Conservation and Water Management. IBH Publishing Co., New Delhi, India.
- IBH Publishing Co., New Delhi, India
- 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.
- Ehlers, W. and G Michael. 2003. Water Dynamics in Plant Production. CAB Publishing, Cambridge, UK.
- Follett, R. F. and B A Stewart. 1985. Soil Erosion and Crop Productivity. ASA, Madison, WI, USA.
- 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:

Introduction Soil Texture, Specific Surface Area and Importance. Stokes' Law: Derivation, Application and Limitations. Soil Textural Classes (USDA and ISSS) 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. Soil Air and Aeration: Description and Significance. Soil Temperature: Factors Affecting and Management. Soil Colour: Causes and Significance. Soil Consistency: Description and Significance. Soil water and its measurement Soil water

potential and its components. Soil Hydraulic Properties. Soil compaction: causes and remedies.

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:

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

Brady, N.C. and R.R. Weil. 2002. The Nature and Properties of Soils. 13th ed. Prentice-Hall, Inc., Upper Saddle River, NJ, USA.

Hillel, D. 2004. Introduction to Environmental Soil Physics. Elsevier, CA, USA.

Jury, W. A. and R. Horton. 2004. Soil Physics. 6th ed. John Wiley & Sons. Inc., NY, USA.

Lal, R. and M. K. Shukla. 2004. Principles of Soil Physics. Marcel & Dekker. Inc., NY, USA.

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.

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. 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:

- Avers, R.S and D.W. Westcot. 1985. Water Quality for Agriculture. Irrigation Drainage Paper No 29. FAO, Rome, Italy.
- Bresler, E., B.L. McNeal and D.L. Carter. 1982. Saline and Sodic Soils: Principles-Dynamics-Modeling. Springer-Verlag, NY, USA.
- Ghafoor, A, M. Qadir and G. Murtaza, 2004 Salt Affected Soil Principles 3. of Management. Allied Book Center, Lahore, Pakistan.
- Gupta, I.C. 1990. Use of Saline Water in Agriculture. Oxford and IBH Pub.
- Shainberg, I. and I. Shalhevet. 1984. Soil Salinity under Irrigation: Processes and Management. Springer-Verlag, NY, USA
- 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, WI USA.
- 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:

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

SS-504

SOIL SURVEY AND LAND EVALUATION

3(2-2)

THEORY:

Soil and landform: introduction. Kinds and levels of soil survey. 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:

- Bashir, E. and R. Bantel. 2001. Soil Science. National Book Foundation, Islamabad.
- Dent, D, and A. Young. 1981. Soil Survey and Land Evaluation. George Allen and Unwin Publishers Ltd.. London, UK.
- FAO. 1985. Guidelines: Land Evaluation for Irrigated Agriculture. FAO Soils Bill LS5. Rome, Italy.
- Reybolu, W.U. and G.W. Peterson. 1987. Soil Survey Technique. SSSA. Special Publication No. 19- Madison. WI, USA.
- Soil Survey Division Staff. 1993. Soil Survey Manual USDA, Washington DC, USA.
- Soil Survey of Pakistan. Reconnaissance Soil Survey Reports.
- 'Soil Survey of Pakistan. 1986. Proceedings of XII 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 Growth expressions: Mitscherlich and Quadratic equations. Essential nutrient elements: functions, deficiency and toxicity. Movement of nutrients to roots and uptake by plants Nitrogen: gains in soil, transformations and losses N-fertilizers and their fate in soil. Phosphorus: forms in soil and transtonnaLion. P-Fertilizers and their behavior in soils. 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:

- Ahmad, N., and M. Rashid. 2003. Fertilizer and Their Use in Pakistan: An Extension Guide. Planning Commission, National Fertilizer Development Centre, Islamabad, Pakistan.
- Brown, J.R. (Ed.). 1987. Soil Testing: Sampling, Correlation, Calibration and Interpretation. Soil Sci. Soc. Am., Inc., Madison, WI, USA.
- 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.
- Kamprath, E.J. 1999. Soil Fertility and Plant Nutrition. In. Sumner, M.E (Ed.). Handbook of Soil Science. CRC Press Inc., Boca Raton, Florida, USA
- Mengle, K and E.A. Kirkby 2000. Principles of Plant Nutrition, 5th ed. International Potash Inst., Bern, Switzerland. Inst., Bern, Switzerland.
- 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:

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.

F.A.O. 1978. Soil Erosion by water. Rome, Italy.

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:

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

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.

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:

- Delevie, R. 1997. Quantitative Chemical Analysis. McGraw-Hill Co. Inc. New York, USA.
- Harris. D.C. 2003. Quantitative Chemical Analysis. 6th ed. W.H. Freeman & Co. NY, USA.
- 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)
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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:

- E. and R. Bantel. 2001. Soil Science. National Book Foundation, Islamabad
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)
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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:

F.A.O. 1960. Soil Erosion by Wind, F.A.O., Rome, Italy:

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 and DNA based techniques. Distribution, adaptation, activity and functions, of bacteria, archaea, actinomycetes, fungi, eukaryotic algae, and cyanobacteria. 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 Soil microbiology. Soil sampling storage and sterilization. Preparation of media, stains and functions of constituents.. Microbial population. Rossi-Cholodny Contact Slide Technique and Dilution Plate Technique. Algal culturing and their microscopy. Staining techniques

BOOKS RECOMMENDED:

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

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

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

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:

- Paul, E. A. 1999. Soil Biology and Biochemistry. In: Sumner, M.E. (Ed). Handbook of. Science. CRC, Boca Raton, FL, USA.
- Paul, E.A., and F. E. Clark. 1989. Soil Microbiology and Biochemistry. Academic Press Inc., San Diego, CA., USA.
- 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 & industrial effluents. Determination of toxic metal ions in effluents, sludge and vegetation.

RECOMMENDED BOOKS:

Kabata-Pendias, P.A. and H. Pendias. 1992. Trace elements in Soils and Plants. CRC, Boca Raton, Florida, -USA.

McBride, M.B. 1994. Environmental Chemistry of Soils. Oxford University Press, NY, USA.

Misra, S.G. and D. Mani 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.I. Units and derived S.I. 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 practices 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:

Westerman, R.L. (ed.). 1990., Soil Testing and Plant Analysis. 3rd Ed. Soil Sci. Soc: Am. Inc. Madison, WI, USA.

Brown, JR. (ed.). 1987: Soil Testing, Sampling, Correlation, Calibration and Interpretation. Soil Sci. Soc. Am., Inc. Madison, WI, USA.

Page, AL. (ed.). 1982. Methods of Soil Analysis. Part 2. Chemical and microbiological properties. 2nd Ed. ASA and SSSA, Inc., Madison, WI, USA.

Jaffery, G.H. (ed.). 1989. Vogel's Text Book of Quantitative Chemical analysis.. 5th Ed. English Language Book Soc. Longman UK.

Reuter, DJ. and J.B. Robinson. 1997. Plant Analysis: An Interpretation Manual. 2nd Ed. CSIRO Publ., Collingwood, Australia.

SS-607	NUCLEAR TECHNIQUES IN SOIL RESEARCH	3(2-2)
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SS – 609 PROJECT PLANNING AND SCIENTIFIC WRITING 2(1–2)

SS-602	INTERNSHIP	15 (0-30)
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