

**RIPHAH INTERNATIONAL UNIVERSITY**  
**ISLAMABAD**



**SELF ASSESSMENT REPORT**

**M.Sc. Mathematics**  
**Department of Basic Sciences**  
**15<sup>th</sup> December 2011**

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## **1.0 Executive Summary**

This report is being prepared almost at the end of the assessment cycle for 3 selected faculties of Riphah International University (RIU), as per requirements of Higher Education Commission (HEC). Quality Enhancement Cell (QEC) was formed in RIU in Oct 2009. Program Team Members of all three faculties, notified by University, worked with Dir QEC to pursue the application of Self Assessment Manual in their respective departments. From each faculty one program was selected.

In Department of Basic Sciences (DBS), M.Sc. Maths program was selected for self assessment, evaluation and improvements. A strong commitment of Respected Vice Chancellor to support QEC made the difference and resultantly, a cycle of assessment is about to complete.

## **1.1 Objectives**

Following are the two main objectives of the self assessment report:-

- a To implement Self Assessment Manual in selected program with a view to improve quality in higher education.
- b To identify the areas requiring improvements in order to achieve objectives through desired outcomes.

## **1.2 Execution**

A soft copy of self assessment manual was given to all faculty members. Quality Awareness Lectures and Workshops on preparation of Self Assessment Report (SAR) were arranged for the Deans/In-charge Programs and Program Team (PT) Members of the selected program. Hard copies of HEC issued 10 proformas, 8 criterion and 31 standards were provided to PT members to evaluate their respected program against defined standards. The PT members with an intimate support and follow up of QEC, completed the SAR and forwarded to QEC in given time frame.

After reviewing SAR, QEC arranged visit of Assessment Team to the selected program on 29 Nov 2011. Dir QEC accompanied the AT Team and participated in discussions with In-charge Program / Program Team members and available faculty members. Date for exit presentation was fixed as 2<sup>nd</sup> Dec 2011, as per availability of respected VC. Dean, In-charge Program, PT and AT members were invited. Prior to Chairman AT's presentation, Dir QEC gave 15 minutes presentation on "Why QEC in Higher Education"? The salient points of Dir QEC's presentation giving the advantages of joining QEC network are as under:-

- a. Eligibility for HEC funding proportionate to our ranking
- b. Preference for HEC scholarships for students and faculty
- c. Eligibility for evaluation by external evaluators
- d. Better ranking on website of HEC is a marketing tool for RIU
- e. Internal improvements (sense of achievements and satisfaction)

The Chairman AT during his presentation, indicated salient points of the SAR, account of his discussions with the faculty members, improvements required in the infrastructure, syllabi and training of the faculty and support staff (Annex-J).

The implementation plan (Annex-K) basing on the discussions in exit meeting of 2<sup>nd</sup> Dec 2011 have been made by In-charge Programs. They prepared it under following headings:-

- a. AT findings
- b. Corrective Actions required
- c. Implementation Dates
- d. Responsible Body
- e. Resources Needed

The implementation plan indicates the resources required to improve the infrastructure, environment in the classes and E-Learning. The recommended target dates to complete the tasks observed by Assessment Team, presented in exit meeting on 2<sup>nd</sup> Dec, 2011 and approved by Vice Chancellor have been indicated in the implementation plan. The tasks will be carried out by the Registrar's Office.

At the completion of Self Assessment cycle, QEC is going to submit the hard and soft copy of SAR to HEC on 15<sup>th</sup> December 2011.

Director  
Quality Enhancement Cell

# Self Assessment Report

## 2.0 Introduction

Riphah International University (RIU) is a private university, chartered by the Federal Government of Pakistan in 2002. The university was established with a view to produce professionals with Islamic moral and ethical values. The Riphah International University is committed to promote and impart quality education with character building of the new generation in the light of Islamic principles and values. Riphah International University is committed to a value based integrated educational philosophy. It is running 10 faculties in 3 different campuses.

## 2.1 University Mission Statement

Establishment of state of the art educational institutions with a focus on inculcation of Islamic ethical values

## 2.2 Department of Basic Sciences (DBS)

Department of Basic Sciences is running following three programs:

- |    |                      |      |
|----|----------------------|------|
| a. | M. Sc. Mathematics   | 2009 |
| b. | M. Phil. Mathematics | 2009 |
| c. | M. Phil. Physics     | 2010 |
| d. | Ph. D. Mathematics   | 2011 |

## 2.3 Program Selected

Riphah International University has selected the **M.Sc. Mathematics** as first model program for Self Assessment Report (SAR) for the year 2010-11 under the directives of Higher Education Commission (HEC).

The selected program has been approved by the Board of Advance Studies & Research (BASR) and Academics Council of the University. The program has got inbuilt mechanism for the revision of syllabi, has competent faculty



and adequate infrastructure. New and modern tools have been introduced in the program to conduct research and quality teaching.

#### **2.4 Program Evaluation**

The program is being evaluated based on 8 criterion and 31 standards as given in the Self Assessment Manual provided by Higher Education Commission (HEC)

### **3.0 Criterion 1: Program Mission, Objectives and Outcomes**

#### **3.1 Standard 1-1**

**The program must have documented measurable objectives that support institution mission statements.**

##### **3.1.1 Program Mission Statement**

M. Sc. Mathematics program aims to impart teaching, logical and mathematical knowledge and skills to students along with sense of ethical and moral obligations.

##### **3.1.2 Program Objectives**

The program is designed to achieve the following objectives:

1. To prepare the students to pursue higher education in universities of repute.
2. To educate the students with logical and mathematical skills
3. To enable the students to pursue career in related field
4. To impart technical skills (mathematical modeling, solution definition, implementation) to the students.
5. To prepare the students to step into research and development (R&D) activities in the related field.

##### **3.1.3 Alignment of Program Objectives with Program & University Mission Statements**

Program objectives intend to impart not only theoretical information to students but moral and ethical information as well. Riphah International University provides a platform to students to get knowledge of their desired field and learn the Islamic ways in order to carry out their duties.

### **3.1.4 Main Elements of Strategic Plan**

#### **3.1.4.1 Curriculum Design**

Curriculum of M. Sc Mathematics comprises of 32 core and elective courses. The curriculum is designed to build the basic concepts of the students and to help them attain the deep insight of the relevant field using different courses and practical work.

Core subjects include computer fundamentals, network analysis, linear circuit analysis, engineering ethics, electrical machines, digital logic design, communication systems, engineering management, communication skills and electronic circuits to name a few, whereas, elective courses can be selected from a wide range of available courses.

#### **3.1.4.2 Practical Work**

Not Applicable

#### **3.1.4.3 Projects**

During the program execution, every student is required to do small subject related projects where required to testify his/her learning level. These subjects' related projects are designed to check the progress of students in small level, while, in the final semester students are given option either to carry out their final project or to complete course work.

#### **3.1.4.4 Internships/Industrial Tours/Visual Demonstrations**

University arranges the internships for students at defined stages during the execution of program. The university keeps in touch with the potential industrial and other units for student's internship possibilities through a very well defined system. Department of Basic Sciences has one Liaison officer and one Students Affairs Officer who mutually look after the possibilities for internships.

### 3.1.5 Program Objectives Assessment

Objective	How Measured	When Measured	Improvement Identified	Improvement Made
1	Alumni Survey	September 2011	Need to have more case studies	Under Review in Board of Faculties
2	Employer Survey	October 2011	Tutorials and report writing skills	Under Review in Board of Studies
3	Alumni Survey, Employer Survey	September 2011 October 2011	Emphasis on Laboratory work	Under Review in Board of Faculties
4	Alumni Survey, Employer Survey	September 2011 October 2011	Need More emphasis on design components	Under Review in Board of Faculties
5	Alumni Survey,	October 2011	Research aptitude building	Under Review in Board of Faculty
6	Employer Survey	September 2011	Not Applicable	Not Applicable

**Table 1: Program Objectives Assessment**

### 3.2 Standard 1-2

The program must have documented outcomes for graduating students. It must be demonstrated that the outcome support the program objectives and that graduating students are capable of performing these outcomes.

### 3.2.1 Program Outcomes

1. Students shall be able to go for higher education (MSc, MS, Ph.D) in Mathematics.
2. Students shall be able to use computer related software.
3. Students shall be able to give presentations.
4. Students will be able to perform technical and non technical jobs in various fields.
5. Students shall be able to perform mathematical analysis of the systems
6. Students shall be able to develop mathematical models and implement the solutions.
7. Students shall be able to administer mathematical concepts in various fields.
8. Students shall be able to perform research in related fields.
9. Students shall be able to execute tasks in positive and constructive manner.

Program Objectives	Program Outcomes								
	1	2	3	4	5	6	7	8	9
1	x								
2		x	x		x				
3				x			x		x
4					x	x	x		
5	x		x					x	
6									x

**Table 2: Outcomes versus Objectives**

### 3.3 Standard 1-3

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

The program assessment has been done by launching HEC Performa number 1 and 10. The students of the program evaluated the courses and teachers in the program.

#### 3.3.1 Course Evaluation

Courses evaluation is shown in the following graphical chart:

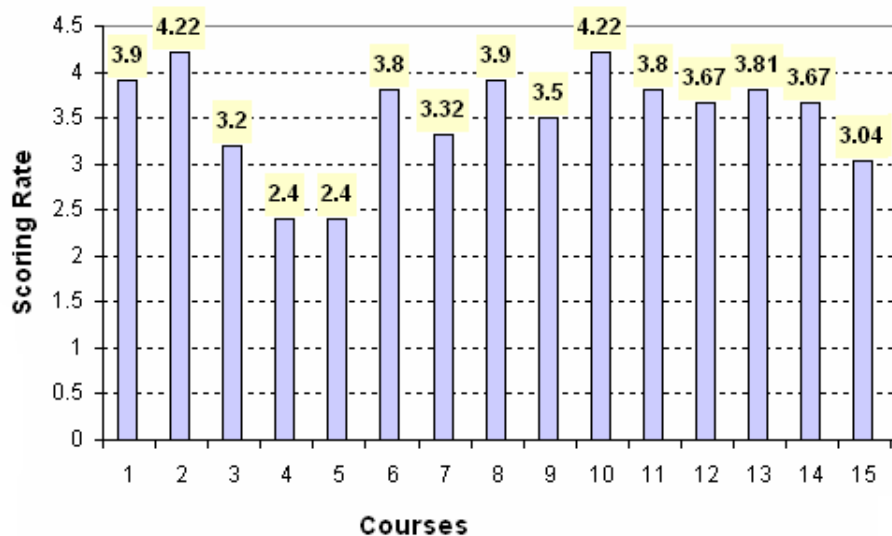


Figure 1: Course Evaluation Bar Chart

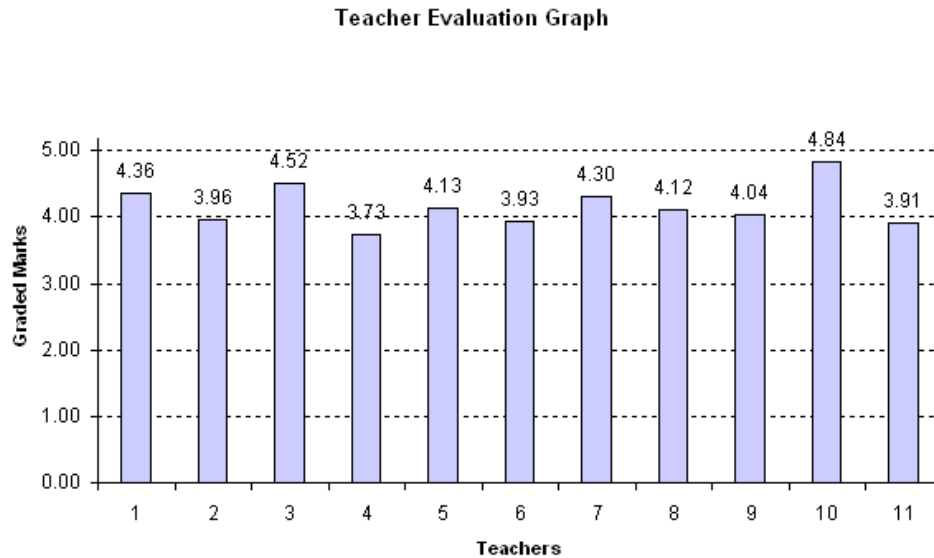
Through this evaluation, students have graded the courses against the structure, method of teaching, learning outcomes, objectives and practical implementation of theory. The total graded marks are 5.

Following is the list of courses that are being evaluated by the students along with their course code and graded scores.

Sr. #	Course Name	Code	Scoring Rate
1	Real Analysis	MAT 101	3.9
2	Group theory	MAT 111	4.22
3	Set Topology	MAT 112	3.2
4	Complex Analysis	MAT 102	2.4
5	Rings & Fields	MAT 121	2.4
6	Linear Algebra	MAT 113	3.8
7	Analytical Mechanics	MAT 122	3.32
8	Functional Analysis	MAT 104	3.9
9	Differential Geometry	MAT 105	3.5
10	Numerical Methods	MAT 206	4.22
11	Mathematical Physics	MAT 224	3.8
12	Analytical dynamics	MAT 241	3.67
13	Mathematical Statistics	MAT 242	3.81
14	Advanced functional Analysis	MAT 202	3.67
15	Discrete Mathematics	MAT 231	3.04

### 3.3.2 Teachers Evaluation

Teacher's evaluation is shown in the following graphical chart:



**Figure 2: Teachers Evaluation Graph**

Through this evaluation, students have graded the teachers against lecture preparation, punctuality, general behavior, subject knowledge and teaching method. The total graded marks are 5.

Following is the list of teachers that are being evaluated by the students along with the serial number and graded scores.

Sr. #	Teacher Name	Graded Marks
Teacher 1	Mr. Abdul Raheem	4.36
Teacher 2	Dr. Afzal Rana	3.96
Teacher 3	Dr. Ali Paracha	4.52
Teacher 4	Dr. Atiq Mufti	3.73



Teacher 5	Dr. Babar	4.13
Teacher 6	Mr. Hammad Nafees	3.93
Teacher 7	Dr. Muhammad Irfan	4.30
Teacher 8	Mr. Nasir Shah	4.12
Teacher 9	Ms. Sadia Nadir	4.04
Teacher 10	Dr. Sarwar Kamran	4.84
Teacher 11	Ms. Ambreen Arshad	3.91

Faculty carried out in house discussion and analyzed the feedback and identified the areas of improvement. A discussion with In charge graduate stream was also held. They decided to go through the identified areas in Board of Studies to finalize the recommendations for improvement to be presented in Board of Faculty and Academic Council.

The Dean and In charge Program also discussed the teachers evaluation results and decided to carry out counseling of teacher who are below par. It was also decided to conduct training sessions for teachers who are not performing at expected level.

The strengths and weaknesses of the program are:

#### Strengths

- a. Coherent, on time and uninterrupted semester system
- b. Efficient and capable senior faculty
- c. Market oriented course contents

#### Weaknesses

- a. low percentage of design contents in syllabi
- b. low number of case studies
- c. infrastructure needs improvement
- d. Training of Junior Faculty members

Significant future development plans for the program are categorized as short and long term arrangements which are as under:

- a. Short term arrangements include improvement of existing infrastructure to run the program in much better environment by replacing or adding

curtains in classrooms, changing of white boards, and performance enhancement of the cooling system in the classes. Prepare handouts, brochures and pamphlets for advisory services.

- b. While the long term arrangements include procurement of high value items like multimedia, additional air conditioners, improvement in sound systems and up gradation of lab equipment. On the academic side, the future development plans for the programs include training programs for junior faculty members to enhance their teaching capabilities, revision of course syllabi and overall enhancement of knowledge and skills of all faculty members in relation to the latest global advancements in the field of Mathematics through exchange program, short trainings and collaborative research projects within and outside Pakistan.

### **3.4 Standard 1-4**

**The department must assess its overall performance periodically using quantifiable measures.**

#### **3.4.1 Graduates/Undergraduates enrolled in last three years**

A Total of 39 students (Graduate Program) enrolled during the last three year as per following yearly breakdown:

- Year 2009                7
- Year 2010                13
- Year 2011                19

#### **3.4.2 Student Faculty Ratio:**

20-1

#### **3.4.3 Average GPA per semester:**

Average GPA per semester for the batch enrolled in year 2010 is as under:

Semester 1	2.1
Semester 2	2.57
Semester 3	2.51
Semester 4	2.13

#### **3.4.4 Average Completion time**

Average Completion time for graduate program is 2 years. The attrition rate is 10% for the period 2009-2011.

#### **3.4.5 Employer Satisfaction**

80% employers are satisfied with the performance of our graduates. Annexure B shows an overall response of employers against different categories.

#### **3.4.6 Students Course Evaluation Rate**

Average student evaluation for all courses is 14.5.

#### **3.4.7 Students Faculty Evaluation**

Students Evaluated faculty. The feedback was taken by QEC staff in the absence of faculty members. 63% teachers (7 out of 11) were awarded more than 80% evaluation grade by students. 37% teachers (4 out of 11) were awarded more than 70% evaluation grade by students.

#### **3.4.8 Research**

The program faculty members published 134 research papers in international and national journals. The faculty members also read 39 papers in different national and international conferences. They have publication of 4 books to their credit. List attached in Annex E.

#### **3.4.9 Community Service**

Riphah Village for flood affected population has been made by university in Charsada (Khyber Pakhtoon Khawa). Students took part in community services, very actively, to establish facilities for flood affectees. The average student hours spent were 15 for each student.

#### **3.4.10 Students/Teachers Satisfaction**

The department maintains a ratio of 4:1 for the academic (technical) and administrative non-technical staff which fulfils the standard set by the HEC.

**Students:** In person discussion in classes by QEC staff with students while taking the feedback, indicated highly positive reactions. The students were extremely satisfied with the standard of teaching and teacher's behaviour. The students awarded over 80% grades to the teachers in response to the evaluation performa. A reasonably good percentage was happy with university environment and administrative support services of the department, while, a few gave suggestion for improvements in administrative facilities like canteen and games etc.

**Teachers:** Teachers have mix reactions about the prevailing environment in the department. However, over 73% teachers were extremely satisfied with the support they are getting from the department, their future promotion in the department and general environment in the university.

## 4.0 Criterion 2: Curriculum Design and Organization

### 4.1 Title of Degree Program

M. Sc. Mathematics

### 4.2 Definition of credit hour:

One credit hour is 1 hours of theory lecture or 3 hours of laboratory work in a week.

### 4.3 Degree plan

Following is the list of courses taught in the selected program. Section 4.5 shows the details about these course including pre-requisites.

### Semester wise Proposed Course Offering Fall 2009 (M.Sc)

1 <sup>st</sup> Year Semester-I			1 <sup>st</sup> Year Semester-II		
Course Title	Course code	Cr. Hr.	Course Title	Course code	Cr. Hr
Real Analysis	MAT 101	3	Rings & Fields	MAT 121	3
Group theory	MAT 111	3	Linear Algebra	MAT 113	3
Set Topology	MAT 112	3	Analytical Mechanics	MAT 122	3
Complex Analysis	MAT 102	3	Functional Analysis	MAT 104	3
Ordinary Differential Equations	MAT 103	3	Differential Geometry	MAT 105	3
<b>Total</b>		15	<b>Total</b>		15
2 <sup>nd</sup> Year Semester-III			2 <sup>nd</sup> Year Semester-IV		
Numerical Methods	MAT 206	3	Operation research	MAT 232	3
Mathematical Physics	MAT 224	3	Advanced functional Analysis	MAT 202	
Partial Differential Equations	MAT 208	3	Theory of Modules	MAT 236	3
Analytical dynamics	MAT 241	3	Discrete Mathematics	MAT 231	3
Mathematical Statistics	MAT 242	3	Measure and Integration	MAT 207	3
<b>Total</b>		15	<b>Total</b>		15

Total Number of Credit hrs

60

In third and fourth semester, students can pick up two subjects from semester 3 & 4 tables given above and remaining 3 subjects from table A (given below).

<b>Sr #</b>	<b>Course Title</b>	<b>Course code</b>
1.	Combinatorial Geometry	MAT235
2.	Advance Group theory	MAT 214
3.	Probability Theory	MAT 243
4.	Combinatorics	MAT 234
5.	Graph Theory	MAT 215
6.	Stochastic Processes	MAT 244
7.	Control Theory	MAT 225
8.	Number Theory	MAT 216
9.	Fluid Mechanics	MAT 226
10.	Linear Operators on Inner Product Spaces	MAT 217

**Table A**

#### 4.4 Curriculum Breakdown

Semester	Course Number	Category (Credit Hours)				
		Math and Basic Science		Core Courses	Humanities and Social Sciences	Technical Electives / Others
		Math	Basic Science			
1	MAT 101, MAT 111, MAT 112, MAT 102, MAT 103	15				
2	MAT 121, MAT 113, MAT 122, MAT 104, MAT 105	15				
3	MAT 206, MAT 224, MAT 208, MAT 241, MAT 242	15				
4	MAT 232, MAT 202, MAT 236, MAT 231, MAT 207	15				

**Table 3: Curriculum Course Requirements (table 4.3)**

Note: Total Credit Hours = 60



## **4.5 Courses Information**

### **4.5.1 Real Analysis I (MAT-101)**

#### **4.5.1.1 Objective**

This course introduces students a knowledge of the real number system, familiarity with the major concepts of modern analysis and enhancement in the level of mathematical maturity, including discovering and writing their own proofs.

#### **4.5.1.2 Books**

- Bartle, R.G. and Sherbert, D.R., Introduction to Real Analysis, John Wiley Sons 1994.
- Widder, D.V., Advanced Calculus, Prentice Hall 1982.
- Rudin, W., Principles of Real Analysis, McGraw-Hill 1995.
- Rabenstein, R.L., Elements of Ordinary Differential Equations, Academic Press, 1984.

### **4.5.2 Complex Analysis (MAT-102)**

#### **4.5.2.1 Objective**

To enable the students to understand the theory of functions of a complex variables and its applications in science and engineering such as physics, hydrodynamics, thermodynamics and electrical engineering, etc.

#### **4.5.2.2 Prerequisite**

Real Analysis I (**MAT-101**)

#### **4.5.2.3 Books**

- Churchill, R.V. Verhey and Brown R., Complex Variables and Applications McGraw-Hill, 1996.
- Marsden, J.E., Basic Complex Analysis, W.H. Freeman and Co, 1982.
- Hille, E., Analytic Function Theory, Vols.I and II, Chelsea Publishing Co. New York, 1974.

### **4.5.3 Ordinary Differential Equations (MAT-103)**

#### **4.5.3.1 Objective**

To facilitate students with initial value and boundary value problems, their solutions techniques, applications in various fields and

development of mathematical model of physical phenomena of science and engineering and analysis of the phenomena.

#### **4.5.3.2 Prerequisite**

Calculus and knowledge of Linear algebra

#### **4.5.3.3 Books**

- Morris, M and Brown, O.E., Differential Equations, Englewood Cliffs, Prentice-Hall, 1964.
- Spiegel, M.R., Applied Differential Equations, Prentice-Hall, 1967
- Chorlton, F., Ordinary Differential and Difference Groups, Van Nostrand 1965
- Brand, L., Differential and Difference Equations, John-Wiley, 1966.
- Zill, D.G and Cullen, M.R., Advanced Engineering Mathematics PWS, Publishing Co. 1992.
- Rainville, E.D. and Bedient, P.E., Elementary Differential Equations, Macmillan Company, New York, 1963.

#### **4.5.4 Functional Analysis (MAT-104)**

##### **4.5.4.1 Objective**

To develop the theory needed to treat linear integral and differential equations, within the framework of infinite-dimensional linear algebra.

##### **4.5.4.2 Prerequisite**

Linear Algebra (MAT-113)

##### **4.5.4.3 Books**

- Kreyszig, E., Introductory Functional Analysis with Applications, John Wiley, 1978.
- Maddox, J., Elements of Functional Analysis, Cambridge, 1970.
- Simmon, G.F., Introduction to Topology and Modern Analysis, McGraw-Hill, N.Y.1983.
- Rudin, W., Functional Analysis, McGraw-Hill, N.Y., 1983.

#### **4.5.5 Differential geometry (MAT-105)**

##### **4.5.5.1 Objective**

To provide the student with the concept and the understanding in Space curves, Geodesics, Intrinsic and Non-Intrinsic properties of a surfaces.

##### **4.5.5.2 Prerequisite**

Real Analysis (MAT-101)

##### **4.5.5.3 Books**

- Millman, R.S and Parker., G.D. Elements of Differential Geometry, Prentice-Hall Inc., New Jersey, 1977.

- Struik, D.J., Lectures on Classical Differential Geometry, Addison-Wesley, Publishing Company, Inc., Massachusetts, 1977.
- Do Carmo, M.P., Differential Geometry of Curves and Surfaces, Prentice-Hall, Inc., Englewood, New Jersey, 1985
- Neil, B.O., Elementary Differential Geometry, Academic Press, 1966
- Goetz, A., Introduction to Differential Geometry, Addison-Wesley, 1970.
- Charlton, F., Vector and Tensor Methods, Ellis Horwood,

## **4.5.6 Real Analysis II (MAT- 109)**

### **4.5.6.1 Objectives**

To develop ability and skills in calculus of one and several variables, vector analysis, understanding of the different methods for building analytical foundation in all areas of Mathematics and its applications in various fields.

### **4.5.6.2 Prerequisite**

Real Analysis (MAT-101)

### **4.5.6.3 Books**

- Bartle, R.G. and Sherbert, D.R., Introduction to Real Analysis, John Wile Sons 1994.
- Widder, D.V., Advanced Calculus, Prentice Hall 1982.
- Rudin, W., Principles of Real Analysis, McGraw-Hill 1995.
- Rabenstein, R.L., Elements of Ordinary Differential Equations, Academic Press, 1984.

## **4.5.7 Group Theory (MAT-111)**

### **4.5.7.1 Objectives**

The aim of this course is to introduce the students to some of the basics concepts and techniques of abstract algebra achieved through a study of an algebraic structure (a group), an algebraic object with one associative operation that satisfies certain properties.

### **4.5.7.2 Prerequisite**

Set Theory

### **4.5.7.3 Books**

- Fraleigh, J.B., A First Course in Algebra, Addison-Wesley 1982.
- Hamermesh, M., Group Theory, Addison-Wesley 1972.
- Herstein, I.N., Topics in Algebra, John Wiley 1975.

## **4.5.8 Set Topology (MAT-112)**

### **4.5.8.1 Objectives**

To enable the students with qualitative geometry

### **4.5.8.2 Prerequisite:**

Set Theory

### **4.5.8.3 Books**

- Munkres, J.R., Topology A First Course, Prentice - Hall, Inc. London, 1975
- Simon, G.F., Introduction to Topology and Modern Analysis McGraw-Hill, New York, 1963.
- Pervin, W.J., Foundation of General Topology, Academic Press, London, 2nd ed., 1965.

## **4.5.9 Linear Algebra (MAT-113)**

### **4.5.9.1 Objectives**

To develop fundamental concepts and techniques associated with the solution of system of equations based on compact approach.

### **4.5.9.2 Prerequisite**

Group Theory (MAT-111)

### **4.5.9.3 Books**

- Shilov, G.E., Linear Algebra, Dover Publication, Inc., New York, 1997.
- Zill, D.G. and Cullen M.R., Advanced Engineering Mathematics, PWS, publishing company, Boston, 1996.
- Herstein, I., Topics in Algebra, John-Wiley, 1975.
- Trooper, A.M., Linear Algebra, Thomas Nelson and Sons, 1969.

## **4.5.10 Rings and Field (MAT-121)**

### **4.5.10.1 Objectives**

To educate the students on concepts of abstract mathematics and its applications in various fields such as engineering, physics, computer science, etc.

### **4.5.10.2 Prerequisite**

Group theory (MAT-111)

## Linear Algebra (MAT-113)

### 4.5.10.3 Books

- Fraleigh, J.A., A First Course in Abstract Algebra, Addison Wesley Publishing Company, 1982.
- Herstein, I.N., Topics in Algebra, John Wiley & Sons 1975.
- Lang, S., Algebra, Addison Wesley, 1965.
- Hartley, B., and Hawkes, T.O., Ring, Modules and Linear Algebra, Chapman and Hall, 1980
- Chorlton, F., A Textbook of Dynamics, McGraw Hill, N.Y 1983.
- Symon, K.R., Mechanics, Addison Wesley, 1964.
- Goldstein, H., Classical Mechanics, Addison Wesley, 2nd Edition, 1980.
- Synge, J. I. and Griffith, B. A., Principles of Mechanics, McGraw-Hill, N.Y. 1986.
- Beer, F. P. and Johnston, E. R., Mechanics

### 4.5.11 Analytical Mechanics (MAT-122)

#### 4.5.11.1 Objectives

To introduce classical laws of physics to describe the motion of point particles and rigid bodies

#### 4.5.11.2 Prerequisite

Undergraduate Mechanics

#### 4.5.11.3 Books

- Chorlton, F., A Textbook of Dynamics, McGraw Hill, N.Y 1983.
- Symon, K.R., Mechanics, Addison Wesley, 1964.
- Goldstein, H., Classical Mechanics, Addison Wesley, 2nd Edition, 1980.
- Synge, J. I. and Griffith, B. A., Principles of Mechanics, McGraw-Hill, N.Y. 1986.
- Beer, F. P. and Johnston, E. R., Mechanics

### 4.5.12 Numerical Methods (MAT-206)

#### 4.5.12.1 Objective

The aim is to give knowledge of types of errors and their sources, finite-differences, various techniques for solving nonlinear equations, integral equations etc.

#### 4.5.12.2 Prerequisite

Calculus & Differential Equations (MAT 103)

#### **4.5.12.3 Books**

- McCracken, D.D., A guide to Fortran IV programme, Second Edition, John Wiley & Sons, Inc, New York, London, Sydney, Toronto, 1979.
- Conte, S.D. and Boor, C., Elementary Numerical Analysis, McGraw-Hill 1980.
- Ahmad, F. and Rana, M.A., Elements of Numerical Analysis, National Book Foundation, Islamabad, 1995.
- Zurmuhl, R., Numerical Analysis for Engineers and Physicists, Springer-Verlag 1976.

#### **4.5.13 Measure and Integration (MAT-207)**

##### **4.5.13.1 Objectives**

To enable students to understand and analyze processes of measure and integration

##### **4.5.13.2 Books**

- Halmos, P.R., Measure Theory, D.Van Nostrand, 1950.
- Cohn, D.L., Measure Theory, Birkhauser, 1980. .
- Royden, H.L., Real Analysis, Macmillan, 1968

#### **4.5.14 Partial Differential Equations (MAT-208)**

##### **4.5.14.1 Objectives**

To provides a foundation regarding initial and boundary value problems, their classification & mathematical modeling and their various solution techniques.

##### **4.5.14.2 Prerequisite**

Ordinary Differential Equations (MAT-103)

##### **4.5.14.3 Books**

- Sneddon, I.N., Elements of Partial Differential Equations, McGraw-Hill Book Company, 1987.
- Dennemyer, R., Introduction to Partial Differential Equations and Boundary Value Problems, McGraw-Hill Book Company, 1968.
- Humi, M and Miller, W.B., Boundary Value Problems and Partial Differential Equations, PWS-Kent Publishing Company, Boston, 1992.
- Chester, C.R., Techniques in Partial Differential Equations, McGraw-Hill Book Company, 1971.
- 5. Haberman, R., Elementary Applied Partial Differential Equations, Prentice Hall, Inc. New Jersey, 1983
- Zauderer, E., Partial Differential Equations of Applied Mathematics, JohnWiley & Sons, Englewood Cliff, New York, 1983.

#### **4.5.14 Mathematical Physics (MAT-224)**

##### **4.5.14.1 Objectives**

To enable the students about mathematical models of physical phenomena in physics, their mathematical modeling and solutions techniques to understand the behavior of the actual phenomena.

##### **4.5.14.2 Prerequisite**

Ordinary Differential Equations (MAT-103)  
Partial Differential Equations (MAT-208)

##### **4.5.14.3 Books**

- E.L. Butkov, Mathematical Physics, Addison-Wesley, 1973.
- H. Sagan, Boundary and Eigenvalue Problems in Mathematical Physics.
- R.P. Kanwal, Linear Integral Equations, Academic Press, 1971.
- Tyn Myint-U: & L. Denbnath, Partial Differential Equations, Elsevier Science Pub., 1987.
- G. Arfken, Mathematical Methods for Physics, Academic Press, 1985.
- Stakgold, Boundary Value Problems of Mathematical Physics, Vol. II, Macmillan, 1968.

#### **4.5.15 Discrete Mathematics (MAT-231)**

##### **4.5.15.1 Objectives**

To develop mathematical problem solving skills and introduce students to a wide variety of applications of discrete mathematics in various fields such as combinational games, network graphs, etc.

##### **4.5.15.2 Books**

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms (2nd edition). MIT Press (2001)
- J.A. Bondy and U.S.R. Murty, Graph Theory with Applications. North Holland (1976).
- Reinhard Diestel, Graph Theory (1st, 2nd or 3rd edition). Springer-Verlag (1997, 2000, 2005).
- Herbert S. Wilf, Algorithms and Complexity (1st or 2nd edition). A K Peter (1985, 2002).
- Norman L. Biggs, Discrete Mathematics (2nd edition). Oxford University Press (2002).

#### **4.5.16 Operations Research (MAT- 232)**

#### 4.5.16.1 Objectives

To develop a scientific approach for decision making and determining how best to design and operate a system, usually under conditions requiring the allocation of scarce resources.

#### 4.5.16.2 Books

- Hamdy A. Taha, Operations Research-An Introduction, Macmillan Publishing Company Inc., New York, 1987.
- B.E. Gillett, Introduction to Operations Research, Tata McGraw Hill Publishing Company Ltd., New Delhi.
- F.S. Hillier & G.J. Liebraman, Operations Research, CBS Publishers and Distributors, New Delhi, 1974.
- C.M. Harvey, Operations Research, North Holland, New Delhi, 1979.

#### 4.5.17 Graph theory (MAT-232)

##### 4.5.17.1 Objectives

The aim of the course is to introduce students algorithmic graph theory and enable them for demonstrating methodologies in graph techniques and their application in solving the complex problems.

##### 4.5.17.2 Books

- John Clerk and Derek Allan Holton : A first look at Graph Theory (Allied Publishers Ltd./World Scientific).
- F. Haray : Graph Theory.
- Narsingh Deo : Introduction to Graph Theory with applications to Engineering and Computer Science.
- Bhavé and T. T. Raghunathan : Elements of Graph Theory.
- Bondy and Murty : Graph Theory with applications.

#### 4.5.18 Combinatorics (MAT-234)

##### 4.5.18.1 Objectives

It is designed to help students to learn the basic concepts of logic and proofs, understand the notions of discrete functions, counting process, and various counting methods to solve complex problems in combinatorics.

##### 4.5.18.2 Books

- Marshall Hall Jr. : Combinatorial Theory, 2nd Edition (Wiley-Inter Science Publications).
- John Riordan : An Introduction to Combinatorial Analysis (Wiley Publications).



- Gerald Berman and K. D. Fryer : Introduction to Combinatorics (Academic Press).
- V. K. Balakrishnan : Schaum's outline series Theory and Problems of Combinatorics (Mc-Graw Hill).
- Alan Tucker : Applied Combinatorics, 3rd Edition (John Wiley & Sons).
- 

#### **4.5.19 Theory of Modules (MAT-236)**

##### **4.5.19.1 Objectives**

To introduce basic concepts of Modules and their applications in various fields such as theory of groups, mathematical physics

##### **4.5.19.2 Books**

- Adamson, J., Rings and modules. Blyth, T.S., Module theory, Oxford University Press, 1977
- Hartley, B. and Hawkes, T.O., Rings, Modules and Linear algebra, Chapman and Hall, 1980.
- Herstein, I.N., Topics in Algebra, John Wiley and Sons, 1975.

#### **4.5.20 Analytical Dynamics (MAT-241)**

##### **4.5.20.1 Objectives**

To enable students about notion of relationship between motion of bodies and its causes and develop and polish skills to attain a level of proficiency in applied mathematics to be used in solving problems in the contemporary Science/Technology and Engineering world.

##### **4.5.20.2 Prerequisites**

Analytical Mechanics (MAT-122)

##### **4.5.20.3 Books**

- Chorlton, F., Textbook of dynamics, Van Nostrand, 1963.
- Chester, W., Mechanics, George Allen and Unwin Ltd., London 1979.
- Goldstein, H., Classical Mechanics, Cambridge, Mass Addison-Wesley, 1980. (latest edition).
- G. Meirovitch. L., Methods of Analytical Dynamics, McGraw-Hill, 1970.

#### **4.5.21 Mathematical Statistics (MAT-242)**

##### **4.5.21.1 Objectives**

This course provides an elementary introduction to probability and statistics with applications.

#### 4.5.21.2 Books

- Mood, A.M. Graybill, F.A., and Boes, D.C., Introduction to the Theory of Statistics, 3rd Edition, McGraw-Hill Book Company New York, 1974.
- Degroot, M. H., Probability and Statistics, 2nd Edition, Addison-Wesley Publishing Company, USA, 1986.
- Mardia, K.V., Kent, J.T., and Bibby, J.M., Multivariate Analysis, Academic Press, New York, 1979

#### 4.6 Standard 2-1

The curriculum must be consistent and supports the program's documented objectives.

#### 4.6.1 Group 1: Pure Mathematics

Real Analysis MAT 101, Group theory MAT 111, Set Topology MAT 112, Rings & Fields MAT 121, Linear Algebra MAT 113, Functional Analysis MAT 104, Operation research MAT 232, Advanced functional Analysis MAT 202, Theory of Modules MAT 236, Measure and Integration MAT 207

#### 4.6.2 Group 2 Applied Mathematics

Complex Analysis MAT 102, Ordinary differential Equations MAT 103, Linear Algebra MAT 113, Analytical Mechanics MAT 122, Differential Geometry MAT 105, Numerical Methods MAT 206, Mathematical Physics MAT 224, Partial Differential Equations MAT 208, Analytical dynamics, MAT 241, Mathematical Statistics MAT 242, Discrete Mathematics MAT 231

#### 4.6.3 Course Groups and Program Objectives

Courses Groups	Objectives				
	1	2	3	4	5
1	x	x	x	x	x
2	x	x	x		x

**Table 4: Courses versus Program Objectives (table 4.4)**

**4.7 Standard 2-2**

**Theoretical backgrounds, problem analysis and solution design must be stressed within the program's core material.**

<b>Elements</b>	<b>Courses</b>
Theoretical Background (Pure Mathematics)	MAT 101, MAT 111, MAT 112, MAT 121, MAT 113, MAT 104, MAT 232, MAT 202, MAT 236, MAT 207
Problem Analysis & Solution Design (Applied Mathematics)	MAT 102, MAT 103, MAT 113, MAT 122, MAT 105, MAT 206, MAT 224, MAT 208, MAT 241, MAT 242, MAT 231

**Table 5: Standard 2-2 Requirement (table 4.5)**

**4.8 Standard 2-3**

**The Curriculum must satisfy the core requirements for the program as specified by the respective accreditation body.**

M.Sc Mathematics program is recognized Higher Education Commission has no deviation from the given syllabi. Minimum Requirements for each program (Program Semester Credit Hours)

<b>Program</b>	<b>Applied &amp; Pure Mathematics</b>
M.Sc Mathematics	60 Credit hours

**Table 6: Program Credit Hours (appendix A table)**

#### **4.9 Standard 2-4**

**The curriculum must satisfy the major requirements for the program as specified by the respective accreditation body.**

Same as Standard 2-3.

#### **4.10 Standard 2-5**

**The curriculum must satisfy general education, arts and professional and other discipline requirements for the program as specified by the respective accreditation body.**

Same as standard 2-3 and Standard 2-1 (table 4.4) as defined above.

#### **4.11 Standard 2-6**

**Information technology component of the curriculum must be integrated throughout the program**

Semester 3 contains the 3 credit hours of information technology topics (C++ Language and Mat Lab), out of which 1 credit hour is for theoretical work and 2 credit hours are for laboratory work. This course educates the students with the basics of the computer sciences and its application in the field of Mathematics.

The knowledge provided during this course is applicable throughout the program whenever students do practical work in laboratory for any course and that requires the knowledge of Information technology concepts to execute their work. This course also helps them in their next higher education fields.

#### **4.12 Standard 2-7**

**Oral and written communication skills of the student must be developed and applied in the program.**

Students go through the elective courses of Mathematical Skills and Technical Report Writing. It develops the oral and written communication skills of the students.

## 5.0 Criterion 3: Laboratories and Computing Facilities

RIU has established multiple laboratories for students to practice their learning outcomes. Following is the list of available laboratories available to M.Sc. Mathematics students:

1. Computer Lab I
2. Computer Lab II

The details about these laboratories are provided as under:

Laboratory Title	Computer Lab I	Computer Lab II
Location & Area	Block A	Block A
Objectives	Provide students with IT facility to practice software applications and programming.	Provide students with IT facility to practice software applications and programming.
Adequacy for Instruction	All required instructions are displayed in the lab at appropriate places for use by faculty, students and support staff.	All required instructions are displayed in the lab at appropriate places for use by faculty, students and support staff.
Courses Taught	C++ Language	C++ Language
Software Available	MS Office, Java, SQL Server, MS Visio,	MS Office, Visual Studio, SQL Server
Major Apparatus / Equipment	Computers, Scanners, Multimedia,	Computers, Network Printers, Multimedia
Safety Regulations	Safety regulations are being strictly followed. See Annexure I for details of Laboratory Precautions.	Safety regulations are being strictly followed. See Annexure I for details of Laboratory Precautions.

**Table 8: Laboratories Details**

### **5.1 Standard 3-1**

**Laboratory manuals/documentation/instructions for experiments must be available and easily accessible to faculty and students.**

Laboratory In-charge is the custodian of all the manuals and instructions concerning his laboratory. Its copies are also available with the Program Coordinator to be used by the faculty and students. These manuals and instructions are issued to desired entity through a defined process and proper record is maintained. The laboratory in-charge keeps the manuals and instructions in laboratory for immediate access to students and faculty members during the laboratory work.

Laboratory equipment and facilities in Faculty of Computing (RIU) are equally good and comparable to any high reputed university of the country.

### **5.2 Standard 3-2**

**There must be support personal for instruction and maintaining the laboratories.**

Each laboratory is authorized two staff members, Laboratory In-Charge and Laboratory Attendant. Laboratory in-charge is responsible for overall maintenance of laboratory and also maintains the manuals and instructions while laboratory Attendant is responsible to maintain the laboratory equipment and general duties within the lab.

### **5.3 Standard 3-3**

**The University computing infrastructure and facilities must be adequate to support program's objectives.**

The computer laboratories have the latest computers & equipments. The program objectives are that students shall be equipped with IT skills at the end of the program and facilities (equipment and software) provided in the

computer laboratories are adequate enough to achieve defined goals. Computing facilities in RIU are extremely good and can be compared with any high reputed university of the country.

RIU is running a comprehensive Campus Management System. It facilitates the faculty members in maintaining the attendance record, examination schedules, time tables and student's data.



## **6.0 Criterion 4: Student Support and Advising**

Since the launch of RIU in year 2002, all its programs have started and finished on schedule. The culture in RIU is that teachers and students have facility of frequent interaction, even after classes, for any professional and academic advice. This aspect is even highlighted and indicated by the students in the feedback on HEC Performa number 10, taken by the Quality Enhancement Cell (QEC) in the university.

### **6.1 Standard 4-1**

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

The department strategy to offer courses (core and electives) for the subject program is based on schedule approved by Board of Studies in the guidance of HEC instructions. The required and elective courses are offered in a logical sequence that grooms the students to obtain the program's defined objectives and outcomes. The courses offered outside the department belongs to Faculty of Computing. The Basic Sciences program coordinator coordinates with the respective coordinator in faculty of Computing and accommodate the desired course in program's time table. This is done well in advance prior to the commencement of classes to avoid any clashes in the schedule.

### **6.2 Standard 4-2**

**Courses in the major area of study must be structured to ensure effective interaction between students, faculty and teaching assistants.**

All courses in the program are taught by the single faculty member. Courses are structured in the board of studies before commencement of each

semester. Faculty members interact frequently among themselves and with students. Students are encouraged to participate in providing feedback and their views about course contents during and after the classes.

### **6.3 Standard 4-3**

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

Students are informed about the program requirements at the start of the session during orientation week by in-charge program and QEC staff. In-Charge Program acts as advisor to guide students to choose appropriate courses and also provide guidance on different issues. He also maintains a list of guidance points provided to students during the semester and program, which is being evaluated at the end of the program to take necessary improvement.

In-charge student's affair provides professional counseling to students when needed. Students can get in touch directly with him/her for any advice.

Program coordinator maintains a list of professional societies and technical bodies, that is provided to students on demand and students can get membership of such organizations on individual basis.

## **7.0 Criterion 5: Process Control**

### **7.1 Standard 5-1**

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

The program has a well defined admission criterion, which include evaluation of student's marks at different levels and admission test results. The admission is done once a year, in fall semester.

The Students with B.Sc. Mathematics degree, who qualify the entry test of the university, are eligible for entry into M.Sc. Mathematics program. Admission is granted strictly on the basis of result of the admission test and interview.

Students from accredited universities are eligible to transfer their credits to RIU. Students have to submit complete course curriculum and internal evaluation certificate of each subject from his/her previous institution duly signed by head of department/principal. Student's applications in this regard are dealt on case to case basis. Such applications are discussed in Board of Studies to evaluate them and make decision. Head of the Basic Sciences Department is the final authority to make decision regarding credit transfers.

This admission criterion is evaluated every 2 years by the board of faculties and academic council in the light of instructions issued by HEC. Minor internal adjustments regarding admission test result weightages or test contents are made.

## **7.2 Standard 5-2**

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

The student's name, after completion of the admission process, is forwarded to the Registrar office for registration in the specific program and the registration number is issued.

Students are evaluated through assignments, sessionals, mid term tests and final examinations at the end of each semester. The laboratory work is done on regular basis as per schedule and contributes significantly towards the student's evaluation for relevant course. Only qualified students in each semester are allowed to join the next semester.

## **7.3 Standard 5-3**

**The process of recruiting and retaining highly qualified faculty members must be in place and clearly documented. Also processes and procedures for faculty evaluation, promotion must be consistent with institution mission statement. These processes must be periodically evaluated to ensure that it is meeting with its objectives.**

Vacant and newly created positions are advertised in the national newspapers, applications are received by the Registrar office, scrutinized by the respective Deans, and call letters are issued to the short-listed candidates on the basis of experience, qualification, publications and other qualities/activities as determined by the University in the light of HEC guidelines.

The candidates are interviewed by the University Selection Board. Selection of candidates is approved by the BOG. Induction of new candidates depends upon the number of approved vacancies. HEC also helps RIU in enrolling the foreign faculty.

Faculty members are retained by giving them good remuneration, favorable teaching environment, research facilities and management support.

On yearly basis faculty performance is evaluated basing on HEC Performa number 10 by the students, Deans recommendations and with the counter signature of vice chancellor and pro chancellor. The annual increment is based on the recommendations of the Dean and the Vice chancellor.

#### **7.4 Standard 5-4**

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

Students are the recipient of the delivery of course material, through their teachers. The program is actively evaluated by Dean, In Charge program and QEC. The feedback of the taught is best instrument to measure that the course learning outcomes are met. The students give feedback on Performa number 1 regarding course contents and how it was delivered. Through Performa number 10, students evaluate and comment on teacher's efforts, put in to deliver the course contents, his general conduct in the class, the environment, he, maintains and extra efforts, he makes to satisfy students, thirst for knowledge.

Faculty feedback is also taken on HEC Performa number 2 (Faculty Course Review Report) and Performa number 5 (Faculty Survey) which is a very

useful activity to evaluate the course contents, learning and teaching environments and overall teachers satisfaction level. Course evaluation by teachers also indicates what percentage of desired outcome has been achieved by the course contents and what needs to be improved or changed.

This exercise is done once a year. The feedback is discussed with Dean and In charge program, who focus on making improvements in the weak areas, identified by the students. Teacher's evaluation performs are fed to the computer and bar charts are made. Each teacher is graded out of 5 marks. The comparative bar charts indicate level of performance of teachers, as visualized by the students. QEC formally submits these bar charts to Dean and Vice Chancellor for their information and taking of necessary corrective actions.

#### **7.5 Standard 5-5**

**The process that ensures that graduates have completed the requirements of the program must be based on standards, effective and clearly documented procedures. This process must be periodically evaluated to ensure that it is meeting its objectives.**

The program is run on semester basis and at the end of each semester examinations are held to evaluate the student's progress in that semester. Qualified students are allowed to join next semester and this cycle continues till the end of 4th semester which is the final semester. Student's final results are announced on the basis of cumulative performance in all the four semesters.

Requirements of this standard are met through 3 Performas issued by HEC. The feedback is documented and its evaluation indicates degree of satisfaction of the graduates. Three forms (Performa 3, Survey of

Graduating Students, Performs 7, Alumni Survey and Performa 8, Employer Survey) are extremely good instruments to measure the program outcomes.

The feedback is taken on yearly basis. The suggestions given by the graduating students and graduates working in the industry are given due weightage. For example a few graduates through Alumni survey indicated that emphasis on mathematical skills be enhanced. The proposal is being evaluated by Board of Faculty of the Department of Basic Sciences and recommendations are being made to Academic Council to grant approval for change in syllabi.

The feedback of employers has been achieved. Generally, they are satisfied; however, they have recommended that graduates be given more practice in technical report writing and mathematical skills. This is also being processed to make changes in syllabi.

## 8.0 Criterion 6: Faculty

### 8.1 Standard 6-1

There must be enough full time faculties 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.

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
Applied Mathematics	MAT 102, MAT 103, MAT 113, MAT 105, MAT 206, MAT 224, MAT 208, MAT 241, MAT 242, MAT 231	9	6
Pure Mathematics	MAT 101, MAT 111, MAT 112, MAT 121, MAT 113, MAT 104, MAT 232, MAT 202, MAT 236, MAT 207	7	2
<b>Total</b>	<b>20</b>	<b>16</b>	<b>8</b>

**Table 11: Faculty Distribution by Program Area (table 4.6)**



## **8.2 Standard 6-2**

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

Faculty concurrency in the discipline is determined based on the criterion set by the University in the light of HEC guidelines. All faculty members submit their professional resumes on HEC Performa number 9 (Faculty Resume) once a year. This information is compared with the existing criterion set by university for the concurrency of the post.

All full time faculty members are allocated teaching hours as per HEC defined limit which enables the faculty to have enough spare time to perform scholarly activities and improve their knowledge and skills.

Faculty members are provided with adequate resources for research and academic activities. Every faculty members has been provided with computer system and access to internet. Faculty members have also access to library materials for academic and research activities. Professional training is also provided to faculty if required to enhance their capabilities.

University has defined the development programs for faculty members under the arrangement of RARE (Riphah Academy of Research and Education). RARE holds frequent interactive sessions of junior and senior faculty to discuss teaching methodology with a view to train the young faculty members. This practice is done on yearly basis during the summer vacations. After every 2 year the development program is analyzed in Deans Council for its effectiveness and necessary improvements.

The university encourages the faculty to participate in research activities by providing them sufficient financial support within or outside university.

### **8.3 Standard 6-3**

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

Faculty members are motivated through public appreciation and documented appreciation (annual performance evaluation report) by the In-Charge Program and Dean on regular basis.

The faculty survey of the program using HEC Performa number 5 indicates the mix reactions of the faculty, which indicates that teaching load be distributed evenly and more relaxed environment be generated. Faculty Surveys are attached in Annex G.

## **9.0 Criterion 7: Institutional Facilities**

### **9.1 Standard 7-1**

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

The university has provided e-learning facilities to faculty members and students. Each faculty member has a computer system with access to internet and e-learning library section.

Students have been provided a number of computer systems in the library to access e-learning section. Every student has been provided with user ID to access the e-learning resources from within the university library. The university library is linked with foreign universities libraries through internet.

The support staff to look after the e-learning resources is sufficient in number, trained and responsive. The university has provided enough funding to support the e-learning.

### **9.2 Standard 7-2**

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

The university library has enough technical books in hard copies to support the program learning. The internet access to the external universities libraries provides opportunities to the students and faculty to obtain knowledge from their technical resources.

The library is staffed with more than 8 professionals to help students and faculty members to get access to required book or learning material efficiently.

### **9.3 Standard 7-3**

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

Enough class rooms are available to run the program as per desired schedule. In few class rooms, there is a need of up-gradation of multimedia and other resources. The work orders have been initiated and procurement process is in progress.

## 10.0 Criterion 8: Institutional Support

### 10.1 Standard 8-1

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

University allocates enough financial resources each year to hire competent faculty as required.

As already listed in standard 5-3, Faculty members are retained by giving them good remuneration, favorable teaching environment, research facilities and management support.

As listed in standard 6-2, Faculty members are provided with adequate resources for research and academic activities to maintain their competence. Every faculty members has been provided with computer system and access to internet. Faculty members have also access to library materials for academic and research activities. Professional training is also provided to faculty if required to enhance their capabilities.

### 10.2 Standard 8-2

**There must be an adequate number of high quality graduate students, research assistants and Ph.D. students.**

The university follows the guidelines of HEC for admission in this program. The number of graduating students during current year is 7 with \_\_\_research fellows and 3 Ph.D. researchers.

Faculty to graduate student's ratio for the last three years remained in the range of 7:1 to 8:1.

### 10.3 Standard 8-3

**Financial resources must be provided to acquire and maintain Library holdings, laboratories and computing facilities.**

Library at RIU holds more than 50000 books for all programs. Sufficient number of computers are available to be used by the students. Library is organized to accommodate 50 students (male, female) in research cubicles as well as in the common places. Separate common rooms for male and female students are available with internet facility.

Laboratories at RIU holds adequate equipment to be used by the students to carry out desired experiments and laboratory work. Each year a handful of budget is allocated for laboratories to maintain and upgrade the equipment and other facilities.

Computing facilities at RIU provide excellent platform to students to enhance their learning capabilities. There are 2 computer laboratories in Faculty of computing, which are accessible to all students for their use.

## 11.0 Conclusion

The self assessment report of the Faculty of Basic Sciences (M. Sc. Mathematics), Riphah International University, I-14 Campus Islamabad is an important document, which gives strengths and weaknesses of the program. The management is striving hard to improve infrastructure for establishment of conducive environments for studies. The faculty is focused on imparting quality education, introduction of new and innovative techniques and conduct of quality research to produce competent graduates in the subject of Mathematics. The report has been prepared after evaluating the program in the light of 8 criterion and 31 standards given in HEC's Self Assessment Manual. The program mission objectives and outcomes are assessed and strategic plans are presented to achieve the goal, which are again measurable through definite standards. Teachers' evaluation revealed satisfactory standards, the score of eleven teachers of the program ranged from 3.73 to 4.84. Students' course evaluation score ranged between 2.40 and 4.22 with a mean of 3.31 points in 0-5 scale. Alumni surveys revealed variable results with regards to knowledge, interpersonal skills, management and leadership skill. Weaknesses are identified which are related to space, laboratories and equipment. Improvements in curriculum design and infrastructure are suggested which are based upon set, well defined and approved criteria. Pre-requisites are fully observed, examinations are held on schedules, academic schemes are prepared well in advance, transparent admission, registration and recruiting policy, excellent student teacher ratio are some of the strong areas of this program. The number of courses along with titles and credit hours for each semester, course contents for degree program, are thoroughly planned. Their efficacy was measured through different standards and it was found to be satisfactory.

The facilities and shortcomings in the infrastructure and syllabi have been discussed. It was concluded that laboratory facilities and class rooms

need further improvement. The need of refreshal courses for the fresh faculty on method of teaching cannot be over emphasized.

Proper steps are taken to guide the students for program requirements, communication, meetings, tutorial system, tours, students-teacher interaction etc. Some improvements have been suggested. As regards the process control covering admission, registration, recruiting policy, courses and delivery of material, academic requirements, performance and grading, university, as well as Higher Education Commission have set forth proper rules, which are properly followed. At present there are eleven faculty members who are highly qualified in their fields. However, faculty members need motivation for advanced knowledge, research and external training.

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

In conclusion, the strong and weak areas of the program are as under:-

### **11.1 Strong Areas**

- Curriculum Design, development and organization are based upon set, well defined and approved criteria
- Pre-requisites fully observed
- Examinations on schedule.
- Academic Schemes fully prepared in advance
- The number of courses along with their titles and credit hours for each semester, course contents for degree program are fully planned
- Transparent admission, registration and recruiting policy



- A very powerful and expanded international library
- HEC rules fully followed
- Excellent Students-Teacher Ratio

### **11.2 Weaknesses**

- Class rooms improvements
- Refreshal Courses for Teachers.

Salient recommendations of Chairman AT's presentations are:-

### **11.3 Class Room Improvements**

- a. Some class rooms have inadequate seating capacities
- b. Shape of class rooms-(Problem of light and echo)
- c. Multimedia projector and overhead projector requirement in a few classes
- d. Lights and Fans and ACs especially in summer
- e. Whiteboard should be dispersive
- f. Sound system for bigger class rooms
- g. All big rooms should be reserved for classes only.

### **11.4 Laboratory Equipment**

- h. Not Applicable

### **11.5 Regular Teacher Training**

- i. Training of Young Faculty
- j. Improve the Teaching Methodology
- k. Preparation and delivery of lectures
- l. Evaluation of students

### **11.6 Facilities for Students**

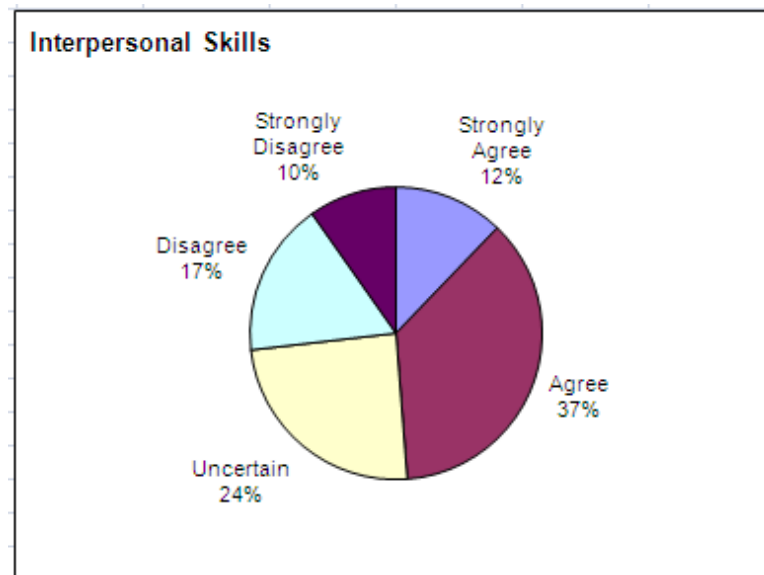
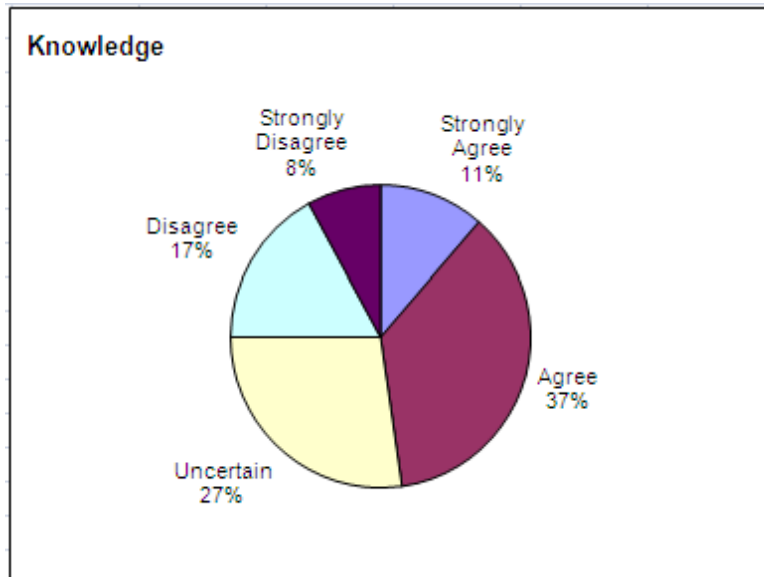
- m. Common Room for Male students

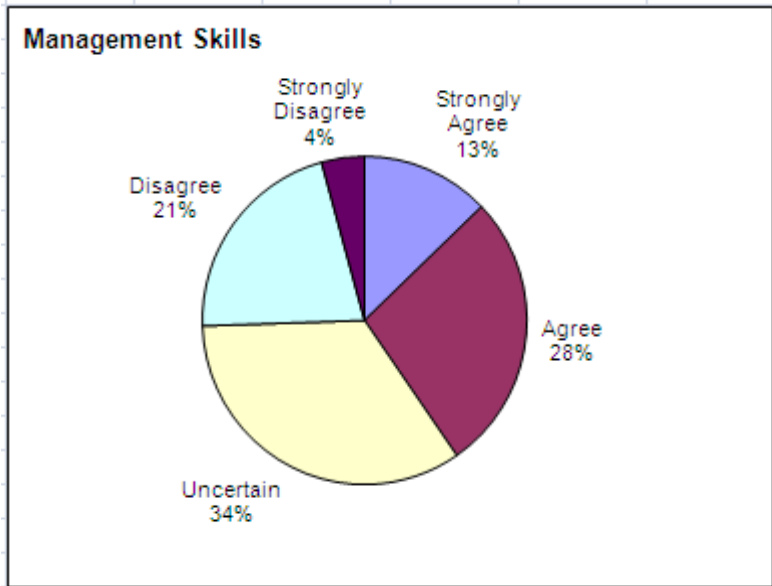
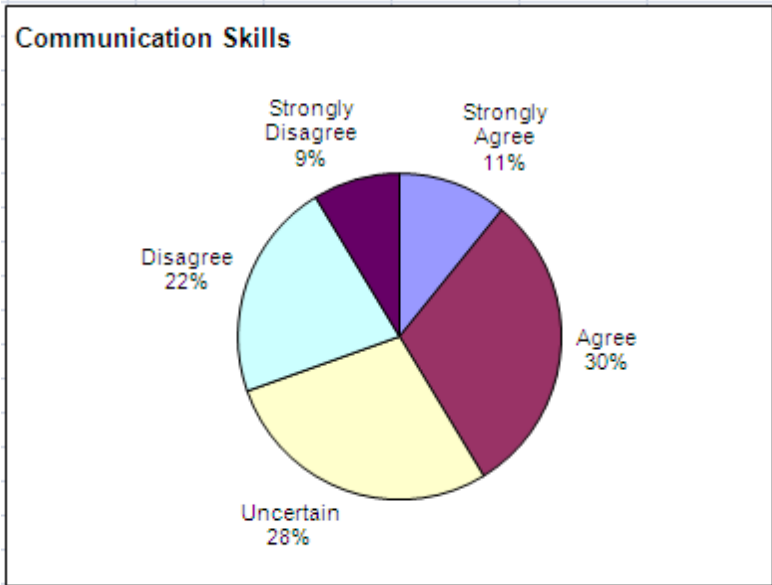
- n. Ample sitting facilities in lawns and under shade
- o. Sport facilities –(Basket ball, Badminton, Table tennis, Cricket ground)
- p. Educational tours

### **11.7 Faculty Development**

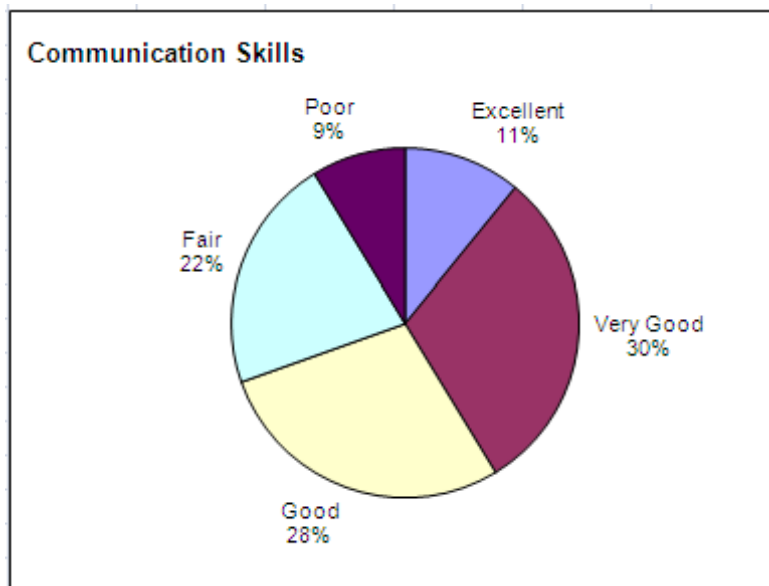
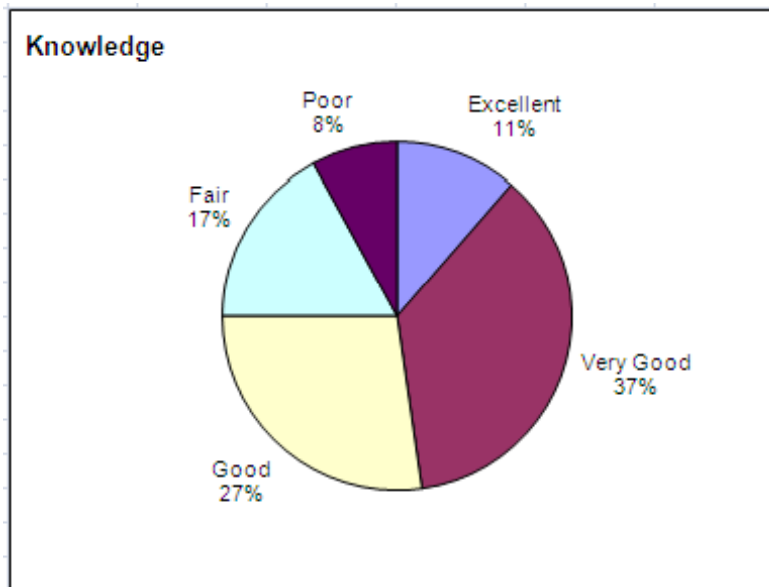
- q. Indigenous Plans for faculty development
- r. Practical skills should be enhanced
- s. Research facilities and funds
- t. Balance of teaching workload and research activities
- u. Technical training regarding handling of Laboratory and Class room equipment (Handling of ACs, Handling of Multimedia Projectors, Handling of PCs, Handling of laboratory equipments)

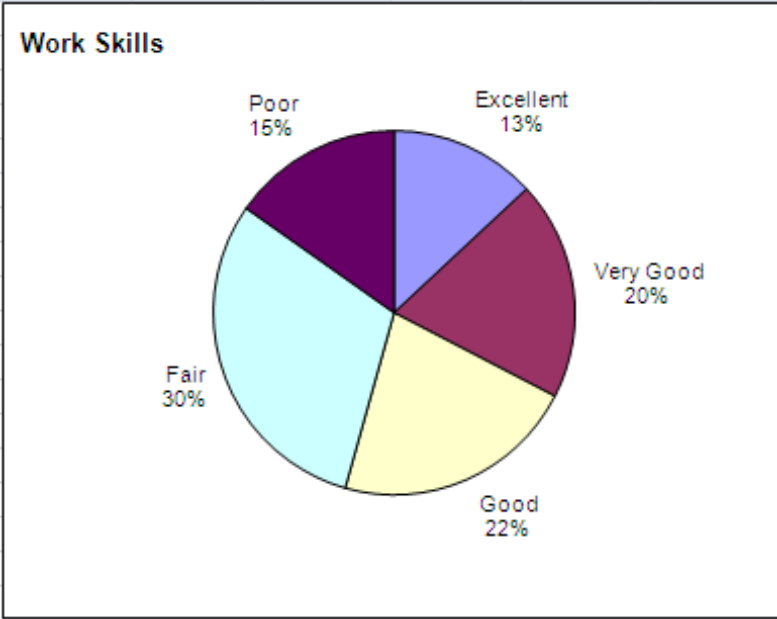
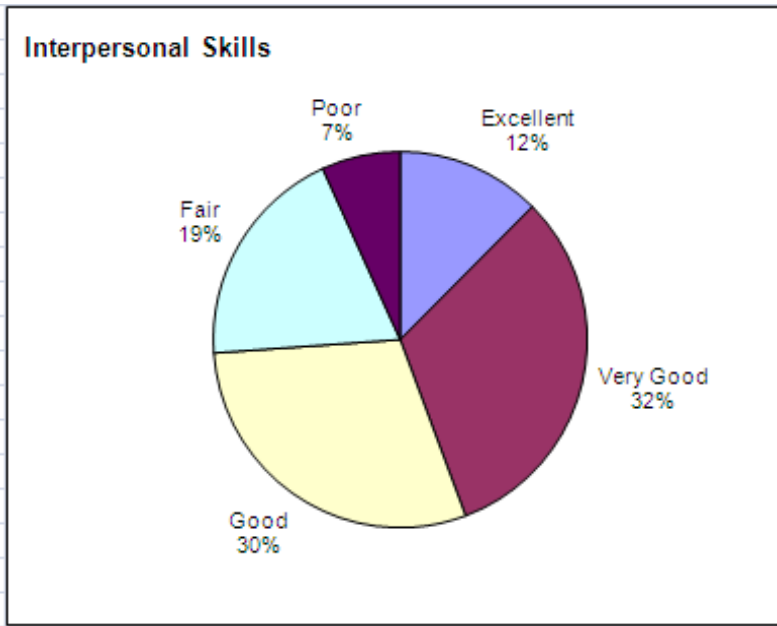
## Annexure – A: Alumni Survey Results





## Annexure – B: Employer Survey Results

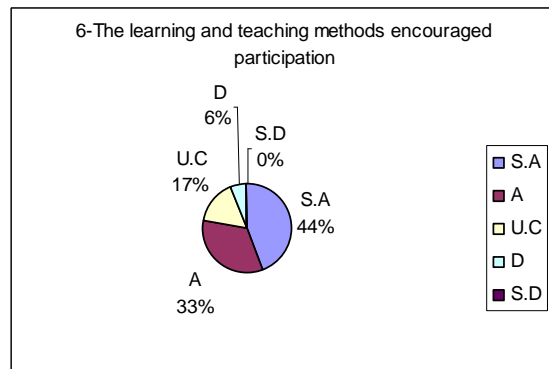
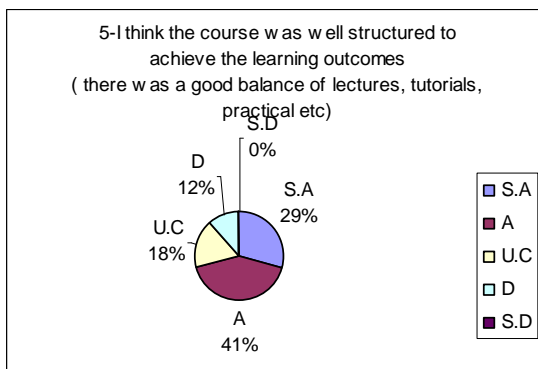
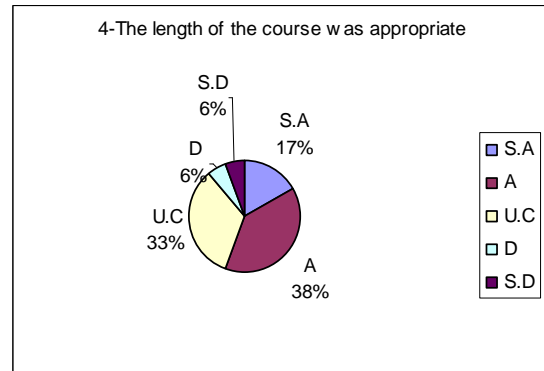
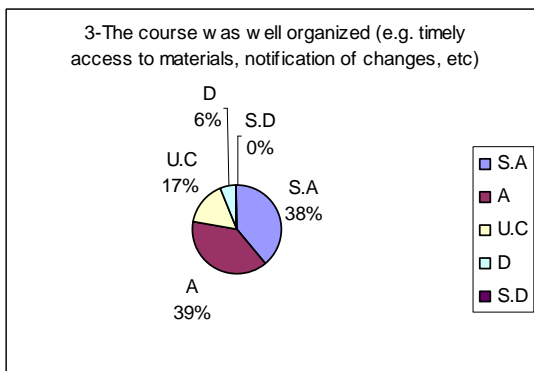
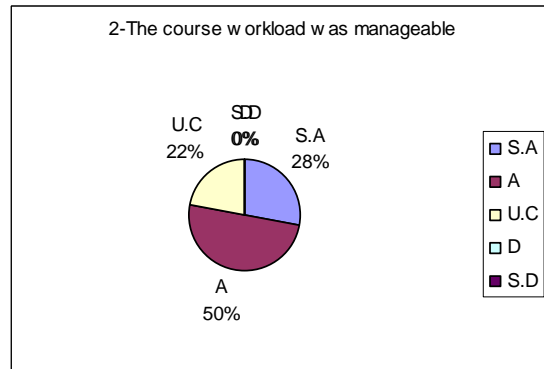
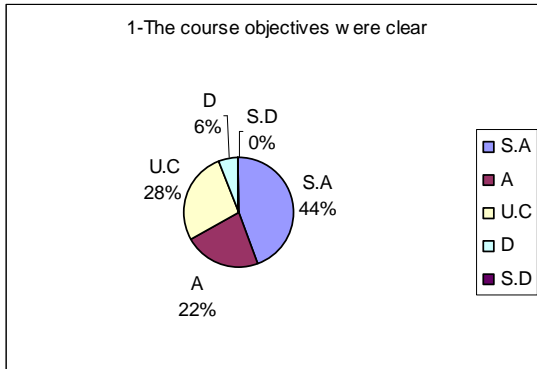


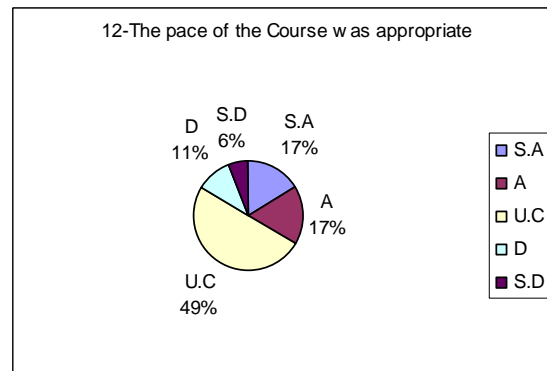
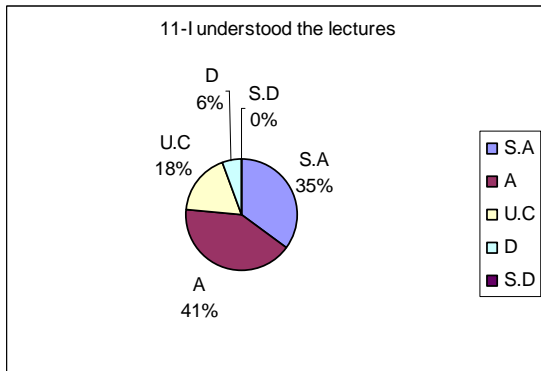
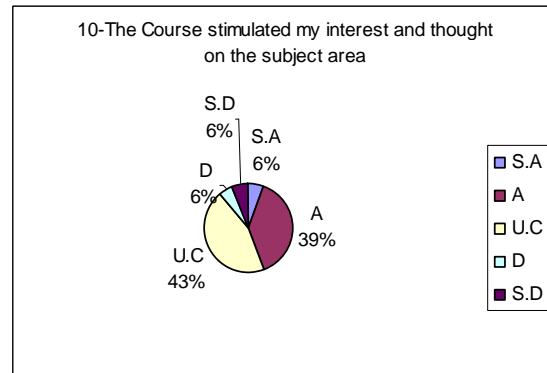
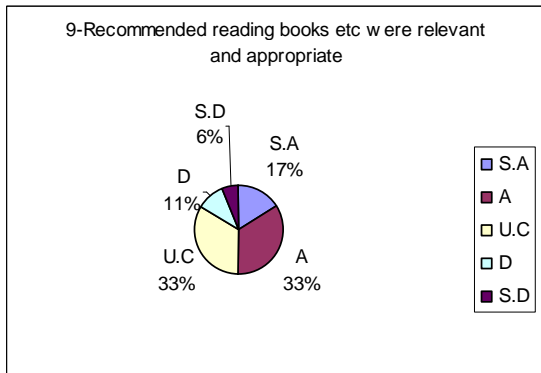
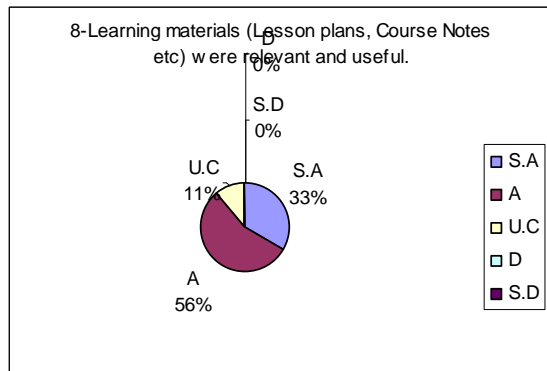
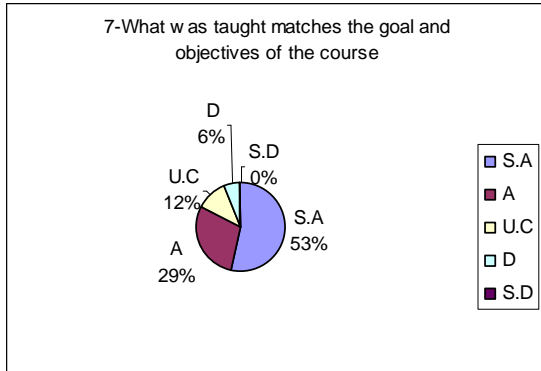


## Annexure – C Students Course Evaluation Sample

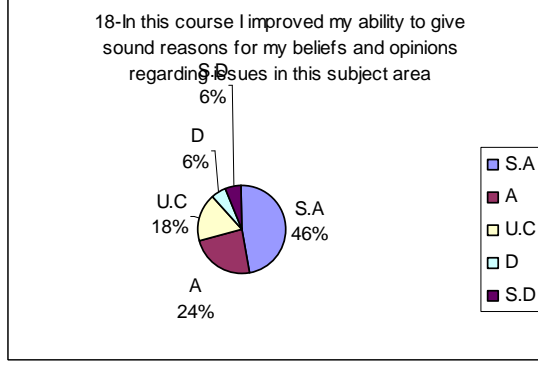
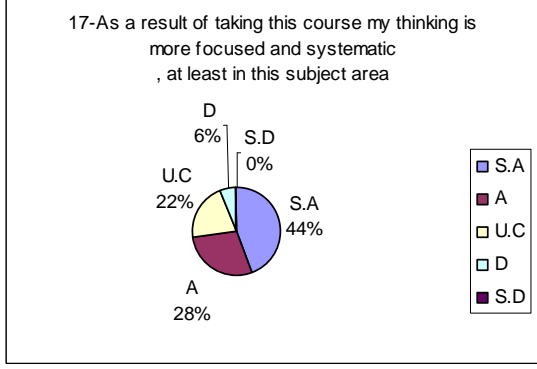
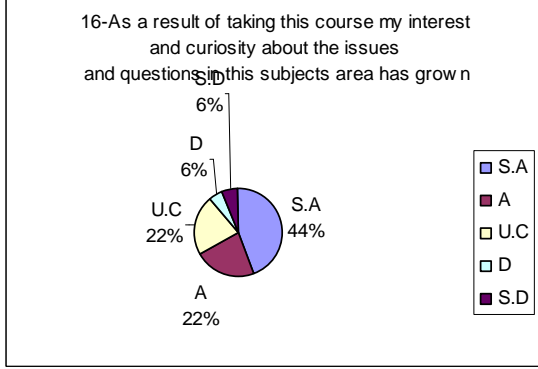
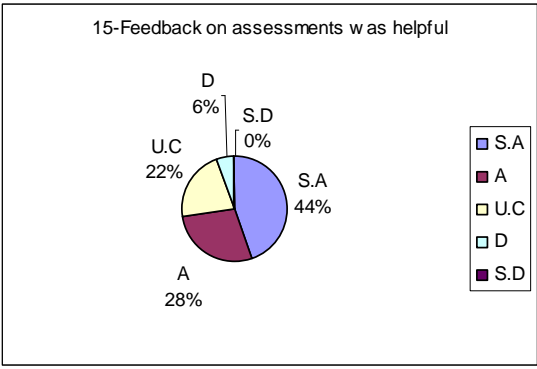
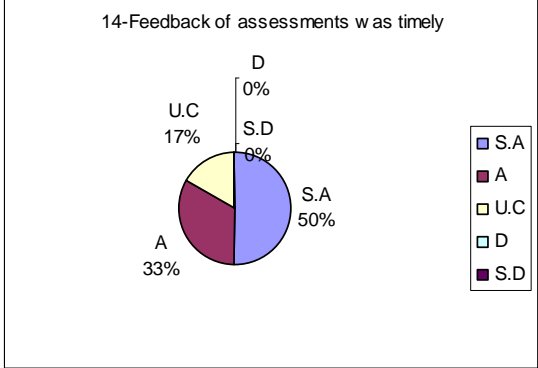
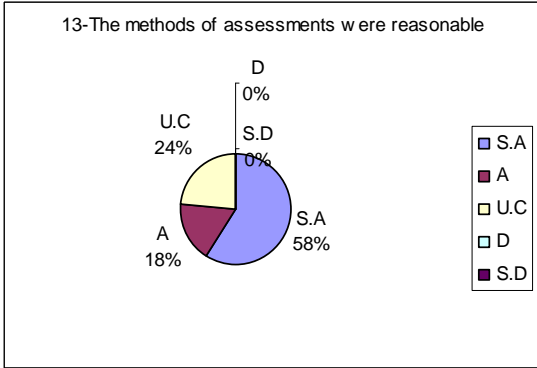
### Course: Differential Geometry

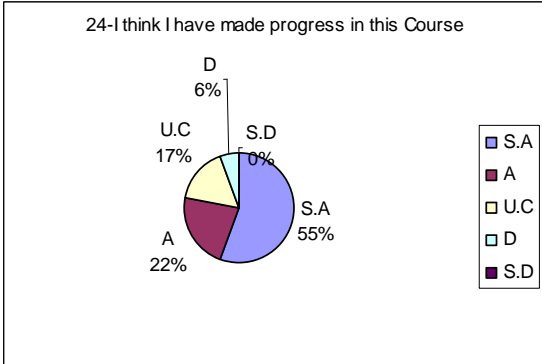
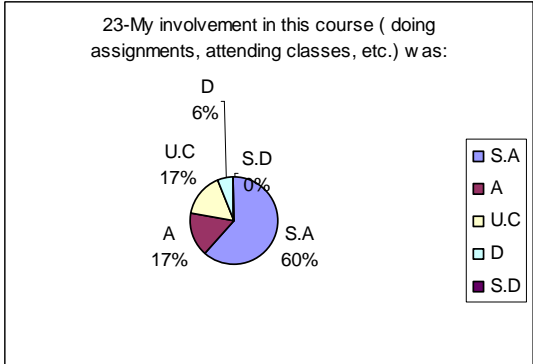
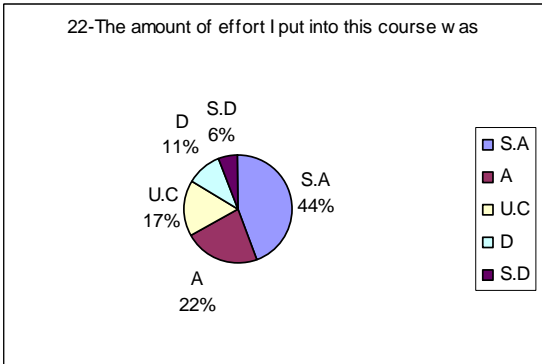
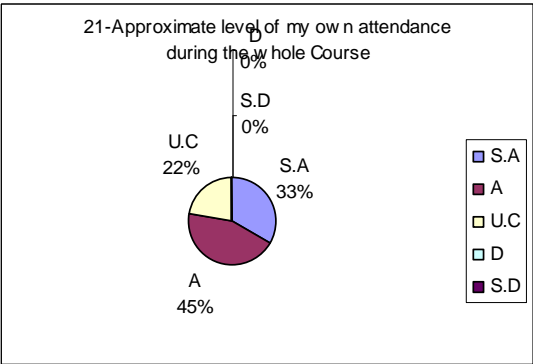
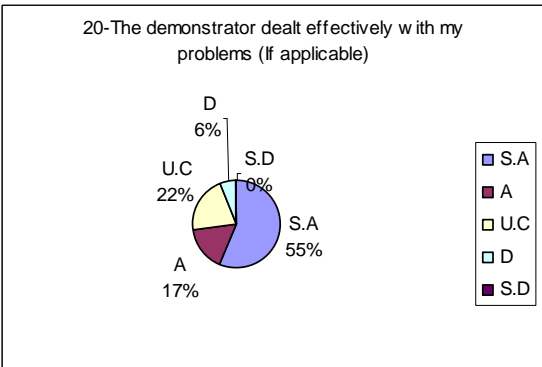
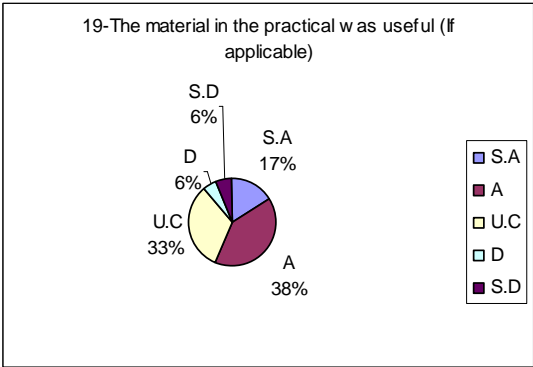
Following is the graphical representation of course evaluation for Differential Geometry course which is attached herewith as sample to show the actual results. Same has been done for all courses listed in section 3.3.1. These charts show students response for all questions against the listed course.







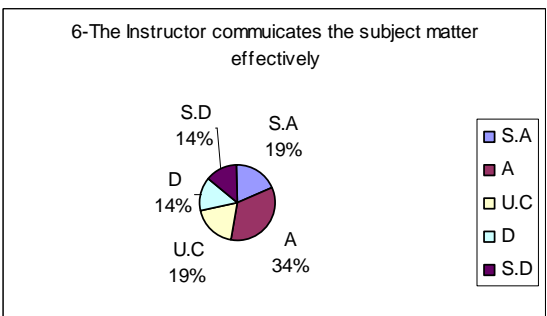
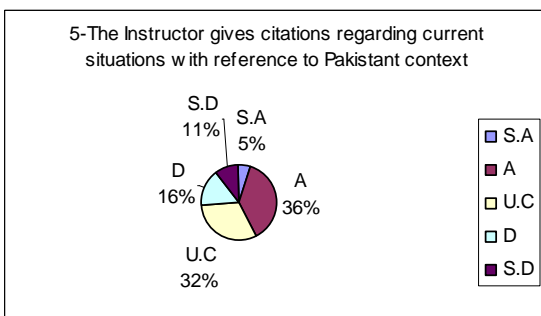
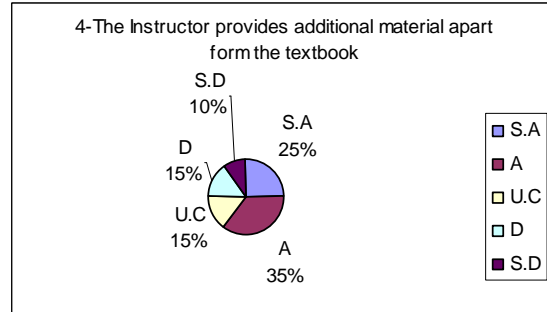
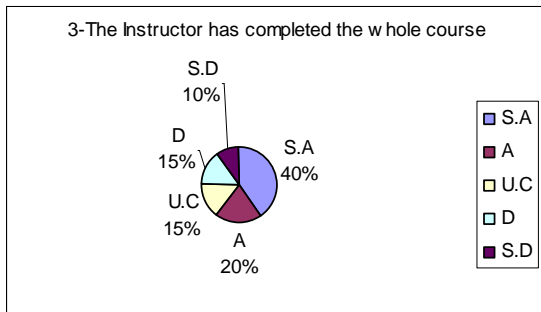
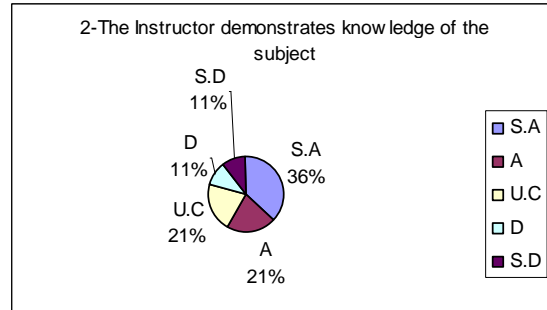
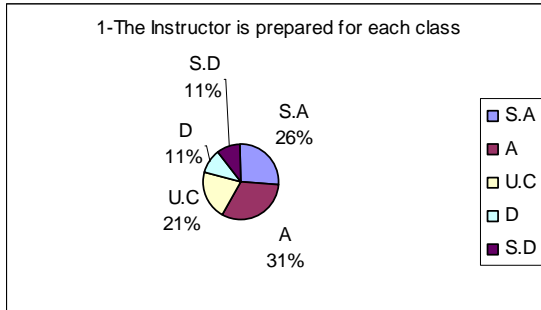


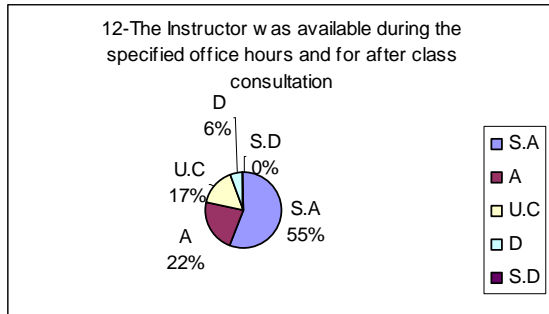
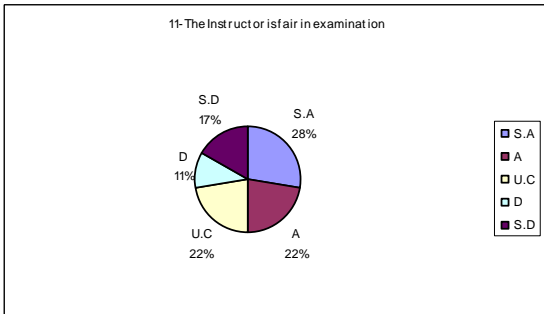
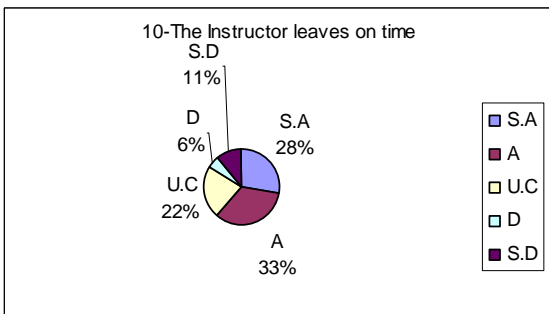
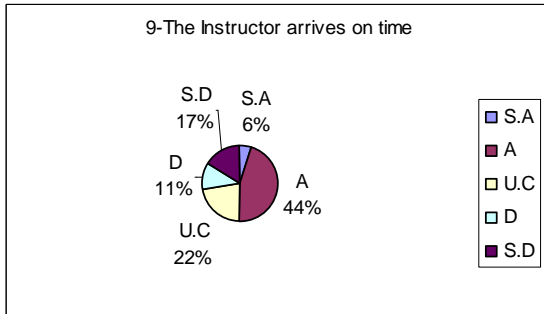
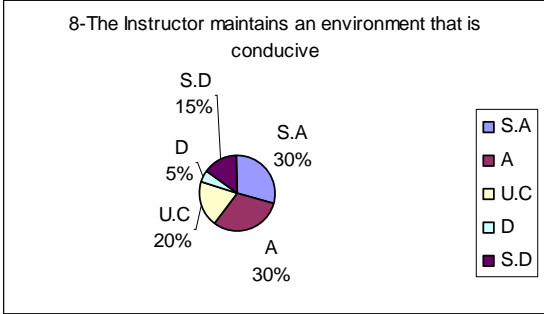
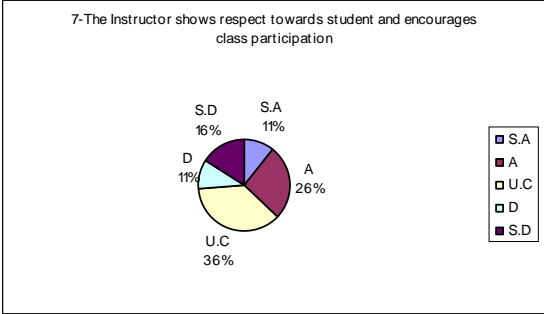


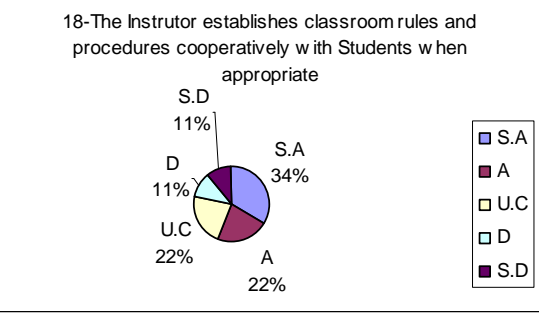
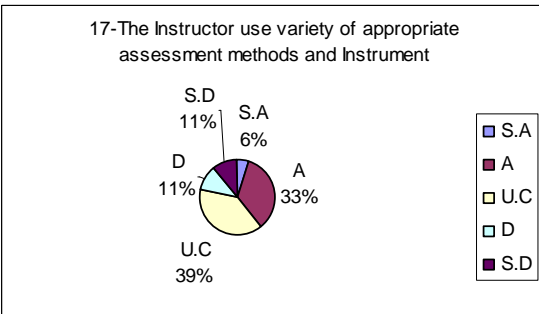
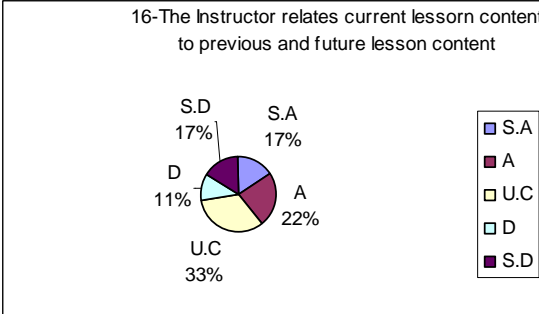
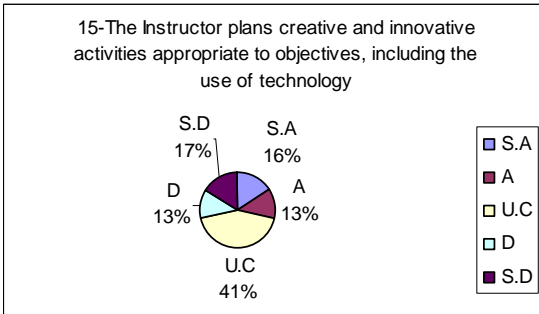
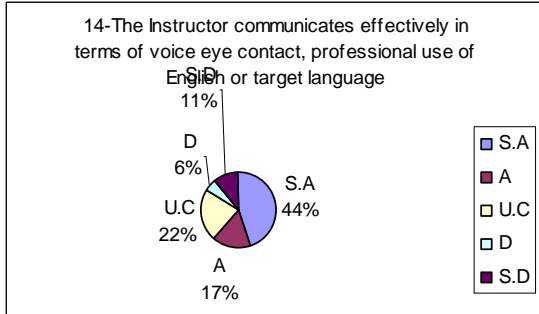
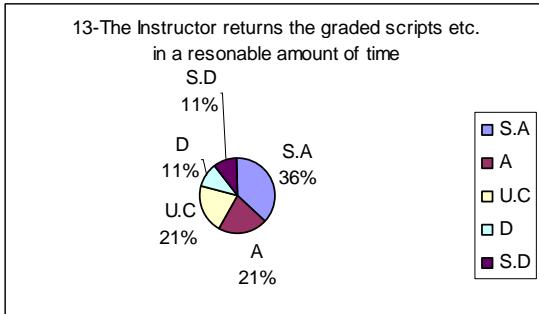
## Annexure – D: Teacher Evaluation Feedback Sample

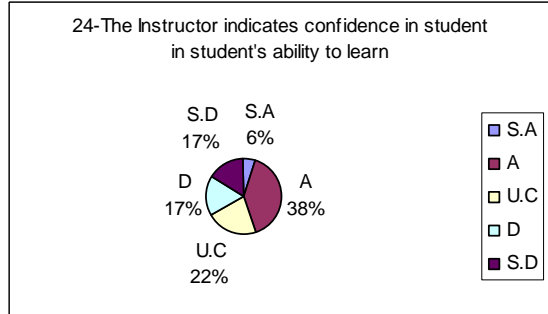
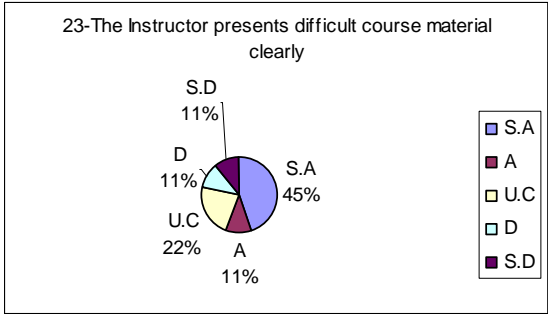
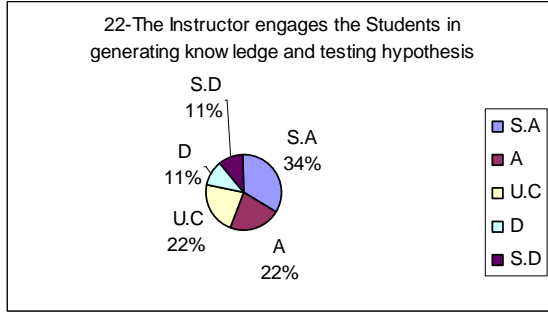
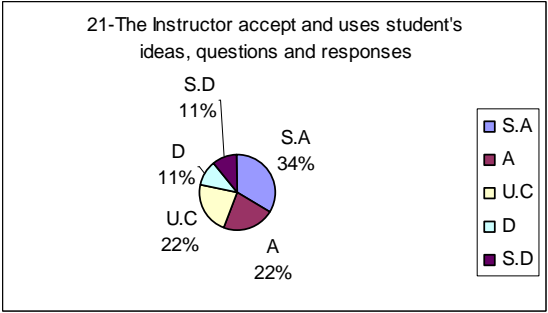
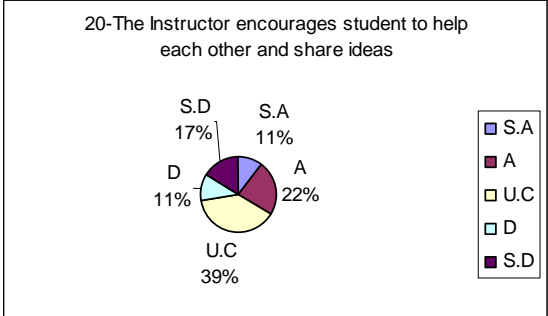
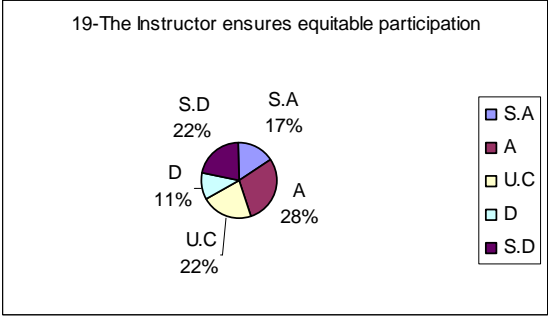
**Teacher:** Dr. Afzal Rana

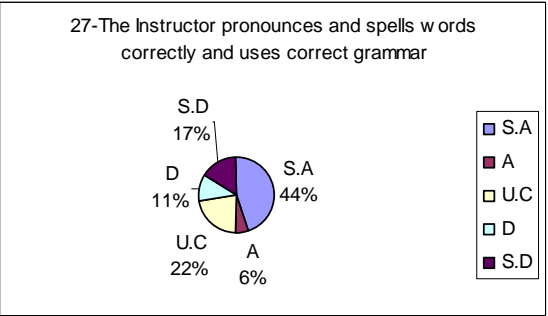
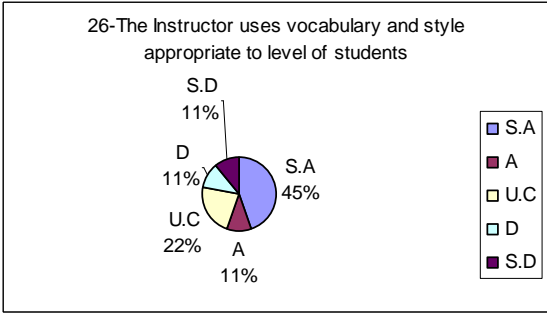
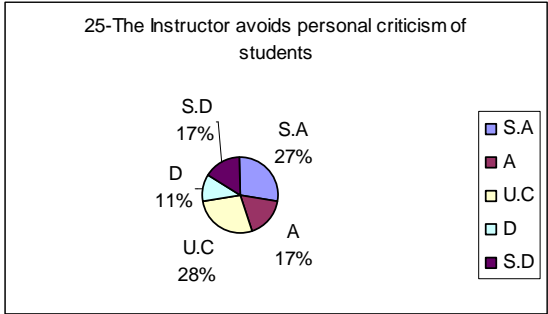
The graphical representation of teacher evaluation is shown below as sample for one teacher only. Same has been done for all the teachers listed in section 3.3.2.











## **Annexure-E: Research Paper List**

**By Dr. Muhammad Afzal Rana**

### **Papers**

1. M.A. Rana, Rashid Qamar, A.A. Farooq, A. M. Siddiqui, Finite-difference analysis of natural convection flow of a viscous fluid in a porous channel with constant heat sources, AML 24 (2011) 2087–2092.
2. A. M. Siddiqui, M. A. Rana, Rashid Qamar, S. Irum, A.R. Ansari, On the numerical solution of unsteady squeezing MHD flow of a second grade fluid between parallel plates, Adv. Studies Theor. Phys., Vol. 6, 2012, no. 1, 27 – 36. A. M. Siddiqui, T. Haroon, M. Zahid and M. A. Rana, Effect of slip condition on
3. Unsteady flows of an Oldroyd-B fluid between parallel plates, World Applied Sciences Journal (In Press)
4. A. A. farooq, A. M. Siddiqui, M.A. Rana, A variant of the classical von karman flow for a micropolar fluid, International Journal of Applied Mathematics and Mechanics (In Press)
5. A. M. Siddiqui, M. A. Rana, Naseer Ahmed, Magnetohydrodynamics flow of a Burgers' fluid in an orthogonal rheometer, Applied Mathematical Modelling 34 (2010) 2881–2892
6. A.M. Siddiqui, M.A.Rana, Q.K. Ghori, Application of Sumudu transform to Newtonian fluid problems, Adv. Studies Theor. Phys., Vol. 4, 2010, no. 1, 21–29.
7. A.M. Siddiqui, Q. A. Azim, M. A. Rana, On exact solutions of concentric n-layer flows of viscous fluids in a pipe, Nonl. Sci. Lett A Vol. 1, No. 1, 93-102, 2010.
8. A.M.Siddiqui, M.A. Rana, Rashid Qamar, S. Irum, Finite-difference analysis for unsteady squeezing flow of a second grade fluid between circular plates, Applied Mathematical Sciences, Vol. 4, 2010, no. 51, 2497-2507.
9. M. A. Rana, Rashid Qamar, A. M. Siddiqui, and M. Zahid, Finite-Difference Analysis of Fully Developed free Convection Heat and Mass Transfer of a



- Micropolar Fluid, Proceedings of 7<sup>th</sup> International Bhurban Conference on Applied Sciences & Technology (IBCAST), Jan 11-14, 2010, National Centres for Physics, QAU, Islamabad, Pakistan, Organized by Centres of Excellence in Science & Applied Technologies (CESAT); ISBN no. 978-969-874-08-02, 42-45.
10. M. A. Rana, A. M. Siddiqui, and M. Zahid, Unsteady Magnetohydrodynamics Flow of a Viscous Fluid Between Porous Plates, Proceedings of 7<sup>th</sup> International Bhurban Conference on Applied Sciences & Technology (IBCAST), Jan 11-14, 2010, National Centres for Physics, QAU, Islamabad, Pakistan, Organized by Centres of Excellence in Science & Applied Technologies (CESAT).; ISBN no. 978-969-874-08-02, 46-52.
  11. M. A. Rana, Sadia Siddiqa, A. M. Siddiqui, Rakhshanda Ikhlaque, and M. Zahid, Solution of Fully Developed Natural Convection Heat and Mass Transfer of a Micropolar Fluid in a Vertical Channel with Asymmetric Wall Temperatures Concentration via Homotopy Perturbation Method, Proceedings of 7<sup>th</sup> International Bhurban Conference on Applied Sciences & Technology (IBCAST), Jan 11-14, 2010, National Centres for Physics, QAU, Islamabad, Pakistan, Organized by Centres of Excellence in Science & Applied Technologies (CESAT); ISBN no. 978-969-874-08-02, 53-55.
  12. A.M. Siddiqui, M.A. Rana, S. Irum, Rashid Qamar, T. Haroon, Application of homotopy perturbation and numerical methods to the unsteady squeezing MHD flow of a second grade fluid between circular plates, Int. J. Nonlinear Sci Numer. Simul. 10(6), 699-709, 2009.
  13. M. A. Rana, A. M. Siddiqui, Rashid Qamar, Hall effect on hydromagnetic flow of an Oldroyd 6-constant fluid between concentric cylinders, Chaos Solitons & Fractals 39(1) (2009) 204-213.
  14. M.A.Rana, A. M. Siddiqui, Naseer Ahmed, Hall effect on Hartmann flow and heat transfer of a Burgers' fluid, Phy. Lett. A. 372 (2008) 562-568.
  15. A.M. Siddiqui, M.A. Rana, Naseer Ahmed, Effects of Hall current and heat transfer on MHD flow of a Burgers' fluid due to a pull of eccentric rotating disks, Cummun Nonlinear Sci. Numer. Simul. 13 (2008) 1554-1570.

16. M. A. Rana, A. M. Siddiqui, Q.K. Ghori, Rashid Qamar, Application of He's homotopy perturbation method to Sumudu transform, *Int. J. Nonlinear Sci Numer. Simul.* 8(2), 185-190, 2007.
17. M. A. Rana, A. M. Siddiqui, Naseer Ahmed, Hydromagnetic flow of a Burgers' fluid and heat transfer due to eccentric rotations of a disk and a fluid at infinity, *Int. J. Modern Math.* 2(1) (2007) 63-80.
18. A. M. Siddiqui, M. A. Rana, Naseer Ahmed, Hall Effects on Flow and Heat Transfer in the Hydromagnetic Burgers Ekman Layer, *Int. J. Modern Math.* 2(2) (2007) 255-268.
19. M. A. Rana, A. M. Siddiqui, Rashid Qamar, Effects of Hall current on flow of an Oldroyd 6-constant fluid between concentric cylinders, in: *Proceedings of The 2007 International Conference on Frontiers in Education: Computer Science & Computer Engineering (FECS 2007)*, June 25-28, 2007 Las Vega Nevada, USA.
20. M Afzal Rana, M. Athar Farooq, Kanwar Liaqat Ali, Timer-Based Data Acquisition of Creep Testing Machines, *Sci.Int(Lahore)*,10(1) (1998) 23-25.
21. M Afzal Rana, Z. Ahmad, M. Athar Farooq, Kanwar Liaqat Ali, Interfacing of Creep Testing Machines, *Data Acquisition & Analysis, Sci. Int.(Lahore)*, 9(3) (1997) 279-283.
22. Q.K. Ghori, M. Afzal Rana, Particular Solutions of Dynamical Equations in Poincare-Cetaeu variables, *J. Natural Sci. Math.* 21(2) (1981) 139-146.

## BOOKS

1. Muhammad Afzal Rana (2011). *Finite-Difference Methods for Partial Differential Equations*, Higher Education Commission, Islamabad, Pakistan.
2. Muhammad Afzal Rana (2010). *Steady MHD flow and heat transfer of Burger's fluid*, VDM Verlag, Germany.
3. Faiz Ahmed, Muhammad Afzal Rana (1995). *Elements of Numerical Analysis*, National Book Foundation, Islamabad, Pakistan.
4. Muhammad Afzal Rana (1991). *Introduction to Numerical Analysis*, Rana Publishers Shaheen Markeet, Islamabad, Pakistan.

## Technical Reports

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2.	1968	The Nuclear magnetic Moment of In 117m	Canadian Journal of Physics Vo 46, 117 (1968)	A.R. Mufti R.G.SummersGill
3.	1972	Epitaxial Growth & Structure of ZnTe evaporated on Ge in Vacuum	Journal of Material Science ( UK)Vol 694 (1972)	A.R. Mufti D.B. Holt
4.	1973	Switching Behavior of Zn Te / Ge	Solid State	A.R.Mufti

		Heterojunctions	Electronics USA Vol 16(1973) 1213	D.B.Holt
5.	1974	Physics Teaching in Developing Countries	Journal of International Theoretical Physics Italy 1974	A.R.Mufti
6.	1974	Physics in developing countries	Unseco Magazine 1974	A.R.Mufti
7.	1976	Phase Transformation of ZrO <sub>2</sub>	Physics Status Solidus Germany 35( 1976)	M.Ali J.Bokhari A.R.Mufti
8.	1981	Remarks on Self Focusing In Cavitations	Acustics, International Germany 1981	G.lernetti A.R.Mufti
9.	1985	Silicon Technology in Pakistan	Echo International , Germany 1985	A.R. Mufti
10.	1988	Dissolution of B- Doped Si ( 100) layer in Na OH Aqueous solutions	ICTP , Italy	P. Akhtar A.Beg A.R.Mufti
11	1989	Effects of temperature on the performance Parameters of BSF Silicon Solar cells	Solar Energy journal. USA	P.Akhtar A.Beg A.R.Mufti
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16.	1991	Determiration of Keff for Boron in Czochraski Grown Single Crystal Silicon	Journal of crystal growth USA 1991	I.A.Qazi M.N.Zakir A.Q.Malik P.Akhtar A.R.Mufti
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2.	1974	Structural & Electrical Properties of Zn/Te Heterojunctions	Proceedings of International College on Thin Films Capri, Italy 1974	A.R.Mufti
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4.	1984	Silicon Technology Revolution-A Challenge for the Developing Countries to Accept or Reject ?	Proceedings of International Conference on Solar Energy. Istanbul, Turkey 1984	A.R.Mufti
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8.	1991	Analysis of Impurities in Silica sand an Quartz critical from Solar Industry Point of view	Proceedings of Workshop on Photovoltaics, Physics Technology and applications Technology,. Libya 1991	Z.I.Zaidi P.Akhtar S.Hussain I.A.Qazi A.R.Mufti
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34.	1990	Analysis of Pakistani Silica Sand and quartz for solar cell Industry using ICP technique	Proceedings of Second National Chemistry Conference	Z.I.Zaidi A.R.Mufti P.Akhtar S.Hussain
35.	1990	Measurement of axial	Proceedings of Second	I.A.Qazi

		and radial distribution of oxygen concentration of cz grown silicon crystals using FTIR technique	national Chemistry Conference	P.Akhtar A.R.mufti3
36.	1993	Sum Up, Conclusion & Recommendations	Proceedings of International seminar on the Commercialization of Solar and wind Energy Technologies	Atique Mufti
37	1999	Renewable & Alternative Technologies and Success Stories	5 <sup>th</sup> International Symposium on Renewable and Alternative Technologies, Pakistan	Atique Mufti
38.	2001	Stalemate in Photovoltaic Development Progress and How to Overcome it-I	World Conference on Technology Advances For Sustainable development (Energy, Water and Environment)Cairo, Egypt	Atique Mufti
39.	2002	Stalemate in Photovoltaic Development Progress and How to Overcome it-II	International Conference on Alternative Energy Systems and applications, Sharjah UAE	Atique Mufti

### **Papers Published in National Journals**

<u>S.No</u>	<u>Year</u>	<u>Publication Title</u>	<u>Name of Journal</u>	<u>Author</u>
1.	1969	Rural Electrification by Solar Energy	Scientific Ravians(Pakistan) Oct, 1969	Atique Mufti
2.	1975	In Situ Measurement of Resistivity of Al	Nucleus (Pakistan ) 1977	A.R.Mufti M.S.Iqbal. M.N.Khan .I.Rehman
3.	1985	Silicon Technology Revolution	Islamic Times International 1984	A.R.Mufti

	1989	Silicon technology in Pakistan	Media International	A.R.Mufti
	1987	Renewable Energy Resources and Developing countries	Science & Technology Vol 6 # 5 1987	A.R.Mufti
	1989	Silicon technology in Pakistan	Pakistan Pictorial, Pakistan	A.R.Mufti

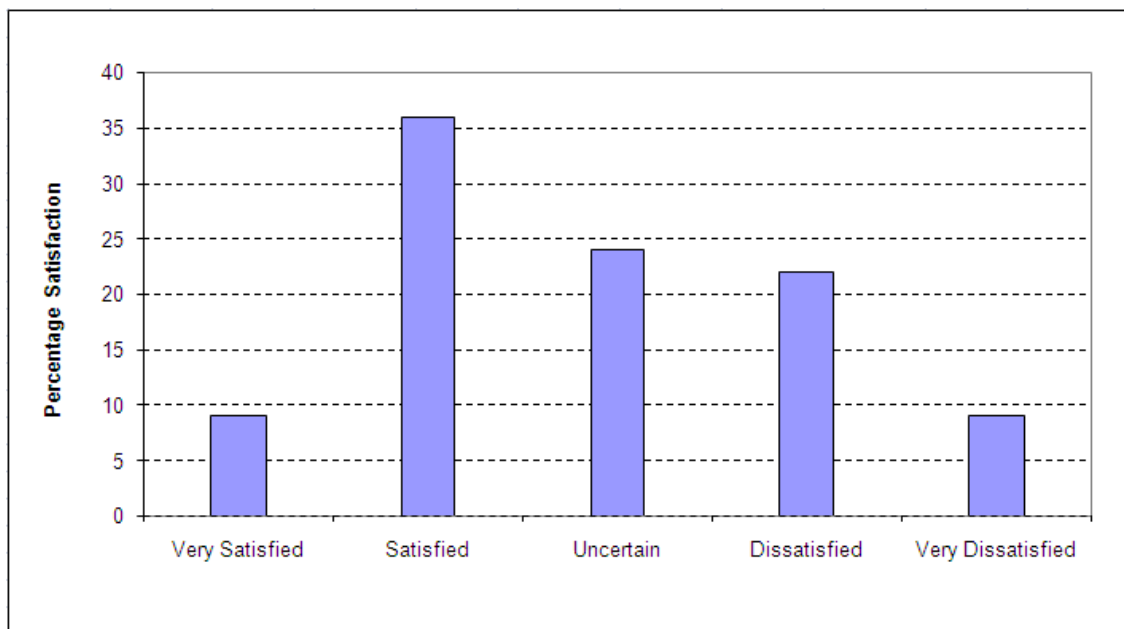
### **Articles Published in National Newspapers and Journals**

<b><u>S.No</u></b>	<b><u>Year</u></b>	<b><u>Publication Title</u></b>	<b><u>Where Published</u></b>	<b><u>Author</u></b>
1.	1985	Silicon technology In Pakistan	Muslim June 28.1985	Atique Mufti
2.	1986	Tawanai Kay Wasail aur Alim E Islam	Jang Nov 19, 1986	Atique Mufti
3.	1986	Silicon Technology Ki Kirshma Sazian	Nawa-e-Waqt 1986	Atique Mufti
4.	1986	Renewable Energy Resources	Dawn Nov 19, 1986	Atique Mufti
5.	1987	Ginti AUR Hindson Ka Irtiqa I	Imroze March 4, 1987	Atique Mufti
6.	1987	Ginti AUR Hindson Ka Irtiqa II	Imroze March 5, 1987	Atique Mufti
7.	1987	Renewable Energy Resources and The Islamic World	Pakistan Times September 27, 1987	Atique Mufti
8.	1988	Science Aur Technology kay teen sal	Imroze. April 8, 1988	Atique Mufti
9.	1988	Renewable Energy Resources	Media International, Pakistan	Atique Mufti

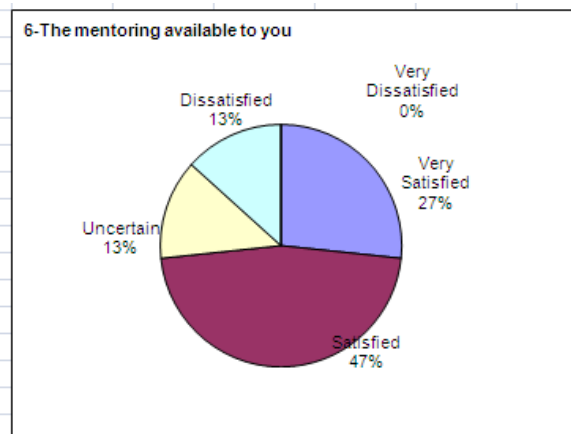
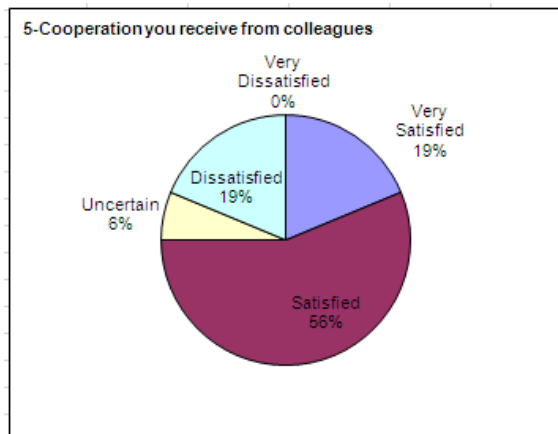
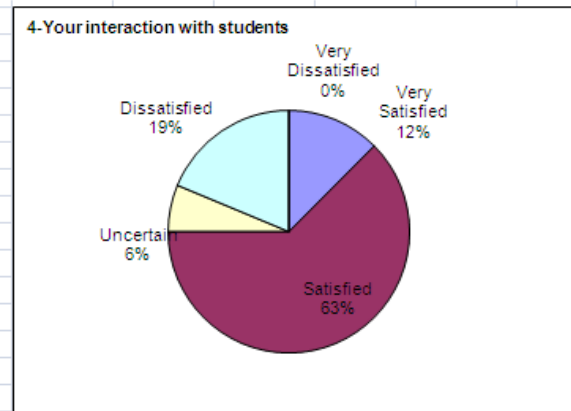
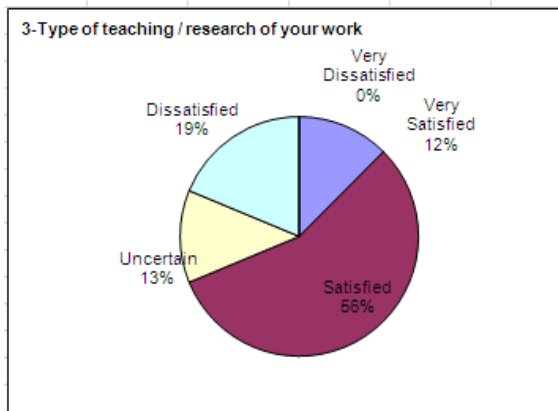
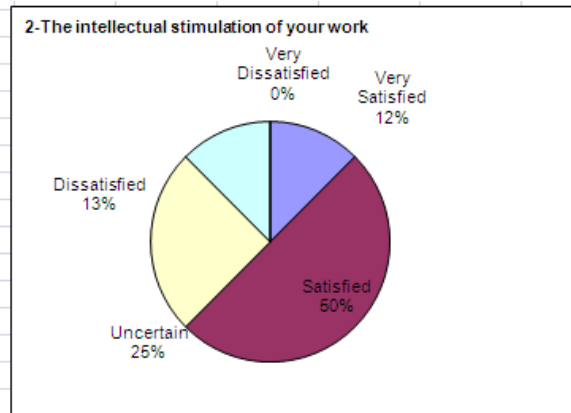
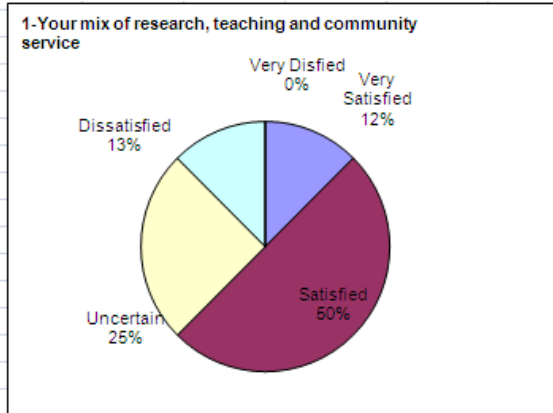
10.	1988	Renewable Energy Resources & Quran	Chemical Horizons. Pakistan	Atique Mufti  Atique Mufti
11.	1988	Energy Dilemma- A Practical Proposal	Economic Review, Pakistan	
12.	1989	Quran-Source of Scientific Inspiratios	Chemical Horizons	Atique Mufti
13.	1989	A Diagnostic Analysis of Failure of Science & technology in he Developing Countries	Media International, Pakistan	Atique Mufti  Atique mufti  Atique mufti
14.	1990	Failure In science & Technology- the root cause	Pakistan Times June 9, 1990	
15.	1991	Autonomous Organizations-Their Rise & Fall Part I	Pakistan Times Sept 3, 1991	
16.	1991	Autonomous Organizations-Their Rise & Fall Part II	Pakistan Times Sept 4, 1991	
17.	1997	Sorry State of S & T Affairs	Dawn , Nov 5, 1997	

## Annexure – F: Graduating Students Feedback Sample

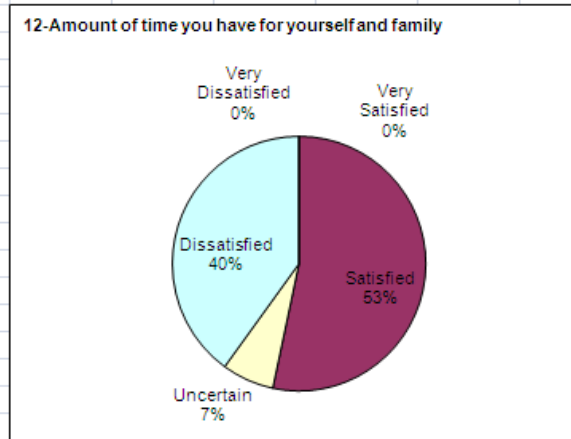
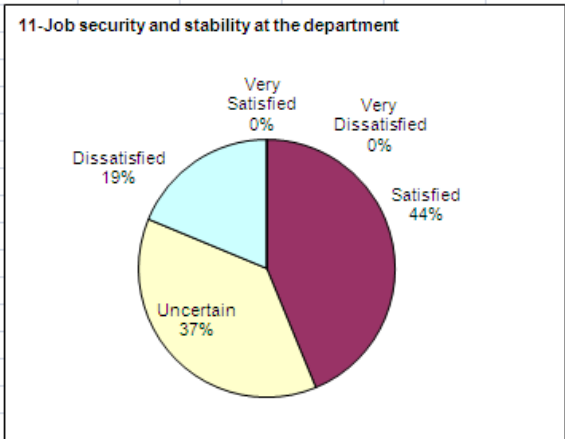
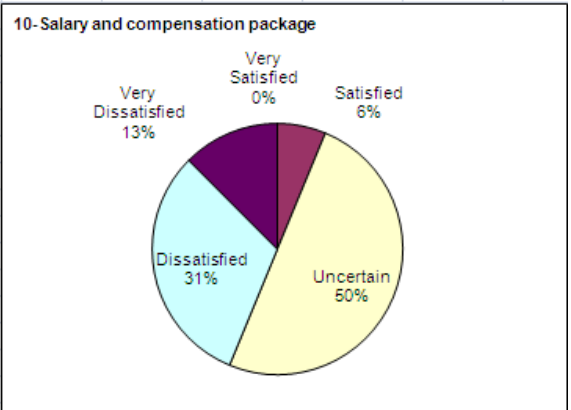
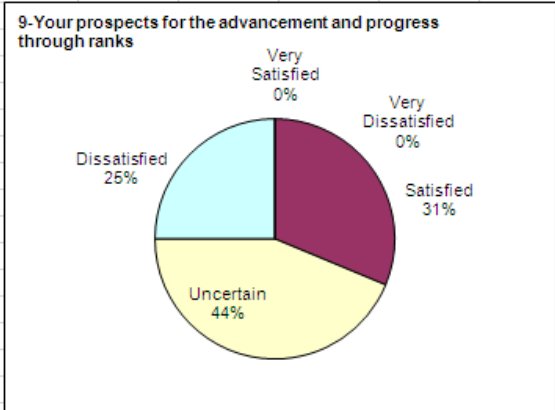
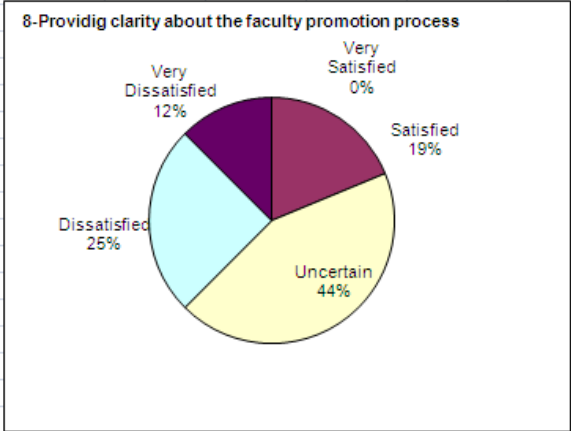
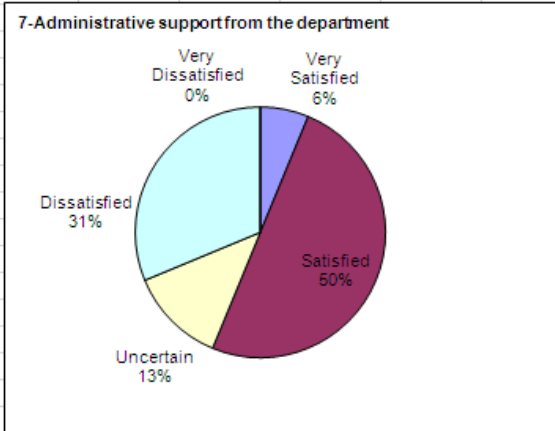
Department of Basic Sciences conducted the survey of graduating students to get feedback about the program, its effectiveness and students satisfaction. Overall, more than 44% were satisfied with the program, while less than 30% were dissatisfied in general. The graph below shows the percentage of student's responses. Faculty is planning to make improvements on education and administrative sides, in the light of this feedback.

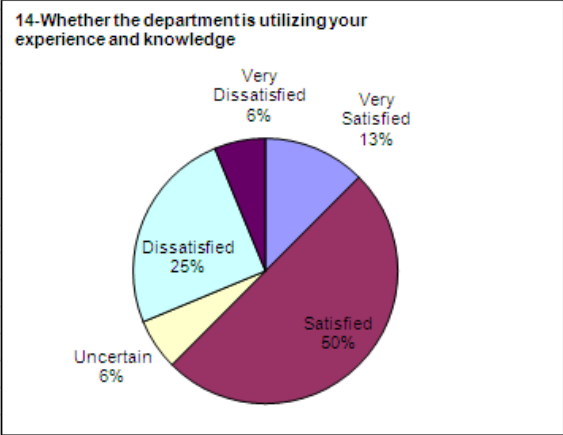
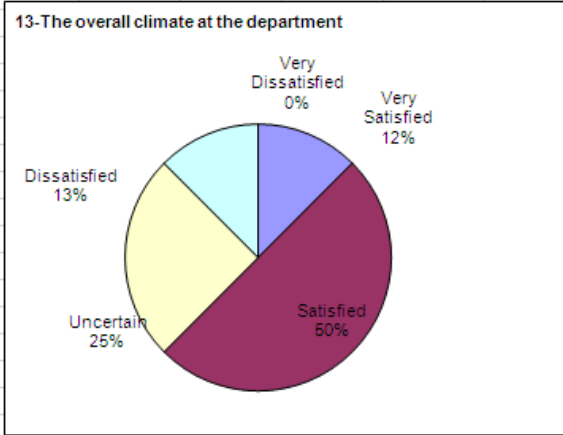


## Annexure – G: Faculty Survey









## Annexure – H: Faculty Resume

Sr. #	Name	Designation	Qualifications	Institituton	Specialization	Experience (years)		Utilization
						Teaching	Total	Dedicated / Shared
1	Prof Dr. M Sarwar Kamran	Professor	PhD Mathematics	QAU Islamabad	Algebra	40	40	D
2	Dr. M Afzal Rana	Associate Professor	PhD Mathematics	QAU Islamabad	Fluid Mechanics	10	38	D
3	Ms. Ambreen Arshad	Assistant Professor	M.Phil Maths	QAU Islamabad		11	11	D
4	Dr. Babar Ahmad	Assistant Professor	PhD Mathematics	GCU Lahore	Control Theory	1.5	1.5	D
5	Mr. Hammad Nafis	Assistant Professor	M.Phil Maths	QAU Islamabad	Fuzzy	5.5	5.5	D
6	Mr. Nasir Shah	Lecturer	M.Phil Maths	International Islamic University		10	10	D
7	Mr. Rehman Jahangir	Lecturer	M.Phil Maths	International Islamic University	Generalized Topological Spaces	4	13	D
8	Mr. Abdul Raheem	Lecturer	M.Phil Maths	QAU Islamabad	Graph	2	2	D
9	Ms. Sadia Nadir	Lecturer	M.Phil Stats	QAU Islamabad		4	4	D
10	Mr. Waqas Shabbir	Lecturer	M.Phil Physics	QAU Islamabad		3	3	D
11	Ms. Salma Kanwal	Lecturer	M.Phil Maths	QAU Islamabad	Group Graphs	1	1	D
12	Dr. Atique Mufti	Professor	PhD Physics					S
13	Dr. Akbar Ali	Professor	PhD Physics	QAU Islamabad	Semi Conductor Physics	36	36	S
14	Dr. Zafar Wazir	Assistant Professor	PhD Physics	Comsats IIT, Islamabad		7	7	S
15	Dr. M Aslam	Assistant Professor	PhD Mathematics	QAU Islamabad	Linear groups and their actions on certain fields.	25	25	S
16	Dr. Zaheer Abbas	Assistant Professor	PhD Mathematics	QAU Islamabad	Fluid Mechanics	4	4	S

## **Annexure – I: Lab Safety Precautions & Work Instructions**

### **Laboratory Staff**

- Be calm and relaxed, while working in Lab.
- No loose wires or metal pieces should be lying on table or near the circuit, to cause shorts and sparking.
- Avoid using long wires, that may get in way while making adjustments or changing leads.
- Keep high voltage parts and connections out of the way from accidental touching and from any contacts to test equipment or any parts, connected to other voltage levels.
- BE AWARE of bracelets, rings, metal watch bands, and loose necklace (if you are wearing any of them), they conduct electricity and can cause burns. Do not wear them near an energized circuit.
- Do not install any software on any computer without getting approval from the respective authorities.
- Make sure all the computers and other equipments in the labs are switched off at the end of the day.
- Do not unplug a computer or equipment without switching it off first.

### **Students**

- Shut down the computers properly after finishing your work.
- Do not install any software on any computer. If you are unable to find any required software, please contact the IT staff for help and support.
- Do not switch off network printers and scanners.
- Do not damage any equipment in the lab.
- Be considerate to other students while working in the labs.

# **Self Assessment Team Report December 2, 2011 (Exit Presentation)**

**Brig ® Dr. Maqsood ul Hassan**

## **Self Assessment Program**

- Successful Assessment Program include
  - Purpose identification
  - Outcomes identification
  - Measurements and evaluation design
  - Data collection
  - Analysis and evaluation
  - Decision-making regarding actions to be taken

# Self Assessment Objectives

- Maintain and continuously enhance academic standards
- Enhance students' learning
- Verify that existing programs meet their objectives and institutional goals
- Provide feedback for quality assurance of academic programs
- Prepare the academic program for review by discipline councils

## Self Assessment Team

- Constituted by VC in Sept 2010
- Members
  - Brig ® Dr. Maqsood ul Hassan, IIMC (Chairman)
  - Mr. Aun Muhammad, AP, RIPS
  - Dr. Muhammad Afzal Rana, AP, DBS

## Terms of Reference

- Conduct of assessment of SAR
- Pin point gaps and deficiencies for improvement
- Report of findings of the Assessment

## Self Assessment Report

- IIMC
- RIPS
- DBS

## Conclusions of SAR

- Class room improvement
- Labs and Project equipment and fund
- Regular teacher training
- Teaching methodology, Evaluation
- Facilities for students
- Development of Faculty
- Mix of research and teaching proportion
- Training of support staff

## Visit of SAT to 3 Faculties

- Tuesday Nov 29, 2011
- Visit of Class rooms and Laboratories and allied facilities
- Visit and Meeting with Faculties
- Head of Department
- Quality Program Team Members

## Class Room Improvement

- Some class rooms have inadequate seating capacities
- Shape of class rooms
- Problem of light and echo
- Multimedia projector and overhead projector requirement in every class
- Lights and Fans and ACs especially in summer

## Class Room Improvement

- Whiteboard should be dispersive rather the reflective (currently installed)
- Sound system for bigger class rooms
- All big rooms should be reserved for classes only.



## Laboratory Equipment

- Being upgraded

## Regular Teacher Training

- Teaching is an art
- Excellent communication skills are required
- Specially required for new and young faculty members
- Teaching Methodology
- Preparation and delivery of lectures
- Evaluation of students

## Facilities for Students

- Common Room for Male students
- Ample sitting facilities in lawns and under shade
- Sport facilities
  - Basket ball, Badminton, Table tennis
  - Cricket ground
- Industrial and Educational tours

## Faculty Development (2)

- Practical skills should be enhanced
- Research facilities and funds
- Balance of teaching workload and research activities
- Student teacher ratio should be adequate

## Training of Support Staff

- Technical training regarding handling of Laboratory and Class room equipment
  - Handling of ACs
  - Handling of Multimedia Projectors
  - Handling of PCs

# Conclusion

- Improvement is a continuous process
- Class Rooms
- Faculty training and development
- Laboratory equipment
- Research and development culture
- Training of support staff
- Facilities for students and Faculty
- Syllabi Review
- Implementation plan is to be developed by the respective faculties

**Annexure – K:**

**Implementation Plan (Summary)  
(Shared Class Rooms & Facilities with other Faculties)**

<b>AT Finding</b>	<b>Corrective Action</b>	<b>Implementation Date</b>	<b>Responsible Body</b>	<b>Present Status</b>
1. Inadequate seating capacity in Three class rooms	Add 10 chairs in each class room	By 30 <sup>th</sup> Dec, 2011	DBS/Registrar Office	In Progress
2. Two class rooms have light and echo problem	Add curtains and carry out sound proofing of walls	By 31 <sup>st</sup> March 2012	-do-	In Progress
3. Deficiency of Multimedia Projectors	Add 1 multimedia projector in 1 class room	By 30 <sup>th</sup> June 2012	-do-	In progress
4. Dispersive white boards	Replace all with mat finish white boards	By 30 <sup>th</sup> April 2012	-do-	In progress
5. Sound system for 1 bigger class rooms	Add sound system	By 30 <sup>th</sup> June 2012	-do-	In progress
<b>Students Facilities</b>				
6. Common room for male students not available	Earmark a bigger room for this purpose	By 30 <sup>th</sup> April 2012	-do-	In progress
7. Sports facility for students	Develop Basket Ball, Bad Minton, and Table Tennis facilities for students	By 30 <sup>th</sup> June 2012	Registrar office	In Progress
8. Shortage of sitting facilities around cafeteria and college verandas	Add all weather chairs/benches for atleast 100 students	By 30 <sup>th</sup> April 2012	Registrar office	In Progress
<b>Faculty Development</b>				
1. Non Attendance of Workshops/Seminars/ Lectures	Provide opportunities to faculty to attend sessions of their interest	By 30 <sup>th</sup> April 2012	Registrar Office/ Finance	In Progress
2. Imbalance of Teaching workload and research activities	Follow HEC instructions	By 30 <sup>th</sup> April 2012	DBS/HR	In Progress
3. Deficiency of indigenous plans for faculty	Active RARE to run faculty development	By 30 <sup>th</sup> June 2012	DBS/Registrar office/RARE	RARE will hold faculty interactive sessions in July-August 2012

development courses on regular basis

- |  |   |                                |        |             |
|--|---|--------------------------------|--------|-------------|
| 4. Deficiency of support staff to handle ACs, Multimedia | Reorganize manpower allocation from within department. Deficiency if any be filled up | By 30 <sup>th</sup> March 2012 | DBS/HR | In Progress |
|--|---|--------------------------------|--------|-------------|

### **Syllabi Review**

- |  |  |                               |   |                |
|--|--|-------------------------------|---|----------------|
| 1. Need to review syllabi for more emphasis on Research, and Mathematical skills | Review Syllabi through Board of Studies and Board of Faculties | By 30 <sup>th</sup> July 2012 | Dean, Incharge Programs and concerned faculty | Action in Hand |
|--|--|-------------------------------|---|----------------|

Chairman's AT Comments  
Name and Signature

Dean's Comments  
Name and Signature

QEC Comments  
Name and Signature

## **Annexure – L: Faculty Course Review Report**

Department of Basic Sciences is running 20 courses for the M.Sc. Mathematics program. All courses curriculum is reviewed periodically by the faculty to assess its effectiveness and contribution in achieving program objectives. Course review also contributes towards making any changes in the syllabi and enhancements required in areas identified as a result of Alumni Survey, Employer Survey and Graduating Students Feedback.

PT members launched HEC Performa 2 (Faculty of Course Review Report) to all the faculty members, to obtain their feedback about courses.

The summary of the overall feedback of all courses identified the following improvement points:

- a. Syllabi review to improve mathematical skills.
- b. Provision to interact more with industrial units during study period.
- c. Research Aptitude Building.
- d. Confidence Building Measures
- e. Exposure to Mathematical Sector

Board of Studies scrutinized these points and presented in the Board of Faculty that will review and suggest the implementation as deemed necessary.

## Annexure – M: Rubric Report

<b>Self Assessment Report</b>					
<b>Criterion 1 – Program Mission, Objectives and Outcomes</b>					<b>Weight = 0.05</b>
<b>Factors</b>					<b>Score</b>
1. Does the program have document measurable objectives that support faculty/ college and institution mission statements?	5	4	3	2	1
2. Does the program have documented outcomes for graduating students?	5	4	3	2	1
3. Do these outcomes support the Program objectives?	5	4	3	2	1
4. Are the graduating students capable of performing these outcomes?	5	4	3	2	1
5. Does the department assess its overall performance periodically using quantifiable measures?	5	4	3	2	1
6. Is the result of the Program Assessment documented?	5	4	3	2	1
<b>Total Encircled Value (TV)</b>	<b>19</b>				
<b>SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.05</b>	<b>1.8</b>				

<b>Criterion 2– Curriculum Design and Organization</b>						<b>Weight = 0.20</b>
<b>Factors</b>					<b>Score</b>	
1. Is the curriculum consistent?	5	4	3	2	1	
2. Does the curriculum support the program's documented objectives?	5	4	3	2	1	
3. Are the theoretical background, problem analysis and solution design stressed within the program's core material?	5	4	3	2	1	
4. Does the curriculum satisfy the core requirements laid down by PEC?	5	4	3	2	1	
5. Does the curriculum satisfy the major requirements laid down by HEC and the PEC?	5	4	3	2	1	
6. Does the curriculum satisfy the professional requirements as laid down by PEC?	5	4	3	2	1	
7. Is the information technology component integrated throughout the program?	5	4	3	2	1	
8. Are oral and written skills of the students developed and applied in the program?	5	4	3	2	1	
<b>Total Encircled Value (TV)</b>	<b>38</b>					
<b>SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.20</b>	<b>1.9</b>					

<b>Criterion 3– Laboratories and Computing Facilities</b>						<b>Weight = 0.10</b>
<b>Factors</b>					<b>Score</b>	
1. Are the laboratory manuals/ documentation/ instructions etc. for experiments available and readily accessible to faculty and students?	5	4	3	2	1	
2. Are there adequate number of support personnel for	5	4	3	2	1	

instruction and maintaining the laboratories?					
3. Are the University's infrastructure and facilities adequate to support the program's objectives?	5	4	3	2	1
Total Encircled Value (TV)	15				
SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.10	10				

<b>Criterion 4– Student Support and Advising</b>						<b>Weight = 0.10</b>				
<b>Factors</b>						<b>Score</b>				
1. Are the courses being offered in sufficient frequency and number for the students to complete the program in a timely manner?	5	4	3	2	1					
2. Are the courses in the major area structured to optimize interaction between the students, faculty and teaching assistants?	5	4	3	2	1					
3. Does the university provide academic advising on course decisions and career choices to all students?	5	4	3	2	1					
Total Encircled Value (TV)	12									
SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.10	8									

<b>Criterion 5– Process Control</b>						<b>Weight = 0.15</b>				
<b>Factors</b>						<b>Score</b>				
1. Is the process to enroll students to a program based on quantitative and qualitative criteria?	5	4	3	2	1					
2. Is the process above clearly documented and periodically evaluated to ensure that it is meeting its objectives?	5	4	3	2	1					
3. Is the process to register students in the program and monitoring their progress documented?	5	4	3	2	1					
4. Is the process above periodically evaluated to ensure that it is meeting its objectives?	5	4	3	2	1					
5. Is the process to recruit and retain faculty in place and documented?	5	4	3	2	1					
6. Are the process for faculty evaluation & promotion consistent with the institution mission?	5	4	3	2	1					
7. Are the process in 5 and 6 above periodically evaluated to ensure that they are meeting their objectives?	5	4	3	2	1					
8. Do the processes and procedures ensure that teaching and delivery of course material emphasize active learning and that course learning outcomes are met?	5	4	3	2	1					
9. Is the process in 8 above periodically evaluated to ensure that it is meeting its objectives?	5	4	3	2	1					
10. Is the process to ensure that graduates have completed the requirements of the program based on standards and documented procedures?	5	4	3	2	1					
11. Is the process in 10 above periodically evaluated to ensure that it is meeting its objectives?	5	4	3	2	1					
Total Encircled Value (TV)	51									
SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.15	13.91									



<b>Criterion 6– Faculty</b>		<b>Weight = 0.15</b>				
<b>Factors</b>	<b>Score</b>					
1. Are there enough full time faculty members to provide adequate coverage of the program areas/courses with continuity and stability?	5	4	3	2	1	
2. Are the qualifications and interest of faculty members sufficient to teach all courses, plan, modifies and updates courses and curricula?	5	4	3	2	1	
3. Do the faculty members possess a level of competence that would be obtained through graduate work in the discipline?	5	4	3	2	1	
4. Do the majority of faculty members hold a Ph.D. degree in their discipline?	5	4	3	2	1	
5. Do faculty members dedicate sufficient time to research to remain current in their disciplines?	5	4	3	2	1	
6. Are there mechanisms in place for faculty development?	5	4	3	2	1	
7. Are faculty members motivated and satisfied so as to excel in their profession?	5	4	3	2	1	
<b>Total Encircled Value (TV)</b>	<b>26</b>					
<b>SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.15</b>	<b>18.57</b>					

<b>Criterion 7– Institutional Facilities</b>		<b>Weight = 0.15</b>				
<b>Factors</b>	<b>Score</b>					
1. Does the institution have the infrastructure to support new trends such as e-learning?	5	4	3	2	1	
2. Does the library contain technical collection relevant to the program and is it adequate staffed?	5	4	3	2	1	
3. Are the class rooms and offices adequately equipped and capable of helping faculty carry out their responsibilities?	5	4	3	2	1	
<b>Total Encircled Value (TV)</b>	<b>15</b>					
<b>SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.15</b>	<b>15</b>					

<b>Criterion 8– Institutional Support</b>		<b>Weight = 0.10</b>				
<b>Factors</b>	<b>Score</b>					
1. Is there sufficient support and finances to attract and retain high quality faculty?	5	4	3	2	1	
2. Are there an adequate number of high quality graduate students, teaching assistants and Ph.D. students?	5	4	3	2	1	
<b>Total Encircled Value (TV)</b>	<b>8</b>					
<b>SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.10</b>	<b>8</b>					

$$\begin{aligned}
 \text{Overall Assessment Score} &= S1+S2+S3+S4+S5+S6+S7+S8 \\
 &= 1.9+1.8+10+8+13.91+18.57+15+8 \\
 &= 76.18
 \end{aligned}$$

