

**RIPHAH INTERNATIONAL UNIVERSITY**

**Lahore**



# **SELF ASSESSMENT REPORT**

**BS Computer Sciences**

**Riphah Institute of Computing & Applied Sciences**

**June 2018**

**Prepared by:**

**Riphah Institute of Computing & Applied Sciences**

**Reviewed by:**

**Quality Enhancement Cell**

## Table of Contents

1.0	Executive Summary .....	6
1.1	Objectives .....	6
1.2	Execution .....	6
2.0	Introduction.....	8
2.1	University Mission Statement.....	8
2.2	Riphah Institute of Computing & Applied Sciences(RICAS) .....	8
2.3	Program Selected .....	8
2.4	Program Evaluation .....	8
3.0	Criterion 1: Program Mission, Objectives and Outcomes .....	8
3.1	Standard 1-1 .....	9
3.1.1	Program Mission Statement.....	9
3.1.2	Program Objectives.....	9
3.1.3	Alignment of Program Objectives with Program & University Mission Statements .....	9
3.1.4	Main Elements of Strategic Plan.....	9
3.2	Standard 1-2.....	10
3.2.1	Program Outcomes.....	10
	Program Objectives and Outcomes.....	11
3.3	Standard 1-3 .....	11
3.3.1	Course Evaluation.....	11
3.3.2	Teachers Evaluation.....	13
3.4	BS Computer Sciences Strong and Weak Points .....	14
3.5	Significant Future Development Plans .....	15
3.6	Standard 1-4.....	15
3.6.1	Graduates/Undergraduates enrolled in during year 2015-16 .....	15
3.6.2	Student Faculty Ratio:.....	15
3.6.3	Average GPA per semester:.....	15
3.6.4	Average Completion time .....	15
3.6.5	Students Course Evaluation Response Rate (Average) .....	16
3.6.6	Students Faculty Evaluation .....	16
3.6.7	Research.....	16
3.6.8	Community Service .....	16
3.6.9	Students/Teachers Satisfaction .....	16
4.0	Criterion 2: Curriculum Design and Organization.....	16
4.1	Title of Degree Program .....	16
4.2	Definition of credit hour: .....	16
4.3	Degree plan .....	16
4.4	Curriculum Breakdown.....	18
4.5	Courses Information/ Outline .....	19
4.5.1	Advance Computer Programming .....	19
	Objective .....	19
	Text Books:.....	19
	• Absolute Java 3rd Edition By Walter Salvich.....	19
	• Java How to Program By Dietel & Dietel 7th Edition.....	19
	• The Complete Reference Java 7th Edition.....	19
	• Android Application Development for Java Programmers by James C. Sheusi	19

4.5.2	Computer Graphics .....	19
	Objectives .....	19
	Text Books .....	20
•	Introduction to Computer Graphics C version (2 <sup>nd</sup> Edition) Donald Hearn, M.Pauline Baker.....	20
4.5.3	Theory of Automata.....	20
	Objectives .....	20
	Text Books .....	20
4.5.4	Compiler Construction.....	20
	Objectives .....	20
	Text Books .....	21
4.5.5	Introduction to Database .....	21
4.5.6	Artificial Intelligence .....	21
	Objectives .....	21
	Text Books .....	22
4.5.7	Introduction to Software Engineering.....	22
	Objective .....	22
4.5.8	Software Engineering II.....	22
	Objective .....	22
	Text Books .....	23
4.5.9	Software Quality Engineering.....	23
	Objective .....	23
	Text Book.....	23
4.5.10	Requirement Engineering .....	23
	Objective .....	23
	Text Book.....	23
4.5.11	Introduction to Software Engineering.....	24
	Objective .....	24
	Text Book.....	24
4.5.12	ENGLISH .....	24
	Objective .....	24
	Text Book.....	24
4.5.13	Life and Living PAKISTAN STUDIES .....	24
	Objective .....	24
	Text Book.....	24
4.5.14	Probability & Statistics .....	25
	Text Book.....	25
4.5.15	Life and Living ISLAMIC STUDIES.....	25
	Objective .....	25
	Text Book.....	25
4.5.16	Analysis of Algorithms .....	26
	Objective .....	26
4.5.17	Data Structures .....	27
	Objective .....	27
4.5.18	Operating System.....	27
	Objective .....	27
4.5.19	Programming Fundamentals .....	27
4.5.20	Software Construction .....	28
	Objective .....	28

4.5.21	Web Design and Development .....	28
	Objective .....	28
4.5.22	Human Computer Interaction .....	29
	Objective .....	29
4.5.23	Object Oriented Programming .....	29
	Objective .....	29
4.5.24	Visual Programming .....	29
	Objective .....	29
4.5.25	Modern Programming Languages .....	30
	Objective .....	30
4.5.26	Web Programming .....	30
	Objective .....	30
4.5.27	Web Design and Application .....	30
	Objective .....	30
4.5.28	Mathematics-III .....	31
	Objective .....	31
4.5.29	Communication Skills .....	31
	Objective .....	31
4.5.30	Mathematics-I .....	32
	Objective .....	32
4.5.31	Mathematics-II .....	32
	Objective .....	32
4.5.32	Communication Skills II .....	33
4.5.33	Islamic Studies .....	33
4.5.34	Digital and Logic Design .....	35
4.5.35	Technical Writing .....	36
4.5.36	Basic Teachings of the Qur'an (Revealed Sciences - I) .....	36
	Objective .....	36
4.5.37	Introduction to Hadith & Seerah (2) .....	37
	Objective .....	37
4.5.38	Senior Design Project .....	38
	Objective .....	38
4.6	Standard 2-1 .....	38
1.	Group 1: Computer Sciences .....	38
2.	Group 2 General Sciences .....	38
3.	Group 3 Humanities .....	38
4.	Group 4: Mathematical Sciences .....	38
5.	Group 5: Projects .....	38
6.	Course Groups and Program Objectives .....	39
4.7	Standard 2-2 .....	39
4.8	Standard 2-3 .....	40
4.9	Standard 2-4 .....	40
4.10	Standard 2-5 .....	40
4.11	Standard 2-6 .....	41
4.12	Standard 2-7 .....	41
5.0	Criterion 3: Laboratories and Computing Facilities .....	41
5.1	Standard 3-1 .....	41
5.2	Standard 3-2 .....	42
5.3	Standard 3-3 .....	42

6.0	Criterion 4: Student Support and Advising.....	42
6.1	Standard 4-1 .....	43
6.2	Standard 4-2.....	43
6.3	Standard 4-3.....	43
7.0	Criterion 5: Process Control.....	44
7.1	Standard 5-1 .....	44
7.2	Standard 5-2.....	45
7.3	Standard 5-3.....	45
7.4	Standard 5-4.....	46
7.5	Standard 5-5.....	47
8.0	Criterion 6: Faculty .....	48
8.1	Standard 6-1 .....	48
8.2	Standard 6-2.....	49
8.3	Standard 6-3.....	50
9.0	Criterion 7: Institutional Facilities .....	50
9.1	Standard 7-1 .....	50
9.2	Standard 7-2.....	51
9.3	Standard 7-3.....	51
10.0	Criterion 8: Institutional Support .....	51
10.1	Standard 8-1 .....	51
10.2	Standard 8-2.....	52
10.3	Standard 8-3.....	52
11.0	Conclusion .....	52
11.1	Strong Areas.....	54
11.2	Weak Points: .....	54

## **1.0 Executive Summary**

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

In Riphah Institute of Computing and Applied Sciences (RICAS) Lahore Campus Program was selected for self-assessment, evaluation and improvements. A strong commitment of Respected Vice Chancellor and Director Riphah Campus Lahore 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 Lecture and Workshop 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. AM QEC accompanied the AT Team and participated in discussions with In-charge Program / Program Team members and available faculty members.

The Chairman AT during his visit, 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.

The implementation plan indicates the resources required to improve the infrastructure, environment in the classes and E-Learning the tasks have been completed on fast track by the combined efforts of Head of Department, QEC officer and Administration of Lahore Campus.

At the completion of Self-Assessment cycle, QEC is going to submit the hard and soft copy of SAR to HEC by 30 June 2018.

**Director**  
**Quality Enhancement Cell**

# Self-Assessment Report

## 2.0 Introduction

Riphah International University 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.

## 2.1 University Mission Statement

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

## 2.2 Riphah Institute of Computing & Applied Sciences (RICAS)

Riphah College of Computing is running following program:

- a. BS Software Engineering
- b. BS Computer Sciences
- c. MS Computer Sciences
- d. M-Phil Mathematics
- e. M-Phil Physics
- f. MSc Mathematics
- g. MSc Physics

## 2.3 Program Selected

Riphah College of Computing has selected the BS Computer Science (BSCS) Program for Self-Assessment Report (SAR) for the year 2017-18 under the directives of HEC. The program has got inbuilt mechanism for the revision of syllabi, has competent faculty and adequate infrastructure.

This program followed HEC accredited Curriculum made by National Curriculum Revision Committee (NCRC) of HEC.

## 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**

B.S. Computer Science program aims to impart IT and Communication 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.
2. To educate the students with IT, communication and team work skills.
3. To enable the students to pursue career in related field using software engineering skills such as analysis, designing, development, quality assurance, project management & solution implementation.
4. To enable the students to step into research and development (R&D) activities.
5. To prepare students to work within ethical values and betterment of the society at large.

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

Program objectives needs to support the program and university mission statements in order to deliver the required output and achieve the desired goals. This is done through planned set of activities during the execution of the BS Computer Sciences program. These activities include overall curriculum composition and its delivery, laboratory work and projects performed at required stages and industrial placement (if possible) to expose students to professional environment.

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

The main elements as discussed above, of a strategic plan for the selected course are as under:

- a. Curriculum Composition
- b. Laboratory work and projects
- c. Industrial Placement

### **3.1.4.1 Curriculum Composition**

B.S Software engineering program comprises of core and elective courses. It has 25 core courses and wide range of elective courses. Curriculum is divided into different segments that builds student's base through basic set of courses and imparts advance knowledge by using advance courses. List of courses is available in section 3.3.1.

### **3.1.4.2 Laboratory work and projects**

Laboratory work and projects are planned at desired stages during the program execution to enhance the working skills of the students. Two computing laboratories are available for students to practice the laboratory work. At the end of their program, students are required to submit a final project that demonstrates their analysis, designing, solution building, implementation and report writing skills, in the form of designed software and its technical report.

### **3.1.4.3 Industrial Placements**

In-Charge Industrial Liaison in Faculty of Computing maintains a list of potential industrial units that can offer placement work to RIU students. Industrial placements provide students with the opportunity to work in professional environment along with experienced professionals and learn from their experiences. This aspect of program also opens the doors of opportunities for talented students to seek permanent position in the participant organization..

## **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 (M.Sc., MS, Ph.D.) in computer sciences / software engineering /field of interest
2. Students shall be able to use software development tools and technologies.
3. Students shall be able to demonstrate oral and written communication skills.
4. Students will be able to perform technical and non-technical jobs in Information Technology field.

5. Students shall be able to perform requirement engineering and analysis of the business systems
6. Students shall be able to design, develop and implement software solutions.
7. Students shall be able to administer Information Technology systems.
8. Students shall be able to perform software quality assurance activities.
9. Students shall be able to perform research and development (R&D) in related field.
10. Students shall be able to perform tasks individually as well as in teams.
11. Students shall be able to execute tasks in positive and constructive manner.

Following table shows the link between program objectives and program outcomes:  
**Program Objectives and Outcomes**

Program Objectives	Program Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
1	X										
2		X	X	X						X	
3		X		X	X	X	X	X			
4		X		X					X		
5											X

**Table 1: Outcomes versus Objectives**

### 3.3 Standard 1-3

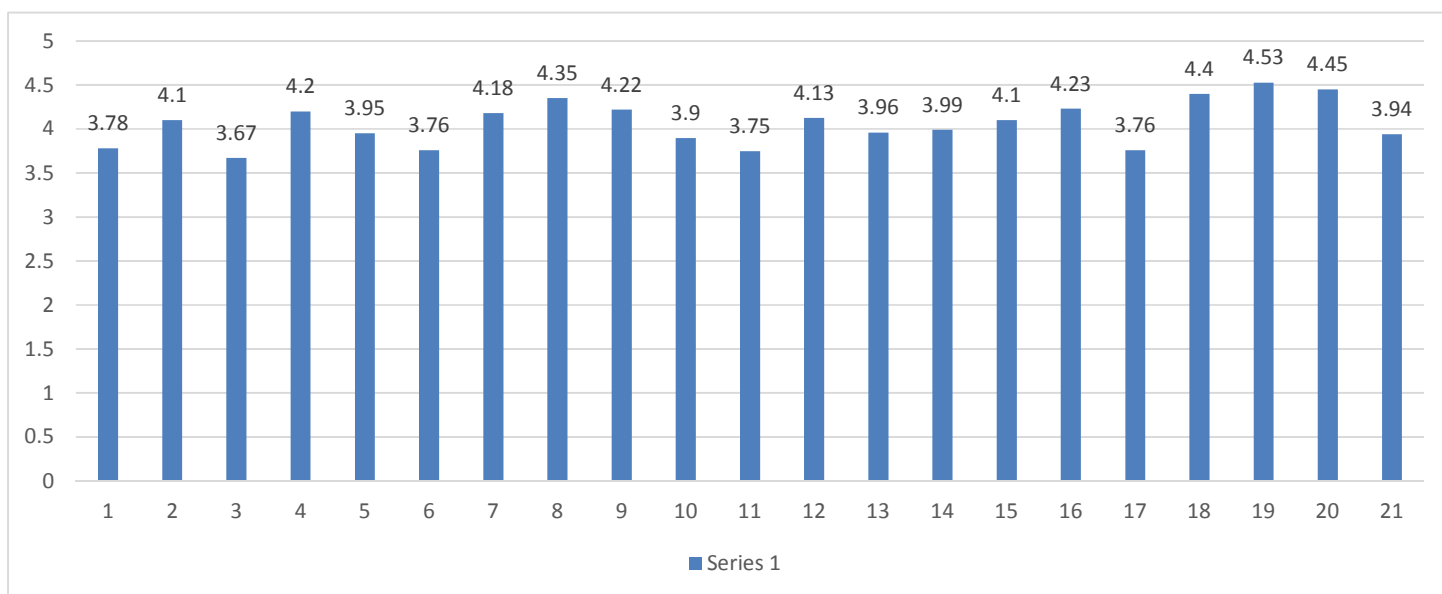
**The results of Program's assessment and the extent to which they are used to improve the program must be documented.**

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

The result of the program assessment is shown below in graphical charts for courses evaluation and teachers' evaluations.

#### 3.3.1 Course Evaluation

Courses evaluation is shown in the following graphical chart:



**Figure 1: Course Evaluation Bar Chart**

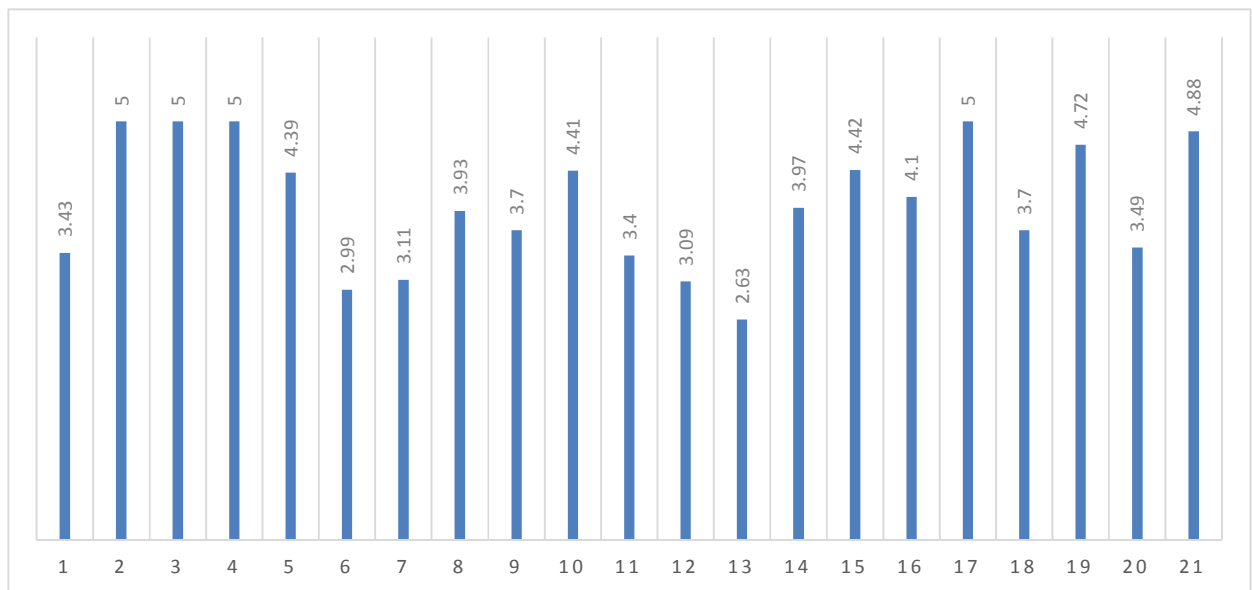
Students have graded the courses against the course structure, teaching methodology, learning objectives and outcomes and practical implementation of theory. The total graded marks are 5. Following is the list of courses that are being evaluated by the students along with their course code and graded scores.

Sr.	Subject	Marks
1.	Introduction to Computing	3.78
2.	Fundamental of Eng. Mathematics	4.10
3.	Basic Electronics	3.67
4.	Functional English	4.20
5.	Basics of Programming	3.95
6.	Life & Living-I (Islamic Studies)	3.76
7.	Discrete Structure	4.18
8.	Programming Fundamentals	4.35
9.	Digital Logic Design	4.22
10.	English-II(Communication Skills)	3.90

11.	Life & Living-II (Pakistan Studies)	3.75
12.	Calculus and Analytical Geometry	4.13
13.	Object Oriented Programming	3.96
14.	Introduction to Software Engineering	3.99
15.	Linear Algebra	4.10
16.	SE-Elective-I(Computer Organization and Architecture)	4.23
17.	Elective General(Sociology)	3.76
18.	Life & Living-III (Revealed Sciences-I)	4.40
19.	Data Structures & Algorithms	4.53
20.	Software Construction	4.45
21.	Introduction to Databases	3.94

### 3.3.2 Teachers Evaluation

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



**Figure 2: Teachers Evaluation Graph**

Students have graded the teachers against their lecture preparation, punctuality, general behavior, subject knowledge and teaching methodology. 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. No	Teacher Name	Marks
1	Qadeer Akbar Sial	3.43
2	Aqeela Batool	5
3	Tahir Ghafoor Malik	5
4	Aumm e Hani .	5
5	Aumm e Hani	4.39
6	Imran Ahmad	2.99
7	Imran Ahmad	3.11
8	Imran Ahmad	3.93
9	Muhammad Imran Malik	3.7
10	Muhammad Imran Malik	4.41
11	Muhammad Imran Malik	3.4
12	Dr.Kamran Jamil	3.09
13	Khawaja Muhammad Fahad	2.63
14	Maryam Anwar	3.97
15	Maryam Anwar	4.42
16	Maryam Anwar	4.1
17	Maryam Anwar	5
18	Syed Mustaqeem Moin	3.7
19	Syed Mustaqeem Moin	4.72
20	Syed Mustaqeem Moin	3.49
21	Aqeela Batool	4.88

This evaluation was carried out by Quality Enhancement Cell to ensure the unbiased feedback from students. QEC staff visited different classes and gathered feedback as desired. QEC performed analysis of the data and submitted the results to Director for further actions.

### 3.4 BS Computer Sciences Strong and Weak Points

#### Strong Points:

- a. Properly scheduled and on time classes
- b. Trained and experienced faculty
- c. Up to date curriculum composition, meeting the market needs
- d. Strong interaction with industry
- e. Well Equipped laboratories and computing facilities

**Weak Points:**

- a. Training of laboratory staff
- b. Availability of senior teaching staff after class hours
- c. Guidance/Advisory Process for Students

**3.5 Significant Future Development Plans**

Significant future development plan for the program includes:

- a. Cloud Service for students
- b. New Computer Labs
- c. MS Program

**3.6 Standard 1-4**

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

**3.6.1 Students enrolled in during year 2015-2017**

<b>Year</b>	<b>Enrolled</b>
2015	9
2016	15
2017	26

**3.6.2 Student Faculty Ratio:**

Department of Computing has 6:1 ratio.

**3.6.3 Average GPA per semester:**

The average GPA is 2.85

**3.6.4 Average Completion time**

The BSCS program has average completion time of 4 years consisting of 8 semesters.

### **3.6.5 Students Course Evaluation Response Rate (Average)**

Student's course evaluation average response rate for all courses is 30.

### **3.6.6 Students Faculty Evaluation**

QEC staff conducted the teacher's evaluation to ensure unbiased feedback. The feedback was taken manually.

### **3.6.7 Research**

The faculty of Computing, Lahore Campus published research papers in different journals. List is attached in Annexure E.

### **3.6.8 Community Service**

1. Education Awareness Seminars
2. Education Services

### **3.6.9 Students/Teachers Satisfaction**

As per HEC defined standard, a ratio of 4:1 for the academic and administrative non-technical staff is maintained by the College of Computing

Students and teachers satisfaction is judged in different ways. For students this is done by faculty as well as QEC staff by conducting in-class discussions to know students views and through feedback provided by them on HEC Performa number 1 & 10. While, teachers satisfaction is judged using the HEC defined Performa number 5 and their views during in-person discussion with QEC staff.

## **4.0 Criterion 2: Curriculum Design and Organization**

### **4.1 Title of Degree Program**

Bachelors of Sciences in Computer Science

### **4.2 Definition of credit hour:**

1 Credit Hours is 1 contact hours for theory and 3 contact hours for lab

### **4.3 Degree plan**

Following is the list of core courses taught in the selected program. Section 4.5 shows the details about these courses.



Semester	Subjects	Credit Hours
1st	Introduction to Computing	2-1
	Fundamentals of Eng. Mathematics	3
	Basic Electronics	3
	English-I (Functional English)	3
	Basics of Programming	2-1
	Life & Living-I (Islamic Studies)	2
2nd	Discrete Structure	3
	Programming Fundamentals	3-1
	Calculus and Analytical Geometry	3
	Digital Logic Design	2-1
	English-II(Communication Skills)	3
	Life & Living-II (Pakistan Studies)	2
3rd	Microprocessor & Assembly Language	3
	Object Oriented Programming	3-1
	Linear Algebra	3
	CS-Elective-I (Web Design Application)	3
	Introduction to Database	3-1
	Life & Living-III (Revealed Sciences-I)	1
4th	Introduction to Software Engineering	3
	Data Structures & Algorithms	3-1
	Microprocessor & Assembly Language	3
	CS-Elective-I (Web Design Application)	3
	Differential Equations	3
	Life & Living-III (Revealed Sciences-I)	1
5th	Operating System	3-1
	Software Engineering II	3
	Theory of Automata	3
	Psychology	3
	Data Communication	3
	Numerical Analysis	3
6th	Computer Networks	2-1
	Visual Programming	2-1
	Theory of Automata	3
	Software Quality Engineering	3
	Modern Programming Languages	2-1
	Human Computer Interaction	2-1
7th	FYP-I	3
	Computer Graphics	3
	Compiler Construction	3
	Network Security	3
	Software Project Management	3
8th	FYP-II	3
	Artificial Intelligence	3
	Professional Ethics	3

	Numerical Analysis	3
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#### 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	CS1014, PHY1013, MATH1013, SS1013, IT1013, SS1062	3	3	6+1	5	
2	CS1033, CS1024, MATH1023, SS1023, CS1043, SS1072	3		9+1	5	
3	MGMT2023, CS2033, MATH2023, SS2031	3		9+1	1	3
4	CS2124, CS2113, CS2213, MT2503, IT2603, SS1431	3		10	3	3
5	MT2313, IT2603, SS3021, CS3104, CS3203, CS2603	3		12+2	1	
6	CS3623, CS3213, CS3123, CS3113, IT3603			12	1	
7	CS2703, CS4103, SS 4403, CS 4213, CS4203, SS 4422			9	6	3
8	CS4113, CS4223, SS4411, MT3503	3		6		3

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

## 4.5 Courses Information/ Outline

### 4.5.1 Advance Computer Programming

#### Objective

The course will introduce students to object oriented programming using Java. It assumes that students know the basics of scalar types (integers, strings, booleans) and fundamental control structures in procedural programming (loops, assignment statements, conditional expressions). It will focus on more sophisticated features such as design of classes, interfaces, packages and APIs. It will also cover the basic principles of software design, testing, and collaborative programming. It will finally include a short introduction to the Java Collection Framework and the Java API

#### Prerequisites

Object Oriented Programming

#### Text Books:

- Absolute Java 3rd Edition By Walter Salvich
- Java How to Program By Dietel & Dietel 7th Edition
- The Complete Reference Java 7th Edition
- Android Application Development for Java Programmers by James C. Sheusi

### 4.5.2 Computer Graphics

#### Objectives

- To study and implement various algorithms in computer graphics using OpenGL and similar graphic libraries
- To identify key input and output hardware components/devices for computer graphics
- To provide an overview of the applications of computer graphics
- To be able to understand the terminology, issues and current trends in the field of computer graphics
- To provide a comprehensive introduction to computer graphics focusing on graph plotting, clipping, scaling, rotation, translation, region filling, two and three dimensional imaging geometry, and transformations

#### Prerequisites

Visual Programming

## **Text Books**

- Introduction to Computer Graphics C version (2<sup>nd</sup> Edition) Donald Hearn, M.Pauline Baker
- OpenGL SuperBible (5th Edition) Richard S. Wright Jr. et al.

### **4.5.3 Theory of Automata**

#### **Objectives**

1. Understand basic properties of formal languages and formal grammars.
2. Understand basic properties of deterministic and nondeterministic finite automata
3. Understand the relation between types of languages and types of finite automata
4. Understanding the Context free languages and grammars, and also Normalizing CFG.
5. Understanding the minimization of deterministic and nondeterministic finite automata.
6. Understand basic properties of Turing machines and computing with Turing machines.
7. Understand the concept of Pushdown automata and its application.
8. Know the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problem.
9. Understand the challenges for Theoretical Computer Science and its contribution to other sciences.

#### **Prerequisites**

Multivariable Calculus

## **Text Books**

J. Hopcroft, R. Motwani, and J. Ullman. Introduction to Automata Theory, Languages, and Computation, 3rd edition

### **4.5.4 Compiler Construction**

#### **Objectives**

1. Gain an understanding of how compilers translate source code to machine executable.
2. Utilize tools to automate compiler construction.
3. Comprehend how to perform parsing (top down and bottom up).
4. Understand how compilers generate code to manage memory during runtime.

5. Be familiar with techniques for simple code optimizations.
6. Have the knowledge to design, implement, and test a compiler for a simple language, to include:
  - a. Constructing a Context Free Grammar (CFG).
  - b. Implementing efficient mechanisms for lexical analysis.
  - c. Creating a parse table from a CFG.
  - d. Performing elementary error recovery strategies during the parsing phase.
  - e. Implementing an efficient symbol table during the parsing phase.
  - f. Perform elementary semantic analysis checks on an abstract syntax tree.
  - g. Generating code for a target assembly language

## **Text Books**

### **4.5.5 Introduction to Database**

#### **Objectives:**

1. Describe fundamental data and database concepts
2. Compare and contrast the relational database model with other database models
3. Explain and use the database development lifecycle
4. Design databases using data modeling and data normalization techniques
5. Create databases using popular database management system products
6. Solve problems by constructing database queries using the Structured Query Language
7. Develop insights into future data management tool and technique trends
8. Recommend and justify strategies for managing data security, privacy , audit/control, fraud detection, backup and recovery

#### **Text Books:**

### **4.5.6 Artificial Intelligence**

#### **Objectives**

- a) Understand the meaning of AI, its alternative approaches and the implications of AI for cognitive science more broadly.
- b) Expand knowledge about Inform and uniform search heuristic search, genetic algorithm, planning, and learning algorithms.

- c) Understand the basic methods in planning and reasoning using both logic and uncertain inference.
- d) Know a variety of ways to represent and retrieve knowledge and information [Expert systems, Agents].
- e) Know the fundamentals of AI programming techniques and advanced machine learning in a modern programming language.
- f) Machine Learning Concept, ANN Concept
- g) Fuzzy system Concept

### **Text Books**

- Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, prentice Hall.
- Programming for Artificial Intelligence, CLIPS User Guide Basic Radiation

### **4.5.7 Introduction to Software Engineering**

#### **Objective**

- The students will study techniques for software verification, validation and testing. They would also study reliability and performance issues in software design and development and also manage the important issues for planning a project.
- Course goals belongs to the predefined objectives of BS(SE)
  - a) That is; impart quality education in the field of computer science.
  - b) Prepare the students to achieve proficiency in software development, problem solving, software design and use of programming languages and tools.
  - c) Aim to provide the students with substantial knowledge of broad range of problem solving techniques.

#### **Textbooks:**

*Software Engineering: A Practitioner's Approach*, Roger Pressman, McGraw-Hill, Sixth Edition, 2005ol 2

### **4.5.8 Software Engineering II**

#### **Objective**

- The students will study techniques for software verification, validation and testing. They would also study reliability and performance issues in software design and development and also manage the important issues for planning a project.
- Course goals belongs to the predefined objectives of BS(SE)
  - a) That is; impart quality education in the field of computer science.
  - b) Prepare the students to achieve software development, problem solving, software design and use of programming languages and tools.

c) Aim to provide the students with substantial knowledge of broad range of problem solving techniques.

### **Text Books**

*Software Engineering: A Practitioner's Approach*, Roger Pressman, McGraw-Hill, Sixth Edition, 2005..

#### **4.5.9 Software Quality Engineering**

### **Objective**

Student should be able to

- A. **Why** software fail
- B. **Define** Quality Engineering
- C. **Understand** Importance of Software Quality
- D. **Analyze** Defects
- E. **Understand** Software Requirement Quality
- F. **Identify** Requirement Defects
- G. **Analyze** Software Design
- H. **Understand** inspection techniques
- I. **Analyze** Testing Techniques
- J. **Construct** Test Cases
- K. **Apply** integration testing
- L. **Understand** software Matrix and process insurance

### **Text Book**

- *Software Quality Assurance: From theory to implementation*, Daniel Galin, Pearson publishers.
- *Software Quality Assurance: Principles and Practice*, Nina S Godbole, Narosa Publisher.

#### **4.5.10 Requirement Engineering**

### **Objective**

The students will study techniques for software Requirements engineering, its verification, validation and testing. How to elicit requirements, techniques to elicit requirements. They would also study reliability and performance issues in software design and development and also manage the important issues for planning a project.

- Course goals belongs to the predefined objectives of BS(CS)
  - a) That is; impart quality education in the field of computer science.
  - b) Prepare the students to achieve proficiency in software development, problem solving, software design and use of programming languages and tools.

### **Text Book**

- *Software Engineering: A Practitioner's Approach*, Roger Pressman, McGraw-Hill, Sixth Edition, 2005.
- *Managing Software Requirements: A Use Case Approach* Second Edition by DeanLeffingwell

#### **4.5.11 Introduction to Software Engineering**

##### **Objective**

To acquaint the students with Introduction, structure, operation, programming, and applications of computers

##### **Text Book**

- Introduction to Computers Edition: 6<sup>th</sup> Author: Peter Norton Publisher: McGraw-Hill

#### **4.5.12 ENGLISH**

##### **Objective**

Enhance language skills and develop critical thinking.

Enable the students to meet their real life communication needs.

##### **Text Book**

- a) Grammar
  1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 1.Third edition.Oxford University Press. 1997. ISBN 0194313492
  2. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2.Third edition.Oxford University Press. 1997. ISBN 0194313506
- b) Writing
  1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet.Oxford Supplementary Skills.Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.
- c) Reading/Comprehension
  1. Reading. Upper Intermediate.Brain Tomlinson and Rod Ellis.Oxford Supplementary Skills.Third Impression 1992.ISBN 0 19 453402 2.
- d) Speaking

#### **4.5.13 Life and Living PAKISTAN STUDIES**

##### **Objective**

- Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan.
- Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

##### **Text Book**

1. Burki, ShahidJaved. *State & Society in Pakistan*, The Macmillan Press Ltd 1980.



2. Akbar, S. Zaidi. *Issue in Pakistan's Economy*. Karachi: OxfordUniversity Press, 2000.
3. S.M. Burke and LawrenceZiring. *Pakistan's Foreign policy: An Historical analysis*. Karachi: OxfordUniversity Press, 1993.
4. Mehmood, Safdar. *Pakistan Political Roots & Development*. Lahore, 1994.
5. Wilcox, Wayne. *The Emergence of Banglades.*, Washington: American Enterprise, Institute of Public Policy Research, 1972.
6. Mehmood, Safdar. *PakistanKayyunToota*, Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.
7. Amin, Tahir. *Ethno -National Movement in Pakistan*, Islamabad: Institute of Policy Studies, Islamabad.
8. Ziring, Lawrence. *Enigma of Political Development*. Kent England: WmDawson& sons Ltd, 1980.
9. Zahid, Ansar. *History & Culture of Sindh*. Karachi: Royal Book Company, 1980.
10. Afzal, M. Rafique. *Political Parties in Pakistan*, Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, 1998.
11. Sayeed, Khalid Bin. *The Political System of Pakistan*. Boston: Houghton Mifflin, 1967.
12. Aziz, K.K. *Party, Politics in Pakistan*, Islamabad: National Commission on Historical and Cultural Research, 1976.
13. Muhammad Waseem, *Pakistan Under Martial Law*, Lahore: Vanguard, 1987.
14. Haq, Noor ul. *Making of Pakistan: The Military Perspective*. Islamabad: National Commission on Historical and Cultural Research, 1993.

#### 4.5.14 Probability & Statistics

##### Text Book

1. Walpole, R. E. 1982. "Introduction to Statistics", 3<sup>rd</sup> Ed., Macmillan Publishing Co., Inc. New York.
2. Muhammad, F. 2005. "Statistical Methods and Data Analysis", KitabMarkaz, Bhawana Bazar Faisalabad.

#### 4.5.15 Life and Living ISLAMIC STUDIES

##### Objective

This course is aimed at:

- 1 To provide Basic information about Islamic Studies
- 2 To enhance understanding of the students regarding Islamic Civilization
- 3 To improve Students skill to perform prayers and other worships
- 4 To enhance the skill of the students for understanding of issues related to faith and religious life.

##### Text Book

- 1) Hameedullah Muhammad, "Emergence of Islam", IRI,

Islamabad

- 2) Hameedullah Muhammad, “Muslim Conduct of State”
- 3) Hameedullah Muhammad, ‘Introduction to Islam
  - 1) Mulana Muhammad YousafIslahi,”
- 5) Hussain Hamid Hassan, “An Introduction to the Study of Islamic Law” leaf Publication Islamabad, Pakistan.
- 6) Ahmad Hasan, “Principles of Islamic Jurisprudence” Islamic Research Institute, International Islamic University, Islamabad (1993)
- 7) Mir Waliullah, “Muslim Jrisprudence and the Quranic Law of Crimes” Islamic Book Service (1982)
- 8) H.S. Bhatia, “Studies in Islamic Law, Religion and Society” Deep & Deep Publications New Delhi (1989)
- 9) Dr. Muhammad Zia-ul-Haq, “Introduction to Al Sharia Al Islamia”Allama Iqbal Open University, Islamabad (2001)

#### 4.5.16 Analysis of Algorithms

##### Objective

- A. **Argue** the correctness of algorithms using inductive proofs and invariants.
- B. **Analyze** worst-case running times of algorithms using asymptotic analysis.
- C. **Describe** the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it.
- D. **Derive** and solve recurrences describing the performance of divide-and-conquer algorithms.
- E. **Describe** the dynamic-programming paradigm and explain when an algorithmic design situation calls for it.
- F. **Describe** the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. **Synthesize** greedy algorithms, and **analyze** them.
- G. **Explain** the major tree algorithms and their analysis
- H. **Explain** the major graph algorithms and their analysis.
- I. **Apply** the techniques of hashing
- J. **Explain** the different ways to analyze randomized algorithms (expected running time, probability of error). **Deliver** algorithms that employ randomization. **Explain** the difference between a randomized algorithm and an algorithm with probabilistic inputs.
- K. **Compare** between different data structures. Pick an appropriate data structure for a design situation.
- L. **Explain** what an approximation algorithm is, and the benefit of using approximation algorithms. Be familiar with some approximation algorithms. **Analyze** the approximation factor of an algorithm.

##### Text Book

1. Introduction to Algorithms 3e, by Thomas H. Cormen (CLRS)
2. The Algorithm Design Manual, Second Edition by Steven S. Skiena

#### 4.5.17 Data Structures

##### Objective

- A. **Identify** fundamental data structures and algorithms and summarize their typical uses, strengths, and weaknesses
- B. **Analyze** the complexity of algorithms
- C. **Solve** problems computationally through the application of fundamental data structures and algorithms

##### Text Book

- E. Horowitz, S. Sahni, and D. Mehta, Fundamentals of Data Structures in C++, Computer Science Press.
  2. Introduction to Algorithms CLRS, 3e.
  3. Data Structures and Algorithm Analysis, Mark Allen Weiss, Florida International University, Addison-Wesley (latest Edition).

#### 4.5.18 Operating System

##### Objective

- A. **Define** Operating System Concepts
- B. **Describe** Components of OS
- C. **Identify** Modes of Processing
- D. **Explain** system performance
- E. **Illustrate** process and states of process
- F. **Classify** scheduling algorithm
- G. **Understand** types of threads
- H. **Explain** memory management
- I. **Characterize** Deadlock types and origin of deadlocks
- J. **Implement** scheduling Algorithm
- K. **Explain** demand paging and page demand
- L. **What** is fragmentation

##### Text Book

- Operating System Concepts by Abraham Silberschatz, Peter B. Galvin, and Greg Gagne, Wiley; 9th edition (December 17, 2012). ISBN-10: 1118063333
- Operating Systems: Internals and Design Principles by William Stallings, Prentice Hall; 7 edition (March 10, 2011). ISBN-10: 013230998X
- Modern Operating Systems by Tanenmaum A.S., Prentice Hall; 3rd Edition (2007). ISBN-13: 978-0136006633.

#### 4.5.19 Programming Fundamentals

##### Objectives

- A. **Recognize** and **Describe** arrays
- B. **Apply** searching and sorting algorithms using arrays

- C. **Apply** use of pointers for data types
  - D. **Use** of dynamic memory allocation using pointers and arrays
  - E. **Understand** major concepts of file processing
- Knowledge** and skills in exception handling

**Text Book**

- C++ How to Program By Dietel & Dietel 8<sup>th</sup> Edition
- Object Oriented Programming in C by Robert Lafore 3<sup>rd</sup> Edition

#### 4.5.20 Software Construction

**Objective**

- Apply a wide variety of software construction techniques and tools, including state-based and table-driven approaches to low-level design of software
- Design simple languages and protocols suitable for a variety of applications
- Generate code for simple languages and protocols using suitable tools
- Create simple formal specifications of low-level software modules, check the validity of these specifications, and generate code from the specifications using appropriate tools
- Design simple concurrent software
- Analyze software to improve its efficiency, reliability, and maintainability

**Text Book**

- Object-Oriented Software Construction, by Bertrand Meyer, Second Edition, Published by, Prentice Hall in 1997
- Formal Methods in Computing by M. Ferenczi, and Andras Patarićza , Sep 2005

#### 4.5.21 Web Design and Development

**Objective**

- A. **Recognize** difference between the internet and World Wide Web.
- B. **Describe** the purpose of various technologies and protocols underlying World Wide Web
- C. **Use** different designing tools and technologies to design layout of websites.
- D. **Apply** appropriate HTML tags to develop web page structure
- E. **Build** HTML pages with text, links, images, tables, and forms
- F. **Recognize** and **Describe** various CSS rules
- G. **Apply** CSS rules, tips, tricks and techniques to develop web page presentation
- H. **Use** HTML and CSS to develop static standard compliant websites
- I. **Recognize** and **Describe** jQuery Syntax and Features
- J. **Apply** various JavaScript features to develop interactive web based application.
- K. **To develop** improved communication and collaborative skills.

**Text Book**

- Learning Web Design by Randy Connolly and Ricardo Hoar

#### 4.5.22 Human Computer Interaction

##### Objective

- a) Gain the knowledge to obtain the best practiced Software Engineering Products for the human use and benefits.
- b) Course will encompass design solutions, design processes, design evaluation techniques and evaluation of undergone projects.
- c) After successful completion of the course, student will be able to develop design processes and products for evaluation of better solutions in real time computing environments.
- d) Improves the use of colors, visualization and graphics techniques of students and programmers with respect to true to type client and engineering requirements.

#### 4.5.23 Object Oriented Programming

##### Objective

- a) **Recognize** and **Describe** difference between procedural and object oriented programming
- b) **Understand** major concepts of object oriented programming
- c) **Knowledge** and skills in OO design and program development
- d) **Understand** major concepts about Inheritance, method overriding, Polymorphism, Operator Overloading and Exception handling in programming
- e) **Apply** basics of Java Programming.

##### Text Book

- C++ How to Program By Dietel & Dietel 8<sup>th</sup> Edition
- Object Oriented Programming in C by Robert Lafore 3<sup>rd</sup> Edition.

#### 4.5.24 Visual Programming

##### Objective

- To design, build and debug C# applications using visual programming environment (MS Visual Studio)
- To use forms, dialogs, and a variety of other GUI components to implement SDI and MDI applications
- To use variables, enumerations, arrays, generic collections, selection and repetition control structures
- To learn to create interfaces, classes, and objects, properties, and methods
- To create data-driven applications using ADO.NET
- To learn event-driven programming principles
- To understand and handle exceptions

##### Text Book

- BEGINNING VISUAL C# ® 2012 PROGRAMMING Karli Watson, Jacob Vibe Hammer, John D. Reid, Morgan Skinner, Daniel Kemper, Christian Nagel, Wrox Press.
- PROFESSIONAL VISUAL STUDIO® 2012 Bruce Johnson, Wrox Press

- PROFESSIONAL C# 2012 AND .NET 4.5 by Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, Wrox Press *Exceptional Children in Focus*

#### 4.5.25 Modern Programming Languages

##### Objective

- To develop** an understanding of various basic concepts and constructs underlying the design of the modern programming languages.
- To analyze** the strengths and limitations of different programming paradigms in solving programming problems.
- To develop** an understanding of any modern Programming language.
- To Identify** Why are there so many different programming languages
- To recognize** in what ways modern programming languages are similar.
- To explain** which programming language is best for which type of application
- To make** students able to enter the market with the expertise of modern languages, which is considered necessary in their field.
- To develop** improved communication and collaborative skills.

**Student** will practice programming in ActionScript 3.0 and different programming language.

##### Text Book

Concepts of Programming Language By Robert Sabesta, 6<sup>th</sup> Edition

#### 4.5.26 Web Programming

##### Objective

- Recognize** difference between the internet and World Wide Web
- Describe** the purpose of various technologies and protocols underlying World Wide Web
- Recognize** and **Describe** JavaScript Syntax and Features
- Apply** various JavaScript features to develop interactive web-based application
- Recognize** and **Describe** PHP Syntax and Features
- Apply** various PHP features to develop dynamic web based application
- Use** MySQL to store web application data
- Recognize** and Describe jQuery Syntax and features
- Apply** jQuery to rapidly develop interactive web based application
- Apply** AJAX to develop dynamic server side web based application
- Understand** the concept of server side framework to rapid develop dynamic website.

##### Text Book

- Fundamentals of Web Development by Randy Connolly and Ricardo Hoar.

#### 4.5.27 Web Design and Application

##### Objective

- To learn Hypertext Markup Language (HTML), the language of the web
- To learn Cascading Style Sheets (CSS)
- To learn the standard, widely used client-side scripting language: JavaScript
- To develop skills in using jQuery to provide enhanced interaction capabilities

- To provide an overview of Extensible Markup Language (XML)
- To introduce to web-design techniques, e.g. mockups, grid system frameworks
- To develop skills in using a WYSIWIG environment (Adobe DreamWeaver)
- To be able to design and create standards-based web pages following usability principles

### **Text Book**

Learning Web Design by Randy Connolly and Ricardo Hoar.

### **4.5.28 Mathematics-III**

#### **Objective**

Fourier series: Periodic functions, Fourier series for functions of period  $2\pi$ , Even and odd functions, half-range expansions, Laplace transforms: Laplace transforms of elementary functions, Unit step function, Periodic functions, Inverse Laplace transforms, Applications to initial-value problems and Physical problems, Complex Variables: Functions, Derivatives, Analytic functions, Cauchy-Riemann equations, Elementary complex functions, Complex integrations, Mathematical statistics: Probability and its theorems, Mean and standard deviations, Binomial, Poisson and Normal Distributions.

#### **Text Book**

1. Erwin Krayzig, “Advanced Engineering Mathematics”, Wiley, 2006
2. B. Creighton Buck, “Advanced Calculus”, Waveland Pr In, 2003.
3. Glyn James, “Advanced Modern Engineering Mathematics”, Prentice Hall, 2005.

### **4.5.29 Communication Skills**

#### **Objective**

Basics of Grammar. Parts of speech and use of articles. Sentence structure, active and passive voice. Practice in unified sentence. Analysis of phrase, clause and sentence structure Transitive and intransitive verbs Punctuation and spelling. Comprehension: Answers to questions on a given text. Discussion: General topics and every-day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students). Listening: To be improved by showing documentaries/films carefully selected by subject teachers

Translation skills: Urdu to English.

Paragraph writing: Topics to be chosen at the discretion of the teacher.

Presentation skills.

#### **Text Book**

- Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492
- Practical English Grammar by A. J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313506
- Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993.
- Reading. Upper Intermediate. Brian Tomlinson and Rod Ellis. Oxford supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.

#### 4.5.30 Mathematics-I

##### Objective

- FUNCTION: Exponential and logarithmic functions, Hyperbolic and inverse hyperbolic functions, relations between circular and hyperbolic functions.
- DETERMINANTS AND MATRICES: Simple properties and their application to solution of system of equations, Algebra of Matrices and their application to solution of system of equations.
- COMPLEX NUMBERS: Argand's diagram, operations with complex numbers and their geometrical interpretations.
- COORDINATE GEOMETRY: Hyperbola, asymptotes, Simple properties of the parabola, ellipse, and hyperbola. Solid Geometry of line, plane and sphere.
- DIFFERENTIAL CALCULUS: Rules of Differentiation, function of a function, implicit function and successive differentiation; partial differentiation.
- INTEGRAL CALCULUS: Integration as inverse of differentiation, general rules; integration by substitution and by parts, use of partial Fraction, Definite integrals, Double integrals.
- APPLICATIONS OF CALCULUS: Slope of curve, Maxima & minima; areas of surfaces and volumes of solids Mean and root mean square values; curvature and radius of curvature and differential equations of first order and first degree.
- VECTORS: Addition and subtraction of vectors, scalar and vector products

##### Text Book

- Thomas G.B. and Funney, R.L. Calculus and Analytic Geometry
- Peter Kuffiting, Technical Mathematics with calculus.

#### 4.5.31 Mathematics-II

##### Objective

- Linear differential Equations of first and second order and their applications to relevant engineering problems.
- Partial differential equation: Total differential and its application to small errors. Taylor's series of two variables. Maxima and minima.
- Second & Third Order integration, area of surfaces and volume of solid. Application to technical problems.
- Complex variable theory: Analytical functions and line integrals.
- Fourier series: Even and odd functions.
- Laplace transforms, Inverse Laplace Transforms and their applications.
- Probability and its theorems, Mean & Standard deviation, Poisson and Normal distribution.

##### Text Books:-

1. Krayzic, Advanced Engineering Mathematics.
2. Modern Advanced Engineering Mathematics, Glyn James.



#### 4.5.32 Communication Skills II

##### Objectives:-

1. Introduction to Communication Importance, Theories, Barriers, Components
2. The Seven C's for Effective Communication
3. Listening Skills Blocks, Thinking and Feeling Notes Taking Giving Feedback.
4. Reading Skills Active Reading Techniques Skimming, General Reading and Careful Reading.
5. Introduction to Writing Skills Planning Drafting and Editing Emphasis and Connections.
6. Grammar and Vocabulary Technical and Business Vocabulary Constructing Formal Sentences.

##### Text Books:-

1. Murphy H. A., Hildebrandt H. W. and Thomas J.P. EFFECTIVE BUSINESS COMMUNICATIONS. McGraw-Hill, USA (Latest edition).
2. Norman S. WE'RE IN BUSINESS. Longman Group Ltd., UK (Latest Edition).
3. Thomson A. J. and Martinet A. V. A PRACTICAL ENGLISH GRAMMAR. Oxford University Press, UK (Latest Edition).

#### 4.5.33 Islamic Studies

##### Objectives:-

This course is aimed at:

1. To provide Basic information about Islamic Studies
2. To enhance understanding of the students regarding Islamic Civilization
3. To improve Students skill to perform prayers and other worships
4. To enhance the skill of the students for understanding of issues related to faith and religious life.

##### Course Outline:-

Introduction to Quranic Studies

1. Basic Concepts of Quran
2. History of Quran
3. Uloom-ul –Quran

Study of Selected Text of Holly Quran

1. Verses of Surah Al-Baqra Related to Faith (Verse No-284-286)
2. Verses of Surah Al-Hujrat Related to Adab Al-Nabi

(Verse No-1-18)

3. Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11)
4. Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77)
5. Verses of Surah Al-Inam Related to Ihkam (Verse No-152-154)

Study of Selected Text of Holly Quran

1. Verses of Surah Al-Ihزاب Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.)

2. Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment
3. Verses of Surah Al-Saf Related to Tafakar,Tadabar (Verse No-1,14)

#### Seerat of Holy Prophet (S.A.W) I

1. Life of Muhammad Bin Abdullah ( Before Prophet Hood)
2. Life of Holy Prophet (S.A.W) in Makkah
3. Important Lessons Derived from the life of Holy Prophet in Makkah

#### Seerat of Holy Prophet (S.A.W) II

1. Life of Holy Prophet (S.A.W) in Madina
2. Important Events of Life Holy Prophet in Madina
3. Important Lessons Derived from the life of Holy Prophet in Madina

#### Introduction To Sunnah

1. Basic Concepts of Hadith
2. History of Hadith
3. Kinds of Hadith
4. Uloom –ul-Hadith
5. Sunnah & Hadith
6. Legal Position of Sunnah

#### Selected Study from Text of Hadith

##### Introduction To Islamic Law & Jurisprudence

1. Basic Concepts of Islamic Law & Jurisprudence
2. History & Importance of Islamic Law & Jurisprudence
3. Sources of Islamic Law & Jurisprudence
4. Nature of Differences in Islamic Law
5. Islam and Sectarianism

#### Islamic Culture & Civilization

1. Basic Concepts of Islamic Culture & Civilization
2. Historical Development of Islamic Culture & Civilization
3. Characteristics of Islamic Culture & Civilization
4. Islamic Culture & Civilization and Contemporary Issues

#### Islam & Science

1. Basic Concepts of Islam & Science
2. Contributions of Muslims in the Development of Science
3. Quranic & Science

#### Islamic Economic System

1. Basic Concepts of Islamic Economic System
2. Means of Distribution of wealth in Islamic Economics
3. Islamic Concept of Riba
4. Islamic Ways of Trade & Commerce

#### Political System of Islam

1. Basic Concepts of Islamic Political System
2. Islamic Concept of Sovereignty
3. Basic Institutions of Govt. in Islam

#### Islamic History

1. Period of Khlaft-E-Rashida
2. Period of Ummayyads
3. Period of Abbasids

#### Social System of Islam

1. Basic Concepts of Social System of Islam
2. Elements of Family
3. Ethical Values of Islam

#### **Text Books:-**

1. Hameed ullah Muhammad, “Emergence of Islam” , IRI, Islamabad
2. Hameed ullah Muhammad, “Muslim Conduct of State”
3. Hameed ullah Muhammad, „Introduction to Islam
4. Mulana Muhammad Yousaf Islahi,”
5. Hussain Hamid Hassan, “An Introduction to the Study of Islamic Law” leaf Publication Islamabad, Pakistan.
6. Ahmad Hasan, “Principles of Islamic Jurisprudence” Islamic Research Institute, International Islamic University, Islamabad (1993)
7. Mir Waliullah, “Muslim Jrisprudence and the Quranic Law of Crimes” Islamic Book Service (1982)
8. H.S. Bhatia, “Studies in Islamic Law, Religion and Society” Deep & Deep Publications New Delhi (1989)
9. Dr. Muhammad Zia-ul-Haq, “Introduction to Al Sharia Al Islamia” Allama Iqbal Open University, Islamabad (2001)

### **4.5.34 Digital and Logic Design**

#### **Objectives:-**

To provide the students a basic understanding of the Digital Electronics (Digital systems and circuits). To provide the student a pre-requisite background for future studies in microprocessors and microcomputer interfacing.

#### **Course Outline:-**

Number systems & Codes ; Binary, Octal, Hexadecimal number systems and their inter-conversion; Binary Arithmetic (Addition, Subtraction, Multiplication and Division); Error detection and correction; Boolean Algebra, basic theorems and properties of Boolean Algebra, Boolean functions, Canonical and Standard forms; Digital Logic Gates; Various logic families, like TTL and CMOS, working and their characteristics; Combinational Logic Design ; The K-map method, two, three, four and five variable maps ; Sum of products and Product of Sums simplification, NAND and NOR implementation; Ex-OR and EX-NOR functions; MSI circuits: Binary adder and subtractor, comparators, decoders, BCD-to-Seven segment decoder/drivers, sevensegment displays, encoders, code converters, multiplexers, de-multiplexers; Introduction to Sequential logic, S-R Flip-flops,

JK flip-flop, D flip-flop, T flip-flop, master slave flip-flops; Classification of sequential circuits, registers, A to D and D to A converter circuits, Counters; Semiconductor memories, introduction, memory organization, classification and characteristics of memories.

**Text Books:-**

- Morris Mano, Digital Design, Prentice Hall of India.
- Thomas L. Floyd & R.P Jain, “Digital Fundamentals”.
- Ronald J. Tocci, Neal S. Widmer, “Digital Systems Principles and Applications”.
- William Kleitz, “Digital Electronics Practical Approach”.

#### 4.5.35 Technical Writing

**Objectives:-**

Enhance language skills and develop critical thinking

**Course Outline:-**

Presentation skills. Essay writing: Descriptive, narrative, discursive, argumentative. Academic writing: How to write a proposal for research paper/term paper. How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency). Technical Report writing. Progress report writing.

**Text Books:-**

1. Writing. Advanced by Ron White. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 435407 3.
2. College Writing Skills by John Langan. McGraw-Hill Higher Education. 2004.
3. Patterns of College Writing (4th Edition) by Laurie G. Kirszner and Stephen R. Mandell. St. Martin’s Press.
4. The Mercury Reader. A Custom Publication. Compiled by norther Illinois University. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and Maurice Scharon. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students).

#### 4.5.36 Basic Teachings of the Qur’an (Revealed Sciences - I)

##### Objective

**Course Objectives:**

**1. General:**

- a. To learn the true concept of Allah, values and needs of the society.
- b. To motivate themselves for determination of the character.
- c. To develop an Islamic professional who can work for Islamic welfare state.
- d. To prepare the students for adaptation of Islamic way of life in modern age.

**2. Specific**

**a. Knowledge:**

- I. To offer an introduction to the Holy Qur’an
- II. To inculcate the basic concept of the Qur’anic teaching.
- III. To know about the etiquettes of DUA.
- IV. To understand the qualities of believers.

**b. Skills:**

- I. To recite the Holy Qur'an with correct pronunciation and annotation.
- II. To make them capable for understanding and translate the Holy Qur'an with the help of Arabic Grammar.
- III. To communicate effectively (written, oral and inter-personal).
- IV. To solve the problems in the light of teachings of the Holy Qur'an.

**c. Attitude/Behavior:**

- I. To adopt good manners and avoid social evils.
- II. To develop the characteristics of MUTTAQEEN.

**Text Book**

- Maududi, Abul A`la. (1998) Tafheem-ul-Qur'an. Lahore: Idara Tarjaman ul Quran.
- Hashmi, Dr. Ramiz Iqbal, (2003), The Science of Reciting the Qur'an, Rawalpindi, Pakcom Printer, Peshawar Road.
- Taqi, Usmani, Uloom-ul-Qur'an, Dar-us-Ishaat, Karachi
- Taqi, Usmani, Introduction to Science of Qur'an, Dar-us-Ishaat, Karachi
- Ali, Syed Shaukat, Taqseem-e-Meeras, Islamic Publication Ltd., Lahore, 2006

**4.5.37 Introduction to Hadith & Seerah (2)**

**Objective**

**1. General:**

- a. To familiarize the students with the status and authoritative position of Prophet Muhammad (SAW).
- b. To build up the information in Hadith and Seerah perspective.
- c. To understand the preservation and transference of Hadith.
- d. To learn the terminologies of Hadith.

**2. Specific:**

- a. Knowledge:
  - i. To understand the science of Hadith.
  - ii. To describe the methods for preservation and transference adopted by Muslim scholars.
  - iii. To have sufficient knowledge on the life of the Holy Prophet (SAW).
  - iv. To inculcate the true spirit of Islam through selected textual study.
- b. Skills:
  - i. To develop the reading skill for Arabic text of Hadith.
  - ii. To create the positive and critical thinking.
  - iii. To enable the students to seek and utilize the basic sources of Shariah.
- c. Attitude/Behaviour:
  - i. To develop a personality under the influence of moral teachings.
  - ii. To follow the exemplary pattern of Holy Prophet's (SAW) seerah in every aspect of life.

**Text Book**

- Hasan, S. (1995) An Introduction to Science of Hadith, RiYadh: Darussalam
- Alvi Khalid Doctor 1999, Hifazat-e-Hadith Lahore Makataba Al-Faisal
- Nawavi, Mohi-ud-din, Arba'een-e-Nawavi, Dar-ul-Ishaat, Karachi

- Alvi, Khalid Dr., Insaan-e-Kamil, Al-Faisal, Lahore

#### 4.5.38 Senior Design Project

##### Objective

This course provides research projects in community to provide problem solving skills and to meet the challenges in the world.

#### 4.6 Standard 2-1

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

BSCS program is designed with Core areas of theoretical work, lab work and Project work to meet the requirements for undergraduates to enter the graduate program.

##### 1. Group 1: Computer Sciences

Analysis of Algorithm (CS-3043), Advance Operating System (CS-3099), 3D-Computer Animation (MGMT-2023), Digital Logic and Design (CS-1043), Discrete Structure (CS-1033), Introduction to Web Development (IT-1023), Introduction to Computing (CS-1014), Network Security (CS-3098), Programming Fundamentals (CS-1024), Software Requirement Engineering (SE-2023), Theory of Computing (CS-3097), Introduction to Software Development (SS-1013), Object Oriented Programming (CS-2024), Data Structure & Algorithms (CS-2014), Computer Organization & Architecture (CS-2043), Data Communication (CS-3083), Database Management (CS-3024), Operating Systems (CS-3014), System Analysis & Design (CS-3183), Computer Communication & Networks (CS-3033), Human Computer Interaction (CS-3113), Software Project Management (SE-3043), Software Design & Architecture (SE-3023), Theory of Automata (CS-3193), Software Construction (SE-3063), Software Quality Assurance (SE-3053), Information Security Management (CS-4213), Web Programming (IT-3033)

##### 2. Group 2 General Sciences

Physics (PHY-1013)

##### 3. Group 3 Humanities

Communication Skills (SS-1023), Life & Living 1 (Personality Development) (SS-1062), English Comprehension & Composition (SS-1013), Life & Living 2 (SS-1072), Life & Living 3 (SS-2031), Life & Living 4 (SS-2041), Technical & Business Writing (SS-2023), Life & Living 5 (SS-3021), Life & Living 6 (SS-3031), Life & Living 7 (Professional Ethics) (SS-4011), Life & Living 8 (SS-4021)

##### 4. Group 4: Mathematical Sciences

Multivariable Calculus (MATH-1023), Calculus & Analytical Geometry (MATH-1013), Linear Algebra & Applications (MATH-2023), Statistics & Probability (STAT-2013), Numerical and Symbolic Computation (MATH-3013)

##### 5. Group 5: Projects

## 6. Course Groups and Program Objectives

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

**Table 4: Courses versus Program Objectives**

### 4.7 Standard 2-2

**Theoretical backgrounds, problem analysis and decision Making and Planning must be stressed within the program's core material.**

Elements	Courses
Theoretical Background	Communication Skills (SS-1023), Digital Logic and Design (CS-1043), Discrete Structure (CS-1033), Introduction to Web Development (IT-1023), Introduction to Computing (CS-1014), Life & Living 1 (Personality Development) (SS-1062), Multivariable Calculus (MATH-1023), Network Security (CS-3098), Programming Fundamentals (CS-1024), Software Requirement Engineering (SE-2023), Calculus & Analytical Geometry (MATH-1013), Theory of Computing (CS-3097), Introduction to Software Development (SS-1013), Linear Algebra & Applications (MATH-2023), Physics (PHY-1013), Statistics & Probability (STAT-2013), Technical & Business Writing (SS-2023) Data Structure & Algorithms (CS-2014), Database Management (CS-3024), Numerical and Symbolic Computation (MATH-3013), Operating Systems (CS-3014), Theory of Automata (CS-3193), Software Construction (SE-3063), Software Quality Assurance (SE-3053), Life & Living 7 (Professional Ethics) (SS-4011), Information Security Management (CS-4213),
Problem Analysis	Analysis of Algorithm (CS-3043), Advance Operating System (CS-3099), Digital Logic and Design (CS-1043), Discrete Structure (CS-1033), Multivariable Calculus (MATH-1023), Software Requirement Engineering (SE-2023), Calculus & Analytical Geometry (MATH-1013), Linear Algebra & Applications (MATH-2023), Object Oriented Programming (CS-2024), Data Structure & Algorithms (CS-2014), Computer Organization & Architecture (CS-2043), Data Communication (CS-3083), System Analysis & Design (CS-3183), Computer Communication & Networks (CS-3033), Human Computer Interaction (CS-3113), Software Design & Architecture (SE-3023), Theory of

	Automata (CS-3193), Software Construction (SE-3063), Information Security Management (CS-4213)
Solution Design	Analysis of Algorithm (CS-3043), Advance Operating System (CS-3099), 3D-Computer Animation (MGMT-2023), Digital Logic and Design (CS-1043), Discrete Structure (CS-1033), Object Oriented Programming (CS-2024), Database Management (CS-3024), System Analysis & Design (CS-3183), Computer Communication & Networks (CS-3033), Human Computer Interaction (CS-3113), Software Project Management (SE-3043), Software Design & Architecture (SE-3023), Software Construction (SE-3063), Final Year Project (CS-4213), Information Security Management (CS-4213), Web Programming (IT-3033)

**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.**

B.S Computer Sciences program is under accreditation by National Computing Education Accreditation Council (NCEAC).

Minimum Requirements for each program (Program Semester Credit Hours)

Program	Maths & Basic Sciences	Computing Science Topics	General Education (Humanities & Management Sciences)	Others	Electives
B.S Computer Science	18	76+5	18	10	

**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**

BS Computer Sciences is an information technology program. It comprises of core technology courses. These courses are covered in 8 semesters and enable the students to analyze, design, develop and implement software solutions. These courses educate the students to basic concepts of the computer sciences and help them do practical work, where required. The list of these courses is available in section 4.6.1 above.

#### **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 course of Communication Skills (course number SS-1023), Technical & Business Writing (course number SS-2023) which develops the oral and written communication skills of the students..

### **5.0 Criterion 3: Laboratories and Computing Facilities**

RIPHAH has established multiple laboratories for students to practice their learning outcomes. Following is the list of available laboratories available to BSCS students:

1. Computer Lab-I
2. Computer Lab-II
3. Computer Lab-III
4. Digital and Logic Design Lab

#### **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 College 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 & equipment. 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 Riphah, Faisalabad Campus are extremely good and can be compared with any high reputed university of the country.

RIPHAH 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**

All, Riphah programs, since year 2002, started and finished on schedule. The teachers and students in Riphah have facility of interaction, even after classes, for any professional and academic advice. This fact is also highlighted by the students

in the feedback on Performa number 10, taken by the Quality Enhancement Cell (QEC).

#### **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 offers courses (core and electives) as per requirements of the program. The required and elective courses are offered in a logical sequence to groom the students to obtain the program's defined objectives and outcomes. The courses offered outside the department belong to Faculty of Basic Sciences and Faculty of Social Sciences. The Software Engineering program coordinator coordinates with the respective coordinators in both the faculties and accommodates the desired courses 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 carry out frequent interaction with students. Students are encouraged to give feedback and their views, about syllabi 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 o 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.

In charge Industrial Liaison arranges industrial tours for students to improve their subject vision and technical know-how. He/ She also invites professionals from different business entities to conduct interactive sessions with students for advice on professional matters/future career planning.

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 twice a year, in fall and spring semester.

Students who have completed the 12 years of education (relevant degree) are eligible to appear in the admission test of the program. Admission is granted strictly on the basis of academic record, admission test and interview.

Students from accredited universities are eligible to transfer their credits to RICAS, Lahore Campus. 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. Dean of the faculty 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 selected students are registered by Registrar office and registration number is issued.

At the end of each semester students are evaluated through assignments, sessional, mid-term tests and final examinations. The laboratory work has got a good weightage and it is done on regular basis as per schedule and contributes significantly towards the student's evaluation for relevant course. Passing 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 positions are advertised in the national newspapers. Applications are scrutinized by the respective Deans and HR Department. Call letters are issued to the short-listed candidates on the basis of experience, qualification, publications and other factors as determined by the University in the light of HEC guidelines.

University has a very transparent selection system. Selection of candidates is approved by the Board of Governors (BoG). HEC helps Riphah, in enrolling the foreign faculty as and when demanded by Riphah.

Good pay package, favorable teaching environment, research facilities and management support keeps the teachers glued to Riphah.

Faculty performance is evaluated through performa number 10 by students. QEC evaluates data, makes comparative charts and puts up to Dean. Annual increment is awarded to the faculty members on the recommendations of Dean, Vice Chancellor and 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 Proforma 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 students' progress in that semester. Qualified students are allowed to join next semester and this cycle continues till the end of 8th semester which is the final semester. At the end of 8th semester all students are required to submit their respective projects. Student's final results are announced on the basis of projects and examination results.

The program completion process is evaluated on the basis of feedbacks from current students, alumni and employers. The feedback is documented and its evaluation indicates degree of satisfaction of the graduates. Three forms (Performa 3, Survey of Graduating Students (Annexure-F), Performs 7, Alumni Survey (Annexure-A) and Performa 8, Employer Survey (Annexure-B)) are extremely good instruments to measure the program outcomes and processes. 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 along with software engineering, they shall be given more exposure towards hardware aspects.

The proposal is being evaluated by Board of Faculty. The recommendations will be put up to Academic Council for grant of 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, presentation skills and ability to perform requirement engineering tasks. 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
Software Engineering	CS-3043, CS-3099, CS-1043, IT-1023, CS-1014, CS-1024, SE-2023, CS-3097, SS-1013, CS-2024, CS-2014, CS-2043, CS-3024, CS-3014, CS-3183, CS-3113, SE-3043, SE-3023, CS-3193, SE-3063, SE-3053, IT-3033	2	1
Computer Networks	CS-3099, CS-1043, CS-3098, CS-2024, CS-2043, CS-3083, CS-3033, SE-3063, CS-4213	2	1
Information Systems	CS-3099, CS-1014, CS-1024, SE-2023, CS-3097, CS-2024, CS-2014, CS-2043, CS-3024, CS-3183, CS-3033, CS-3113, SE-3023, CS-3193, SE-3063, CS-4213, IT-3033	2	
<b>Total</b>		<b>6</b>	<b>2</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 Proforma number 5 indicates the mix reactions of the faculty, which indicates that teaching load be distributed evenly and more relaxed environment be generated. Cumulative results of faculty surveys are attached in Annexure 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 6 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 BSCS Program has no graduates yet.

#### **10.3 Standard 8-3**

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

Library at Riphah Faisalabad Campus holds more than 2894 books for all programs. Sufficient number of computers is 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 Riphah 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 Riphah 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 BS-Computer Sciences, Lahore Campus is an important document, which gives strengths and weaknesses of the program. The management is striving hard to improve infrastructure for establishment of an environment conducive for studies. The faculty is focused on imparting quality education, introduction of new and innovative techniques and conduct of quality research to produce competent engineers. 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. Weaknesses are identified which is training of Laboratory staff, availability of senior teaching staff after class hours. Improvements in curriculum design and infrastructure are suggested which are based upon set, well defined and approved criteria. 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, is thoroughly planned. Their efficacy was measured through different standards and it was found to be satisfactory.

The facilities and shortcomings in the laboratory have been discussed. It was concluded that laboratory facilities and class rooms need further improvement. The need of refresher 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 12 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**

- a. Properly scheduled and on time classes
- b. Trained and experienced faculty
- c. Up to date curriculum composition, meeting the market needs
- d. Strong interaction with industry
- e. Well Equipped laboratories and computing facilities

#### **11.2 Weak Points:**

- a. Training of laboratory staff
- b. Availability of senior teaching staff after class hours
- c. Guidance/Advisory Process for Students

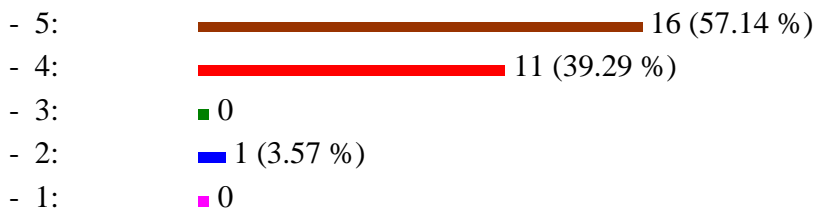
**Annexure – A: Employer Survey**  
NOT APPLICABLE

**Annexure – B: Alumni Survey**  
NOT APPLICABLE

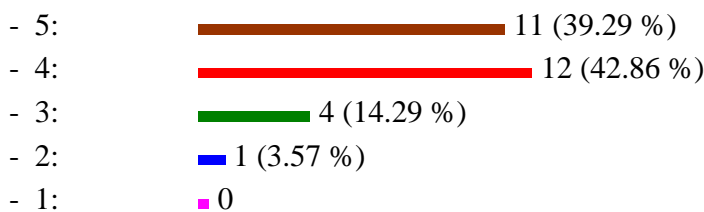
**Annexure – C: Course Evaluation Survey**

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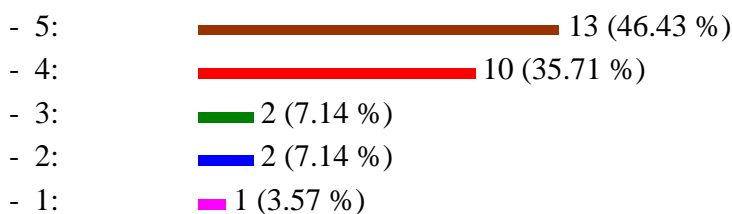
**1. (1) The course objectives were clear.**



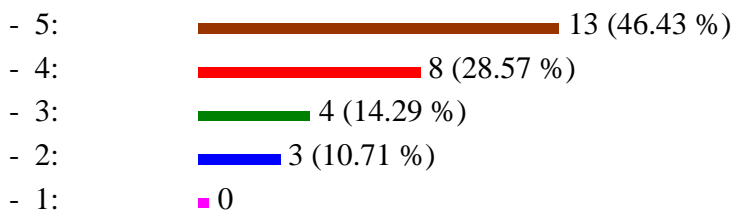
**2. (2) The course workload was manageable**



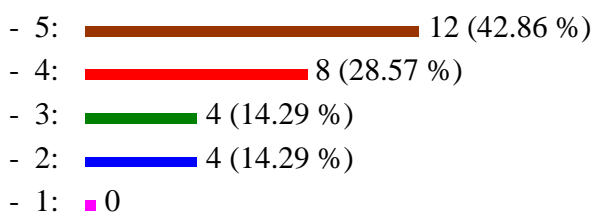
**3. (3) The length of the course was appropriate**



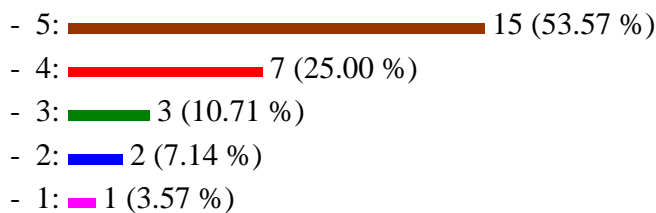
**4. (4) Teaching methods encouraged participation**



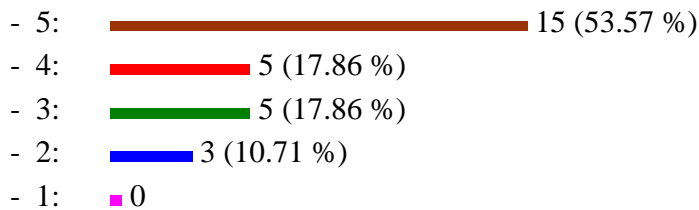
**5. (5) The Teacher strictly follows the goals and objectives of the course.**



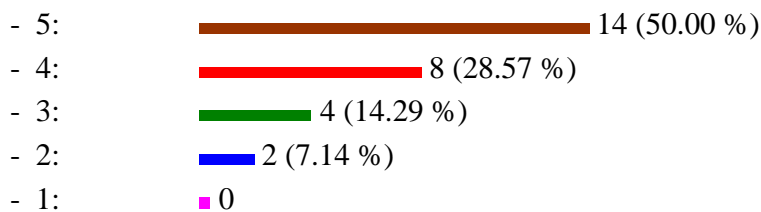
**6. (6) Learning materials (lesson plans, Course notes etc) were relevant and useful.**



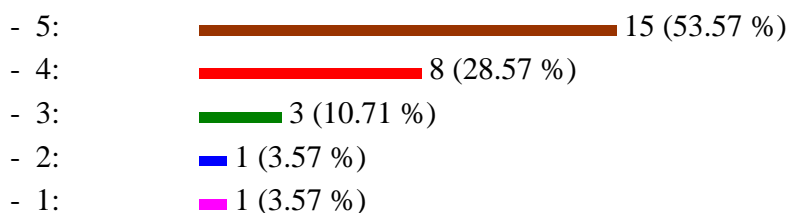
**7. (7) Recommended reading books etc were relevant and appropriate**



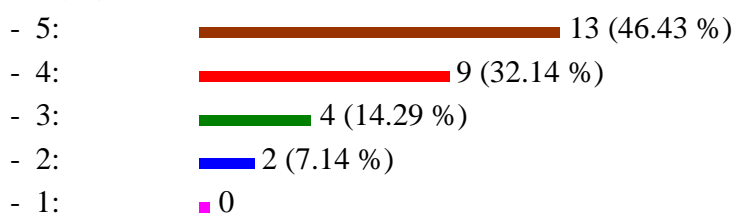
**8. (8) I understood all the lectures**



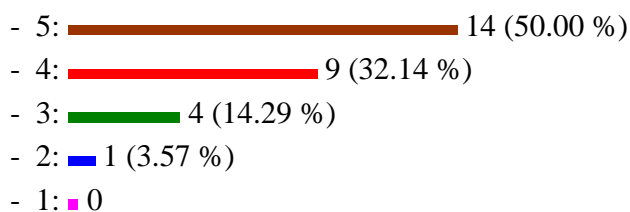
**9. (9) The pace of the course was appropriate**



**10. (10) The methods of assessments were fair**








**11. (11) As a result of taking this course my interest and curiosity about the issues and questions in this subject area has grown**













**12. (12) As a result of taking this course my thinking is more focused and systematic, at least in this subject area.**

- 5:  14 (50.00 %)
- 4:  7 (25.00 %)
- 3:  5 (17.86 %)
- 2:  2 (7.14 %)
- 1:  0

**13. (13) The material in the practical was useful (if applicable)**

- 5:  15 (53.57 %)
- 4:  8 (28.57 %)
- 3:  3 (10.71 %)
- 2:  2 (7.14 %)
- 1:  0

**14. (14) In this course, I improved my ability to give sound reasons regarding issues in this subject area**

- 5:  15 (53.57 %)
- 4:  7 (25.00 %)
- 3:  3 (10.71 %)

**Annexure- D:**

**Students Teachers Evaluation Survey**

**1. (Undertaking) I confirm that evaluation being done by me is all correct**

- Yes: 28 (100.00 %)
- No: 0

**2. (1) The Teacher starts and finishes class on time**

- 5: 15 (53.57 %)
- 4: 8 (28.57 %)
- 3: 3 (10.71 %)
- 2: 2 (7.14 %)
- 1: 0

**3. (2) The Teacher comes duly prepared for the lecture in each class**

- 5: 19 (67.86 %)
- 4: 3 (10.71 %)
- 3: 4 (14.29 %)
- 2: 1 (3.57 %)
- 1: 1 (3.57 %)

**4. (3) The Teacher utilizes full time of class focusing on the subject matter**

- 5: 18 (64.29 %)
- 4: 5 (17.86 %)
- 3: 4 (14.29 %)
- 2: 1 (3.57 %)
- 1: 0

**5. (4) The Teacher demonstrates knowledge of the subject**




- 5: 17 (60.71 %)
- 4: 6 (21.43 %)
- 3: 2 (7.14 %)
- 2: 2 (7.14 %)
- 1: 1 (3.57 %)

**6. (5) The Teacher has covered the whole course**






- 5: 14 (50.00 %)
- 4: 6 (21.43 %)
- 3: 6 (21.43 %)
- 2: 1 (3.57 %)
- 1: 1 (3.57 %)

**7. (6) The Teacher is available for after class consultations during the specified office hours.**






- 5: 12 (42.86 %)
- 4: 8 (28.57 %)

- 3:  3 (10.71 %)
- 2:  5 (17.86 %)
- 1:  0






**8. (7) The Teacher provides additional material/books/internet references apart from the text book**

- 5:  15 (53.57 %)
- 4:  7 (25.00 %)
- 3:  3 (10.71 %)
- 2:  3 (10.71 %)
- 1:  0






**9. (8) The Teacher communicates the subject matter clearly and effectively**

- 5:  16 (57.14 %)
- 4:  6 (21.43 %)
- 3:  4 (14.29 %)
- 2:  1 (3.57 %)
- 1:  1 (3.57 %)






**10. (9) The Teacher maintains a conducive environment in the class**

- 5:  13 (46.43 %)
- 4:  10 (35.71 %)
- 3:  3 (10.71 %)
- 2:  1 (3.57 %)
- 1:  1 (3.57 %)





**11. (10) The Teacher shows respect towards students and encourages class participation**

- 5:  15 (53.57 %)
- 4:  6 (21.43 %)
- 3:  5 (17.86 %)
- 2:  1 (3.57 %)
- 1:  1 (3.57 %)

**12. (11) The Teacher ensures equitable participation of the students in the class**

- 5:  14 (50.00 %)
- 4:  8 (28.57 %)
- 3:  4 (14.29 %)
- 2:  2 (7.14 %)
- 1:  0

**13. (12) The Teacher is fair in exams and grading**

- 5:  15 (53.57 %)
- 4:  6 (21.43 %)
- 3:  4 (14.29 %)
- 2:  3 (10.71 %)

- 1: ■ 0

**14. (13) The Teacher checks and returns assignments/exams and scripts, in time**

- 5: ■ 12 (42.86 %)  
- 4: ■ 10 (35.71 %)  
- 3: ■ 3 (10.71 %)  
- 2: ■ 1 (3.57 %)  
- 1: ■ 2 (7.14 %)

**15. (14) The Teacher relates current lesson content to previous and future lessons**

- 5: ■ 17 (60.71 %)  
- 4: ■ 6 (21.43 %)  
- 3: ■ 4 (14.29 %)  
- 2: ■ 1 (3.57 %)  
- 1: ■ 0

**16. (15) The teacher takes extra steps to elevate competency level of weak students**

- 5: ■ 13 (46.43 %)  
- 4: ■ 9 (32.14 %)  
- 3: ■ 4 (14.29 %)  
- 2: ■ 1 (3.57 %)  
- 1: ■ 1 (3.57 %)

**17. (16) The Teacher accepts and incorporates student's ideas, questions and responses.**

- 5: ■ 12 (42.86 %)  
- 4: ■ 9 (32.14 %)  
- 3: ■ 4 (14.29 %)  
- 2: ■ 3 (10.71 %)  
- 1: ■ 0






**18. (17) The Teacher make use of audio/visual aids to make the lectures interesting**

- 5: ■ 13 (46.43 %)  
- 4: ■ 7 (25.00 %)  
- 3: ■ 5 (17.86 %)  
- 2: ■ 3 (10.71 %)  
- 1: ■ 0






**19. (18) The Teacher uses easy and understandable vocabulary for students**

- 5: ■ 16 (57.14 %)  
- 4: ■ 5 (17.86 %)  
- 3: ■ 4 (14.29 %)  
- 2: ■ 2 (7.14 %)  
- 1: ■ 1 (3.57 %)

**20. (19) During the teaching, the teacher display the enthusiasm towards the subject and teaching -motivation to subject interest**

- 5:  15 (53.57 %)
- 4:  7 (25.00 %)
- 3:  4 (14.29 %)
- 2:  2 (7.14 %)
- 1:  0

**21. (20) The teacher is using VLE/Moelim for academic activities (assignments/quizzes/notes)**

- 5:  13 (46.43 %)
- 4:  7 (25.00 %)
- 3:  4 (14.29 %)
- 2:  3 (10.71 %)
- 1:  1 (3.57 %)

**Annexure – E:**

**Research Papers List**

**Research Publication Detail**

Name	Research Paper
Umair Ahmad Khan	<ol style="list-style-type: none"> <li data-bbox="576 488 1350 723">1. Secure Communication Protocol for Bluetooth Devices over Short Distances,” In <i>Proceedings of the First EAI Conference on Smart Cities, Societies Infrastructures, Technologies, and Applications (SCITA)</i>, Jeddah, Saudi Arabia, 2017. To appear in <i>Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering</i>, <b>Springer</b>. (2016 IF – 0.279 – Source SJR)</li> <li data-bbox="576 768 1350 969">2. S. Rehman and <b>M. U. Khan</b>, “Security and Reliability Requirements for a Virtual Classroom,” In <i>Proceedings of the 2<sup>nd</sup> International Workshop on Enterprise Web Application Dependability</i>, Montreal, Canada, 2016. <i>Procedia Computer Science</i>, <b>Elsevier</b>, volume 94, pages 447-452. (2016 IF – 0.81 – Source SJR)</li> <li data-bbox="576 1014 1350 1216">3. S. Rehman and <b>M. U. Khan</b>, “A Reliable and Secure Virtualized Clinical Assistance Tool for Doctors and Patients,” In <i>Proceedings of the 2<sup>nd</sup> International Workshop on Enterprise Web Application Dependability</i>, Montreal, Canada, 2016. <i>Procedia Computer Science</i>, <b>Elsevier</b>, volume 94, pages 441-446. (2016 IF – 0.81 – Source SJR)</li> <li data-bbox="576 1261 1350 1417">4. <b>M. U. Khan</b>, “Representing Security Specifications in UML State Machine Diagrams,” In <i>Proceedings of the International Workshop on Enterprise Web Application Dependability</i>, Belfort, France, 2015. <i>Procedia Computer Science</i>, <b>Elsevier</b>, volume 56, pages 453-458. (2016 IF – 0.81 – Source SJR)</li> <li data-bbox="576 1462 1350 1597">5. <b>M. U. Khan</b> &amp; M. Zulkernine, “A Hybrid Monitoring of Software Design-Level Specifications,” In <i>Proceedings of the International Conference on Quality Software (QSIC’14)</i>, Dallas, Texas, USA, 2014, <b>IEEE CS Press</b>, pp. 111-116.</li> <li data-bbox="576 1641 1350 1798">6. <b>M. U. Khan</b> &amp; M. Zulkernine, “Building Components with Embedded Security Monitors,” In <i>Proceedings of the 2<sup>nd</sup> ACM SigSoft International Symposium on Architecting Critical Systems (ISARCS)</i>, Boulder, Colorado, USA, 2011, <b>ACM Press</b>, pp. 133-142.</li> <li data-bbox="576 1843 1350 1942">7. <b>M. U. Khan</b> &amp; M. Zulkernine, “Activity and Artifact Views of a Secure Software Development Process,” In <i>Proceedings of the International Conference on Computational Science and</i></li> </ol>

	<p><i>Engineering</i>, Vancouver, Canada, 2009, <b>IEEE CS Press</b>, vol. 3, pp. 399-404.</p> <p>8. <b>M. U. Khan</b> &amp; M. Zulkernine, "On Selecting Appropriate Development Processes and Requirements Engineering Methods for Secure Software," In <i>Proceedings of the 33<sup>rd</sup> Annual IEEE International Computer Software and Applications Conference (COMPSAC '09)</i>, Seattle, Washington, USA, 2009, <b>IEEE CS Press</b>, vol. 2, pp.353-358.</p> <p>9. <b>M. U. Khan</b> and M. Zulkernine, "Quantifying Security in Secure Software Development Phases," In <i>Proceedings of the 33<sup>rd</sup> Annual IEEE International Computer Software and Applications Conference (COMPSAC '08)</i>, Turku, Finland, 2008, <b>IEEE CS Press</b>, pp. 955-960.</p> <p>10. M. Zulkernine, M. Graves, &amp; <b>M. U. Khan</b>, "Integrating Software Specification into Intrusion Detection," <i>International Journal of Information Security</i>, <b>Springer</b>, 2007, vol. 6, no. 5, pp. 345-357. (2016 IF – 1.91 – Source Springer)</p> <p>11. J. Li, R. Conradi, O. P. N. Slyngstad, C. Bunse, M. U. Khan, M. Torchiano, and M. Morisio, "An Empirical Study on Off-the-Shelf Component Usage in Industrial Projects," In <i>Proceedings of the International Conference on Product Focused Software Process Improvement (PROFES '05)</i>, Oulu, Finland, 2005, <i>Lecture Notes in Computer Science</i>, Springer, volume 3547, pages 54 – 68. (2016 IF – 0.667 – Source SJR).</p> <p>12. J. Li, R. Conradi, O. P. N. Slyngstad, C. Bunse, <b>M. U. Khan</b>, M. Torchiano, and M. Morisio, "Validation of New Theses on Off-the-Shelf Component Based Development," In <i>Proceedings of the 11<sup>th</sup> IEEE International Software Metrics Symposium (METRICS'05)</i>, Como, Italy, 2005, <b>IEEE CS Press</b>, volume 00, page 26 (10 Pages).</p> <p>13. J. Li, R. Conradi, O. P. N. Slyngstad, C. Bunse, <b>M. U. Khan</b>, M. Torchiano, and M. Morisio, "Barriers to Disseminating off-the-shelf Based Development Theories to IT Industry," In <i>Proceedings of the 2<sup>nd</sup> International Workshop on Models and Processes for the Evaluation of Off-the-shelf components (MPEC '05)</i>, Louis, Missouri, USA, <b>ACM SIGSOFT Software Engineering Notes</b>, 2005, <b>ACM Press</b>, volume 30, number 4, pages 1-4.</p>
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Tahir Naseem	<p>Naseem M.T., Qureshi I.M., Cheema T.A., Zubair M., "Invertible and Fragile Watermarking for Medical images Using Residue Number System and Chaos," Journal of Basic and Applied Scientific Research, Vol. 10, No. 2, pp. 10643-10651, 2012. [ISI Indexed]</p> <p>2. Naseem M.T., Qureshi I.M., Cheema T.A., Rahman Atta-ur Rahman., "Hash based Medical Image Authentication and Recovery Using Chaos and Residue Number System," Journal of Basic and Applied Scientific Research, Vol. 3, No. 6, pp. 488-495, 2013. [ISI Indexed]</p> <p>3. Naseem M.T., Qureshi I.M., Atta-ur Rahman., Mu zaffar M.Z., "Image Selection Criteria for Embedding Desired Capacity using FRBS," Neural Network World Journal, Vol. 5, No. 14, pp. 521-538, 2014 [IF:0.4]</p> <p>4. Naseem M.T., Qureshi I.M., Atta-ur Rahman., Muzaffar M.Z., "Novel Technique for Capacity Maximizing in Digital Watermarking using Fuzzy Rule Base," Journal of Intelligent and Fuzzy Systems, Vol. 27, No. 5, pp. 2497-2509, 2014 [IF: 1.96]</p> <p>5. Naseem M.T., Qureshi I.M., Cheema T.A., Atta-ur Rahman., "Spread Spectrum based Invertible Watermarking for Medical Images using RNS &amp; Chaos," International Arab Journal of Information Technology, Vol. 13, No. 2, 2016 [ IF: 0.56]</p> <p>6. Naseem M.T., Qureshi I.M., Cheema T.A., Atta-ur Rahman., "Robust &amp; fragile watermarking for medical images using RRNS &amp; chaos," Neural Network World Journal," 2018 (Accepted &amp; under publication) [IF:0.4].</p> <p>7. Atta-ur-Rahman, Naseem M.T., Muzaffar M.Z, "Reversible and Robust Watermarking using Residue Number System and Product Codes", Journal of Information Assurance and Security (JIAS), Vol. 7, No.3, pp. 156-163, 2012.</p> <p>8. Atta-ur-Rahman, Qureshi I.M., Mu zaffar M.Z., Naseem M.T., "A Novel Technique for Reliable Image Transmission using Product Codes," International Journal of Computer Applications, Vol. 65, No.4, pp. 12-17, 2013.</p> <p>9. Muzaffar M.Z., Qureshi I.M., Atta-ur-Rahman, Naseem M.T., " Changing slope method: A novel technique for audio Steganography," Journal of Basic and Applied Scientific Research, Vol. 3, No. 12, pp. 71-81, 2013. [ISI Indexed]</p> <p>10. Atta-ur-Rahman, Qureshi I.M., Malik A.N., Naseem M.T., "Dynamic Resource allocation in OFDM Systems using DE and FRBS", Journal of Intelligent &amp; Fuzzy Systems, vol. 26, no. 4, pp. 2035-2046, 2014. [IF: 01.96]</p>
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	<p>11. Atta-ur-Rah man, Qureshi I.M ., Malik A.N., Naseem M.T., “A Real Time Adaptive Resource Allocation Scheme for OFDM Systems using GRBF -Neural Net works and Fuzzy Rule Base System,” International Arab Journal of Information Technology (IAJIT), Vo l. 11, No. 6, pp. 590-598, 2014.[IF: 0.56]</p> <p>12. Atta-ur-Rah man, Qureshi IM., Malik A.N., Naseem MT., “ QoS and rate enhancement in DVB-S2 using fuzzy rule base system,” Journal of Intelligent &amp; Fuzzy Systems, vol. 30, no. 2, pp. 801-810, 2016. [IF: 1.96]</p>
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**Annexure – F:**

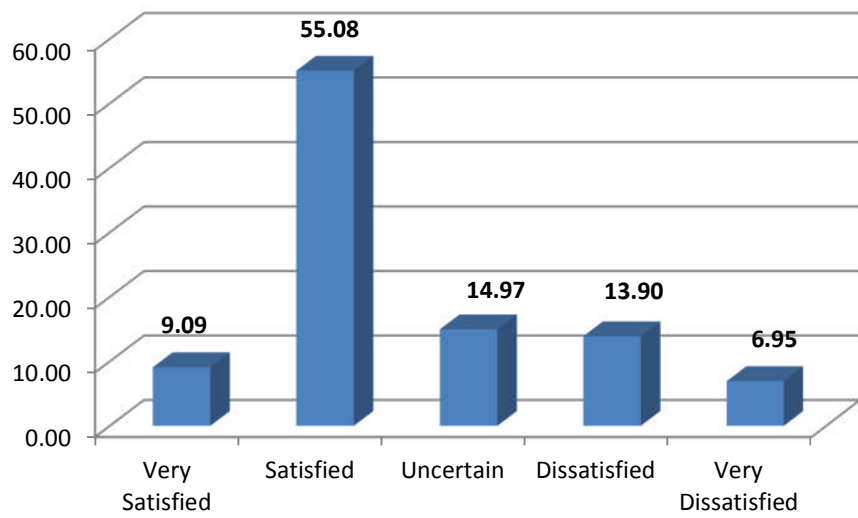
**Graduating Students Feedback Sample**

**Not Applicable**

**Annexure – G:**

**Faculty Survey**

No.	Questions	Percentage				
		Very Satisfied	Satisfied	Uncertain	Dissatisfied	Very Dissatisfied
1	Clarity of institution's goals/mission	18.18	63.64	9.09	9.09	0.00
2	Communications from/with peers and faculty/departmental leadership	9.09	54.55	9.09	18.18	9.09
3	Type of teaching/ research you currently do.	27.27	45.45	9.09	9.09	9.09
4	Your interaction with students in and outside classroom	27.27	72.73	0.00	0.00	0.00
5	Your satisfaction level regarding office and IT facilities available to you.	18.18	36.36	0.00	36.36	9.09
6	The mentoring available to you from seniors	9.09	45.45	27.27	18.18	0.00
7	Administrative support from the faculty/department.	0.00	72.73	18.18	0.00	9.09
8	Clarity and Satisfaction about the faculty promotion process.	0.00	27.27	36.36	18.18	18.18
9	Your prospects for advancement and progress through ranks.	0.00	45.45	36.36	9.09	9.09
10	Salary and compensation package.	9.09	36.36	27.27	9.09	18.18
11	Job security and stability at the faculty/department/university.	0.00	54.55	27.27	9.09	9.09
12	Amount of time you have for yourself and family.	0.00	72.73	18.18	9.09	0.00
13	The overall environment in the department.	18.18	63.64	0.00	18.18	0.00
14	Adequacy of technological & multimedia instructional resources in classrooms	9.09	63.64	0.00	18.18	9.09
15	Whether the department is utilizing your experience and knowledge.	9.09	63.64	0.00	27.27	0.00
16	Recognition/appreciation of good teaching by seniors	0.00	54.55	9.09	27.27	9.09
17	Opportunities for research in your discipline and recognition of research accomplishment	0.00	63.64	27.27	0.00	9.09
	<b>Faculty Average</b>	<b>9.09</b>	<b>55.08</b>	<b>14.97</b>	<b>13.90</b>	<b>6.95</b>



**Annexure – H:****Faculty Resume**

Name	Designation	Qualification
Muhammad Umair Ahmed Khan	Assistant Professor	PhD
Imran Ahmad	Assistant Professor	MS
Khawaja Muhammad Fahd	Assistant Professor	MS
Tahir Naseem	Assistant Professor	PhD
Aumm e Hani	Lecturer	MS
Zarmina Jahangir	Lecturer	MS

## **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 equipment 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.

## AT Findings Panel - Assessment Team

Following Assessment Team Members Visited RICAS on 18<sup>th</sup> April, 2018

- |                             |          |
|-----------------------------|----------|
| 1. Dr. Muhammad Islam       | Chairman |
| 2. Dr. Muhammad Kashif Fida | Member   |
| 3. Mr.Husnat Ahmad          | Member   |

## Exit Meeting – 18<sup>th</sup> April, 2018

Following attended the meeting:-

- |                                   |                        |
|-----------------------------------|------------------------|
| ▪ Mr.Umer Farooq                  | Director Lahore Campus |
| ▪ Prof. Dr. Faqir Muhammad Bhatti | HoD RICAS              |
| ▪ Dr. Muhammad Islam              | Chairman               |
| ▪ Dr. Muhammad Kashif Fida        | Member                 |
| ▪ Mr.Husnat Ahmad                 | Member                 |
| ▪ Mr.Jalal-ud-Din                 | Member                 |

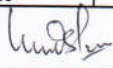
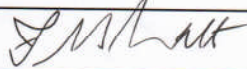
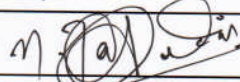
The Chairman AT presented his final recommendations to carry out the improvements in this program. The Respected VC approved the proceedings:

- 1) Common room/space for male students is required
- 2) Requirement of separate program coordination office
- 3) Requirement of Faculty Offices

**Note:** After the above exit meeting, the Departmental head prepared the implementation plan with target dates and submitted it to the QEC. The QEC pursued the activities and then mentioned the final status completed/in progress in Annex-K before submitting the SAR to HEC

Annexure – K

**Implementation Plan (Summary) – RICAS (BS Computer Sciences) – Lahore Campus**

AT Finding	Corrective Action	Implementation Date	Responsibility	Present Status
Requirement of Faculty Offices	Provision of 3 x Faculty Offices	10 <sup>th</sup> April, 2018	Procurement/Administrator	<b>Completed</b>
Common room/space for male students is required	1 x common room is available for students	24 <sup>th</sup> April, 2018	Administrator /Procurement	<b>Completed</b>
Requirement of separate program coordination office	Provision of 1 x Program Coordination office	2 <sup>nd</sup> May 2018	Administrator /Procurement	<b>Completed</b>
AT Chairman's Comments Name and Signature	 DR. M. ISLAM.			
Dean's Comments Name and Signature	Prof. Dr. F. M. Bhatt. 			
QEC Comments Name and Signature	 M. JALEEL-UD-DIN.			

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

BSCS is comprised of 133 credit hours with 64 core subjects. 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 areas:

- a. Confidence Building Measures
- b. Customer Relationship Management.
- c. Software Engineering Skills
- d. Exposure to IT sector

These improvement areas have been presented in Board of Studies to finalize its recommendations and suggest further actions.



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>24</b>				
<b>SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.05</b>					<b>4</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 HEC?					5	4	3	2	1
5. Does the curriculum satisfy the major requirements laid down by HEC?					5	4	3	2	1
6. Does the curriculum satisfy the professional requirements as laid down by HEC?					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>34</b>				
<b>SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.20</b>					<b>17</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 instruction and maintaining the laboratories?					5	4	3	2	1
3. Are the University’s infrastructure and facilities adequate to support the program’s objectives?					5	4	3	2	1
<b>Total Encircled Value (TV)</b>					<b>12</b>				

<b>SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.10</b>	<b>8</b>
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<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	
<b>Total Encircled Value (TV)</b>	<b>14</b>					
<b>SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.10</b>	<b>9.33</b>					

<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	
<b>Total Encircled Value (TV)</b>	<b>51</b>					
<b>SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.15</b>	<b>13.90</b>					

<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>32</b>				
<b>SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.15</b>	<b>13.71</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>12</b>					
<b>SCORE 1 (S1) = [TV/ (No. of Question * 5)] * 100 * 0.15</b>	<b>12</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>					

$$\begin{aligned}
 \text{Overall Assessment Score} &= S1+S2+S3+S4+S5+S6+S7+S8 \\
 &= 4+17+8+9.33+13.90+13.71+12+8 \\
 &= 85.94
 \end{aligned}$$