



**FOUNDATION UNIVERSITY ISLAMABAD (FUI)**

**Foundation University Rawalpindi Campus (FURC)**

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**Department of Software Engineering**

**Bachelor of Computer in Software Engineering (BCSE)**

**Self-Assessment Report**

Submitted to

**Quality Enhancement Cell  
Foundation University Islamabad (FUI)**

## **Program Representative Team**

- |                            |          |
|----------------------------|----------|
| 1. Prof. Dr. Aftab Ahmad   | Chairman |
| 2. Engr. Umar Mahmud       | Member   |
| 3. Mr. Muhammad Usman Khan | Member   |

## **EXECUTIVE SUMMARY**

Self Assessment Report (SAR) is an effective tool in measuring and monitoring the outcome of a program. This is employed in Degree Awarding Institutes of Pakistan to identify strengths and weaknesses of the degree programs. The tool is primarily dependent on surveys that are conducted at the end of the session. These surveys include the Faculty's survey, the Course survey, the Employer's survey and the Gradating Students' survey.

this SAR concerns the department of software engineering (DSE) that executes Bachelors of Computing in Software Engineering (BCSE) program. The report concerns the UG program during the semester Spring 2015. The report includes the surveys and relevant information as well as the strengths and weaknesses of the program as identified through surveys.

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# **I. PROGRAM MISSION, OBJECTIVES AND OUTCOMES**

## **1.1 Department of Software Engineering (DSE) - Mission Statement**

The basic purpose of an academic program in computer science is to develop a student's empirical professional thinking and intuition. The curriculum is structured to provide a balanced mixture of learning experiences to make the graduate capable of sound professional decisions. As a result the graduate should be able to assume responsible positions in business, government, educational research & development, and planning levels. The program also provides an excellent foundation for further formal learning and training. The computer science curriculum is designed to provide the environment to put into practice, the principles and techniques learnt during the course of implementation of academic program.

## **1.2 Foundation University Rawalpindi Campus (FURC)**

The Foundation University aspires to establish itself as an esteemed research and teaching educational institution committed to intellectual leadership through academic excellence by offering diverse multidisciplinary educational programs. The university envisions focusing on attracting gifted faculty and producing promising young graduates to bring about a positive intellectual social and technological change in the society. The Foundation University aims at achieving a prominent status at the national and international levels by creating a dynamic educational environment where teaching learning research innovation leadership and public service will have a harmonious blend. The university will constantly strive to prepare useful and productive citizens for the country by forging fruitful relationship with community.

## **1.3 Program's Educational Objectives**

The objective of the program is to produce graduates who have necessary technical skills in computer hardware and software knowledge to develop integrated real world systems with computer as the main processing element. The program is structured in such a manner that the students are provided a firm theoretical foundation with opportunity to strengthen their knowledge through research assignments, practical training and projects. The course is designed to meet the growing demand of computer professionals who are competent in electronic engineering, systems engineering and computer sciences

### **1.3.1 Objective #1 – Core Concepts**

To impart education to students in a manner that infuses core mathematical, scientific and computing concepts in the Software Engineering discipline.

### **1.3.2 Objective #2 – Practical Skills**

To develop in students practical skills needed for their functioning as Software Engineers. Armed with these skills, the graduates should: -

- 1.3.2.1 Analyze and model real world problems based on mathematical and engineering principles and solve such problems by utilizing their skills and information technology tools
- 1.3.2.2 Be able to use theoretical knowledge to implement practical solutions
- 1.3.2.3 Use software engineering as an enabling technology to provide solutions that enhance quality of life in the society
- 1.3.2.4 Be able to think and work independently when involved in problem solving
- 1.3.2.5 Continue in pursuit of higher learning and enlightenment throughout their life
- 1.3.2.6 Exhibit superior communication and presentation skills in report writing and presentations
- 1.3.2.7 Be able to manage information in computing environment for a better working and usefulness of integrated computing systems

### **1.3.3 Objective #3 – Professionalism**

To provide students with a professional learning experience which instills a sense of professional ethics in their personal discipline, as well as awareness of the impact information technologies make on the society and the effect of their professionalism on the shape of society.

### **1.3.4 Objective#4 – Research Culture**

- 1.3.4.1 The first objective is geared towards providing quality education to students with strong basic concepts.
- 1.3.4.2 The second object is aimed at producing quality graduates with necessary training in essential tools and technologies and equipped with skills required by the industry and essential to succeed in professional life.
- 1.3.4.3 The third objective is aligned with the department’s vision of producing graduates with a sense of professional responsibility and carrying out such responsibility in line with utmost standards of professional ethics.
- 1.3.4.4 The fourth objective focuses on training students in research methodologies and inspiring them to innovate.

## **1.4 Strategic Plan**

The strategic plan of the department follows the strategic plan of the institute. The areas covered under strategic plan are curriculum, professionalism, stands of program assessment and measurements.

### **1.4.1 Curriculum**

Ensure that the students undergo quality training and learning based on a broad curriculum. This concern the theoretical and practical aspects of BCSE program offered in DSE. The curriculum is based on HEC’s guidelines.

#### **1.4.1.1 Elements**

- 1.4.1.1.1 Design the curriculum based on recommendations of international and national academic bodies and keeping in view the requirements of local industry and national needs
- 1.4.1.1.2 Lay strong emphasis on laboratory work and honing practical skills
- 1.4.1.1.3 Strive for top quality teaching of the designed curriculum

#### **1.4.1.2 Strategies**

- 1.4.1.2.1 Undergo extensive review of curriculum recommendations of Higher Education Commission of Pakistan (HEC) and Pakistan Engineering Council (PEC) for Computer Engineering programs
- 1.4.1.2.2 Attract and retain highly qualified and motivated faculty in all core areas of the program
- 1.4.1.2.3 Provide latest relevant software in laboratories to ensure that students get practical training along with theoretical concepts
- 1.4.1.2.4 Maintain a strong faculty to student ratio.
- 1.4.1.2.5 Ensure that curriculum is taught by using the latest and good quality text books

#### **1.4.1.3 Benchmarks**

- 1.4.1.3.1 Ensure review of curriculum and subject matter after every semester
- 1.4.1.3.2 Achieve enrollment target of 80 to 90 new students/year in the undergraduate program by academic year 2008-2009
- 1.4.1.3.3 Achieve enrollment target of 60 new students/year in the postgraduate program by academic year 2008-2009
- 1.4.1.3.4 Achieve enrollment target of 8 to 10 new students/year in PhD program for Academic year 2008-2009
- 1.4.1.3.5 Carry out survey of installed software's in laboratories
- 1.4.1.3.6 Carry out survey of curriculum and ensure compliance with latest established facts and text

### **1.4.2 Workshops and Seminars**

Provide opportunities to students, faculty and staff to expand their knowledge by attending workshops and seminars on up and coming subjects and topics.

#### **1.4.2.1 Elements**

- 1.4.2.1.1 Invite professionals from academic and industrial sector to give seminars and hold workshops on important technical subjects
- 1.4.2.1.2 Faculty members organize workshops and seminars in their areas of expertise
- 1.4.2.1.3 Encourage students to organize student seminars for sharing their experiences

### **1.4.2.2 Strategies**

- 1.4.2.2.1 Identify key academic and industry professionals with domain expertise in core areas of computer engineering and invite them for seminars
- 1.4.2.2.2 Identify and invite key scientists of international standing for seminars
- 1.4.2.2.3 Invite local engineering and IT companies and multinational companies for seminars

### **1.4.3 Professional Ethics**

Introduce a spirit of attaining highest professional standards and work ethics in students.

#### **1.4.3.1 Elements**

- 1.4.3.1.1 The students during their academic career should be given a greater insight into the established norms and practices of the professional work environment.
- 1.4.3.1.2 Introduce a code of ethics that the students should uphold in their practical lives

#### **1.4.3.2 Strategies**

- 1.4.3.2.1 Develop a course on professional ethics for undergraduate courses
- 1.4.3.2.2 Invite industry professionals and organize seminars on ethical practices related to the workplace environment

#### **1.4.3.3 Benchmarks**

- 1.4.3.3.1 Invite employer feedback from graduated student's employers
- 1.4.3.3.2 Assess professional and ethical standards followed by students during the routine tasks of the semester
- 1.4.3.3.3 Assess students' responsibility, regularity and punctuality through instructor feedback at the end of each semester

## **1.5 Standards and Program Assessment**

This section discusses the standards of program assessment. The educational goals of the program have been identified in section 1.3.

### **1.5.1 Program Title: Bachelors of Computer in Software Engineering (BCSE)**



### 1.5.2 Program Objectives Assessment

Following table shows the program objectives assessment. It identifies the criterion, its measurement and improvements identified through this mechanism.

Objectives	How Measured	When Measured	Improvement Identified	Improvement Made
<b>Awareness of Core Concepts</b>	Assignments Internships Exams Quizzes Case studies Projects	During and at the end of semester	Study tours, Academic journals and periodicals, Workshops and seminars	Regular arrangements of seminars and conferences, Wireless Internet facility is provided, Broadband Internet facility is available both in labs and faculty offices
<b>Practical Skills</b>	Industry / Academic Projects, Lab Assignments	During and at the end of semester	Training of latest IT resources	Workshops and Seminars to train the students
<b>Team Work</b>	Group projects and assignments	During the semester	Progress monitoring	Reports and presentation
<b>Ethics and Corporate Social Responsibility</b>	Meeting the deadlines Leading the teams	Weekly	Regular Progressive Monitoring	Full Semester courses in Islamic Studies and Professional Ethics

### 1.5.3 Outcomes for Graduated Students, Program Assessment, Measurable Objectives of the Program

Following table gives the outcomes of the program vs. program objectives. The outcomes have been measured through different surveys.

Program Learning Outcomes	Program Objectives				
	Awareness of Core Concepts	Practical Skills	Research Culture	Team work	Ethical and Corporate Social Responsibility
Theory into Practice	✓	✓	✓		✓
Apply Systematic Approach	✓	✓	✓	✓	✓
Maintaining the Highest Professional Standards				✓	✓
Creative and Critical Thinking	✓	✓	✓	✓	✓
Addressing Evolving need of the Industry		✓	✓		✓
Ability to use and utilize IT resources efficiently and effectively	✓	✓	✓	✓	✓
Charismatic Leadership skills	✓	✓	✓	✓	✓
Effective Communication Skills	✓			✓	✓

## 1.6 Program Outcome Measurement

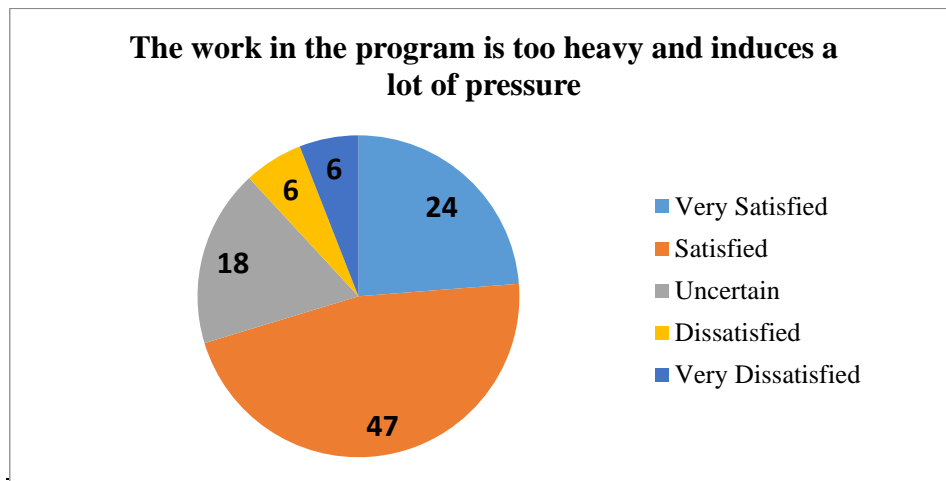
Three surveys were conducted in order to assess the performance of the graduates in light of the stated program objectives and program outcomes. These surveys are Graduating Students' Exit Survey, Alumni Survey and Employers' Survey.

### 1.6.1 Graduating Students' Exit Survey

There are total of 72 participants in this survey. Participants are asked different questions ranging from the study program to the research resources. Issues like academic, analytic and communication skills were brought into the attention of the participants. The surveys are designed giving full consideration to the outcomes and objectives of the program.

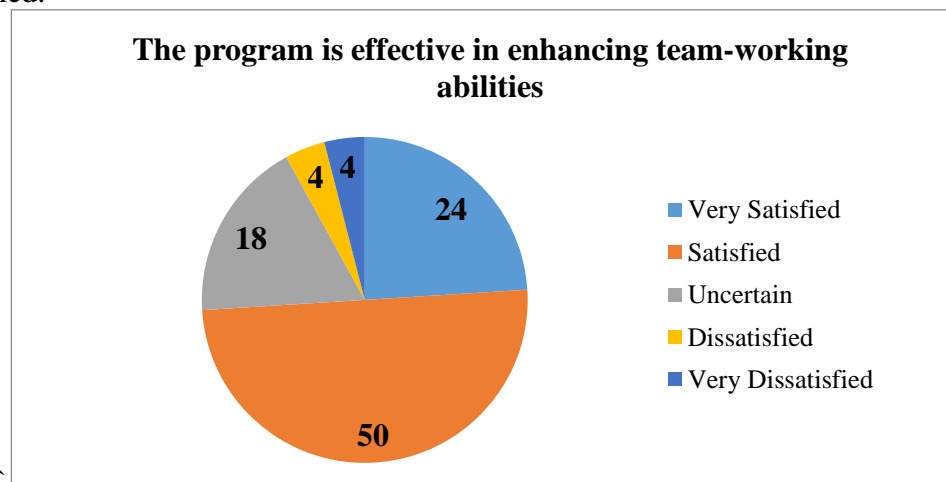
#### 1.6.1.1 Question No. 1: Work Load and Pressure on the Students

71% of the students are satisfied with the work load while 12% of the students are not satisfied.



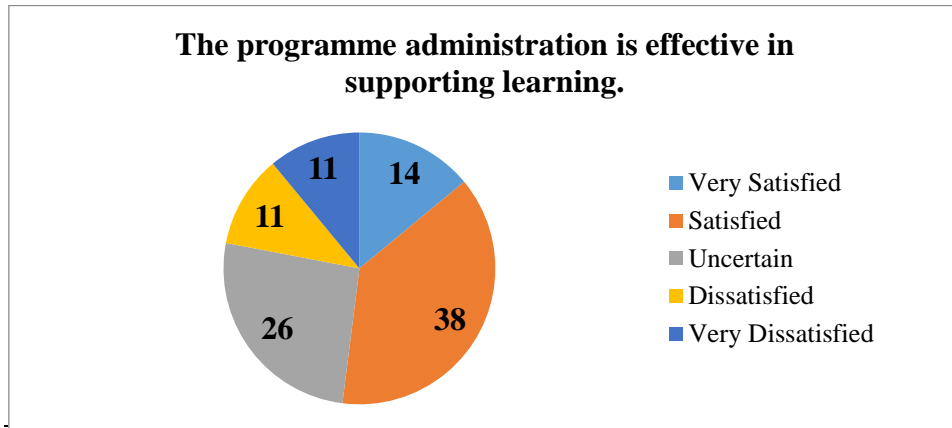
#### 1.6.1.2 Question No. 2: Teamwork Abilities

74% of the students are satisfied with the enhancement in team work facilities while 8% are not satisfied.



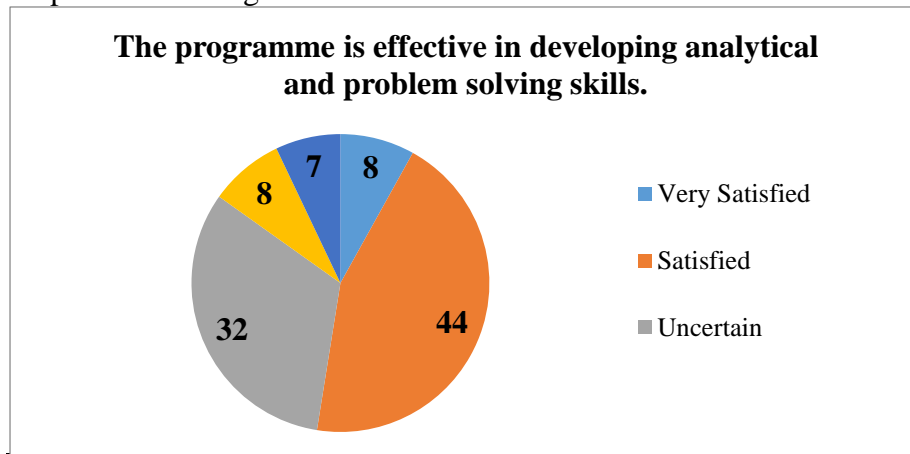
### 1.6.1.3 Question No. 3: Learning Support from Program Administration

52% of the students are satisfied with learning support from program administration while 22% are not satisfied.



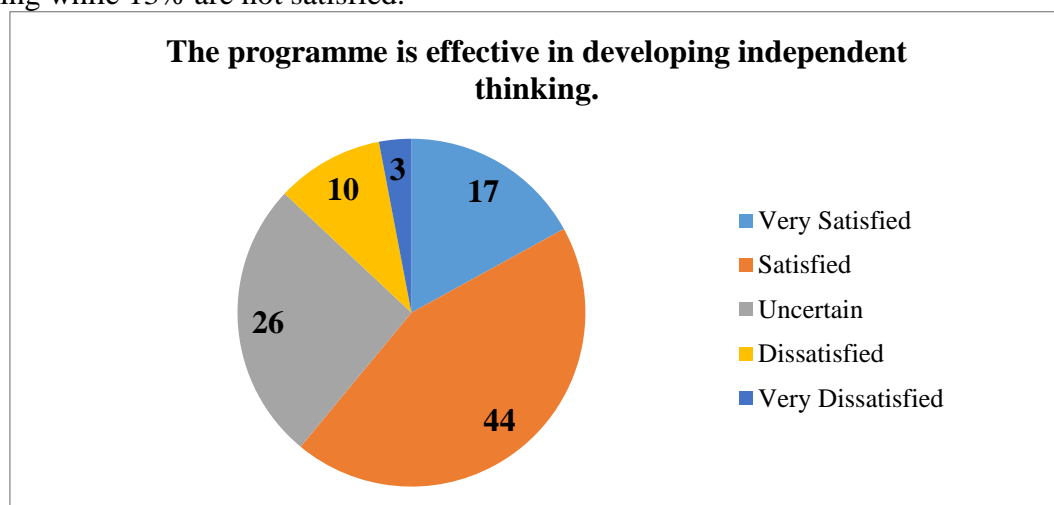
### 1.6.1.4 Question No. 4: Analytical and Problem Solving Skills

52% of the students are satisfied with the effectiveness of program in the development of analytical and problem solving skills while 15% are not satisfied.



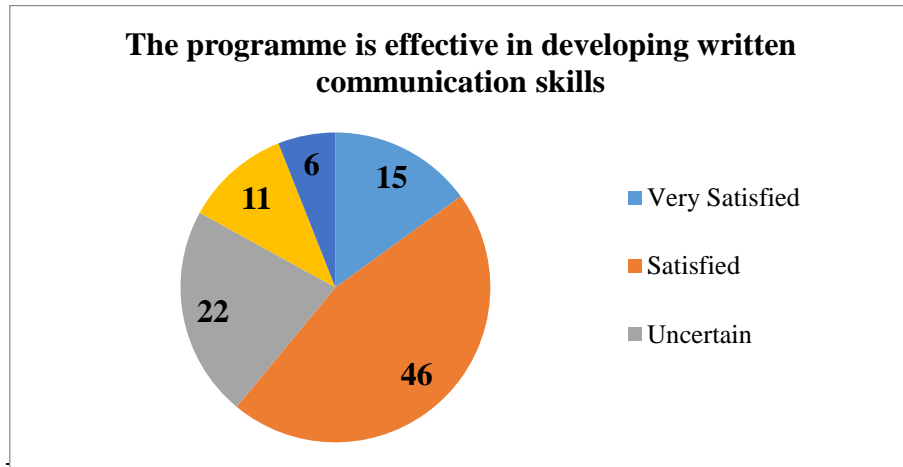
### 1.6.1.5 Question No. 5: Independent Thinking

61% of the students are satisfied with the effectiveness of program in developing independent thinking while 13% are not satisfied.



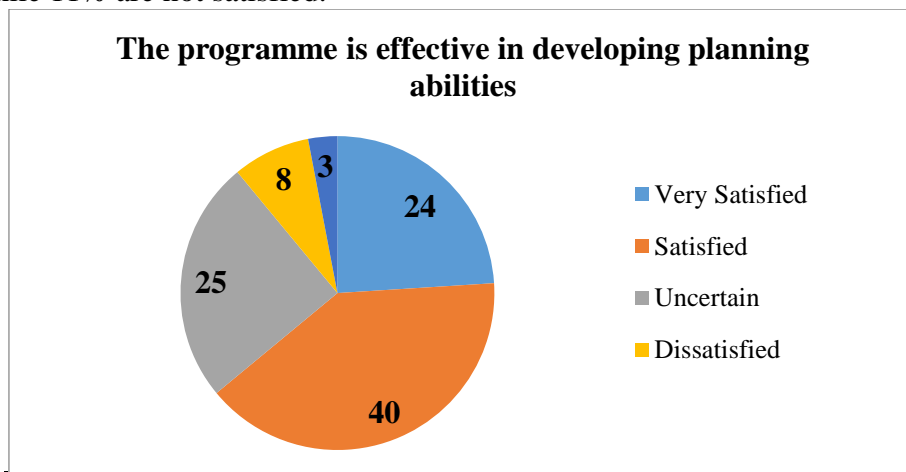
### 1.6.1.6 Question No. 6: Written and Communication Skills

61% of the students are satisfied with the effectiveness of program in developing written communication skills while 17% are not satisfied.



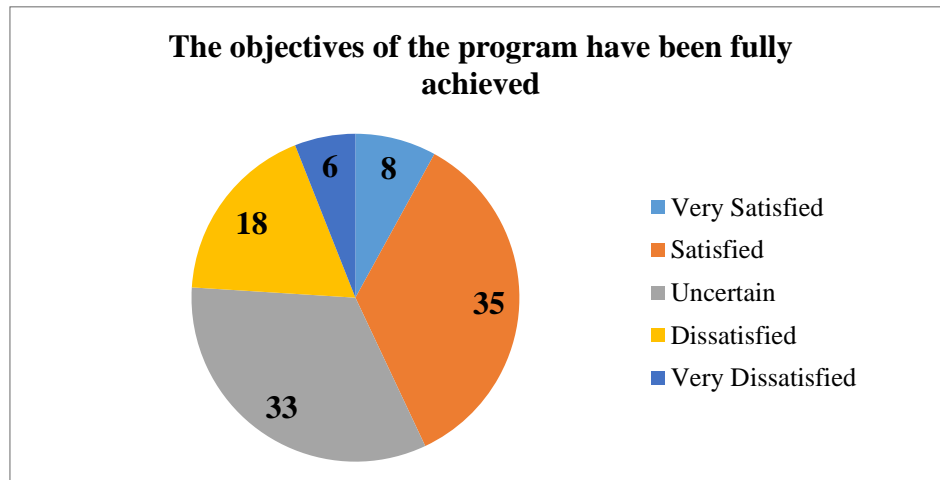
### 1.6.1.7 Question No. 7: Planning Abilities

64% of the students are satisfied with the effectiveness of program in developing planning abilities while 11% are not satisfied.



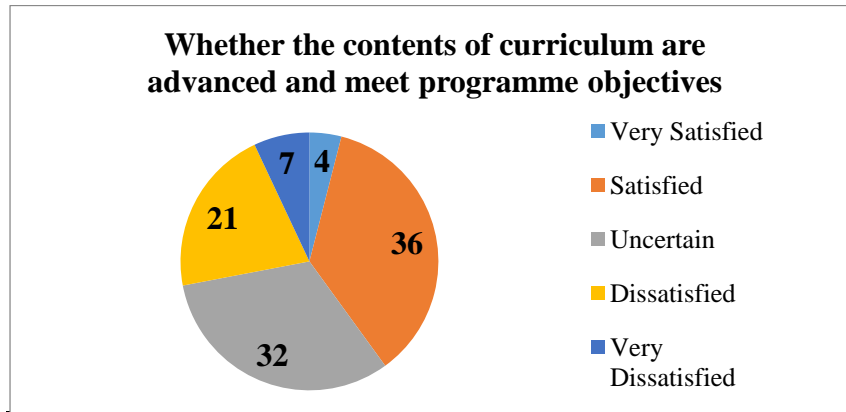
### 1.6.1.8 Question No. 8: Achievement of Program Objectives

43% of the students are satisfied with the effectiveness of program in achievement of its objectives while 14% are not satisfied.



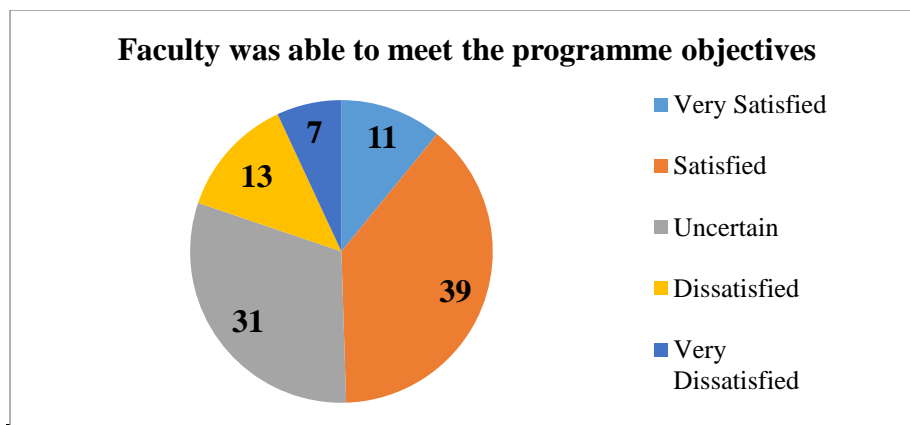
### 1.6.1.9 Question No. 9: Contents of the Curriculum

40% of the students are satisfied with the contents of curriculum in meeting program objectives while 28% are not satisfied.



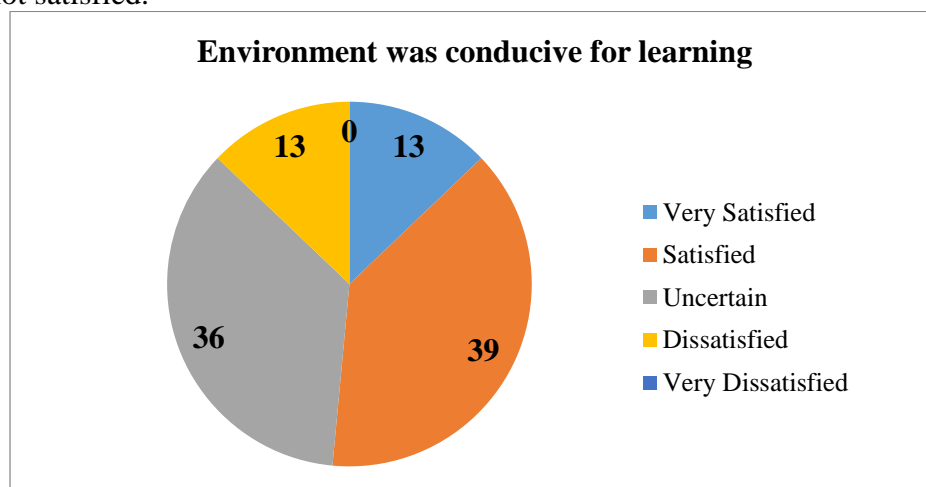
### 1.6.1.10 Question No. 10: Competent Faculty to meet Program Objectives

50% of the students are satisfied with the ability of the faculty to achieve program objectives while 20% are not satisfied.



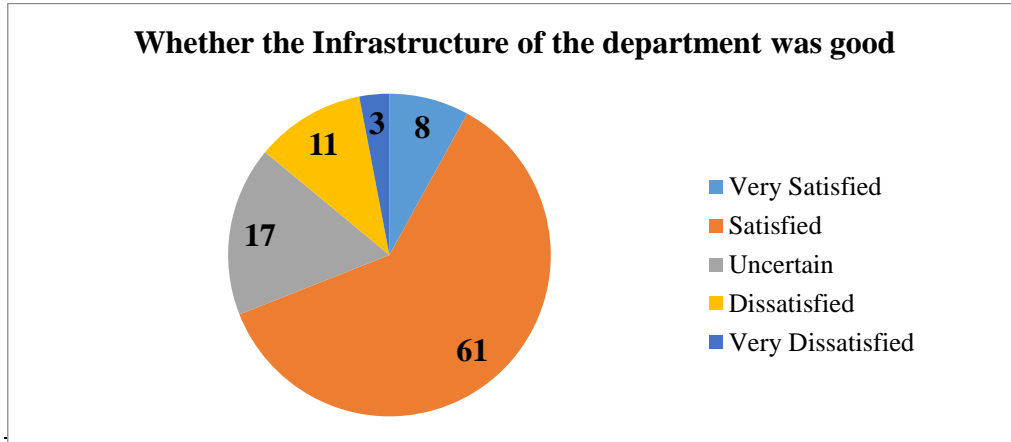
### 1.6.1.11 Question No. 11: Conducive Environment for Learning

52% of the students are satisfied with the environment being conducive for learning while 13% are not satisfied.



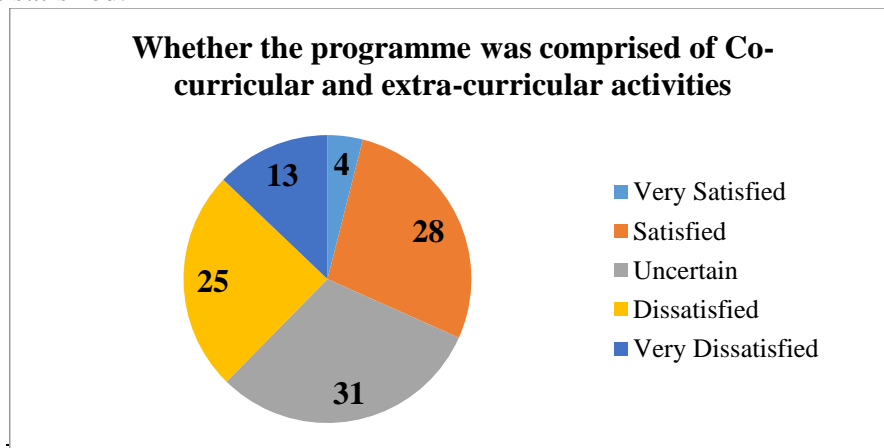
### 1.6.1.12 Question No. 12: Infrastructure of the Department

69% of the students are satisfied with the department infrastructure while 14% are not satisfied.



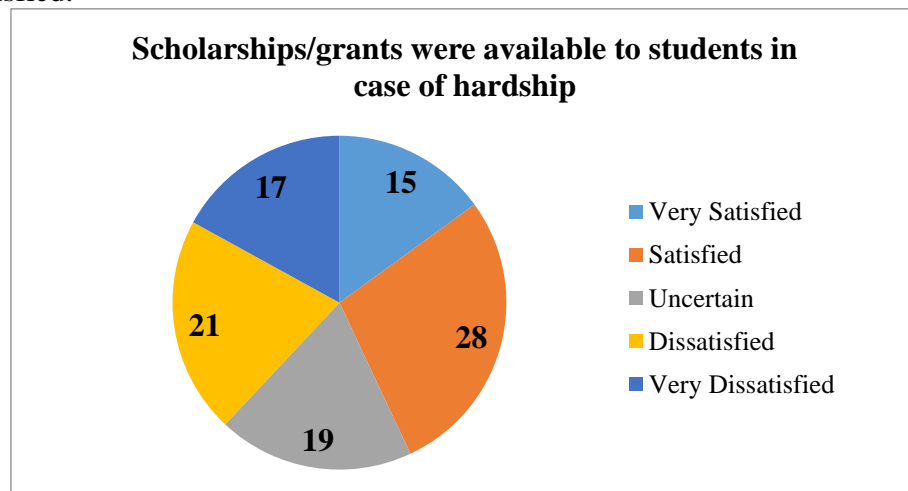
### 1.6.1.13 Question No. 13: Co-curricular and Extra Curricular Activities

32% of the students are satisfied with the extra-curricular and co-curricular activities while 38% are not satisfied.



### 1.6.1.14 Question No. 14: Availability of Scholarships/Grants

43% of the students are satisfied with the availability of scholarships and grants while 38% are not satisfied.

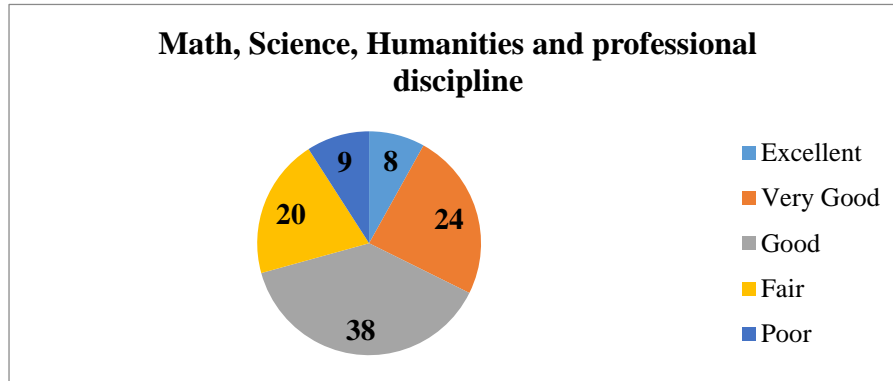


## 1.6.2 Alumni Survey

The Department was able to collect responses from more than 80 alumni. Participants were asked different questions on the quality of education they received and the level of participation they had at the Department.

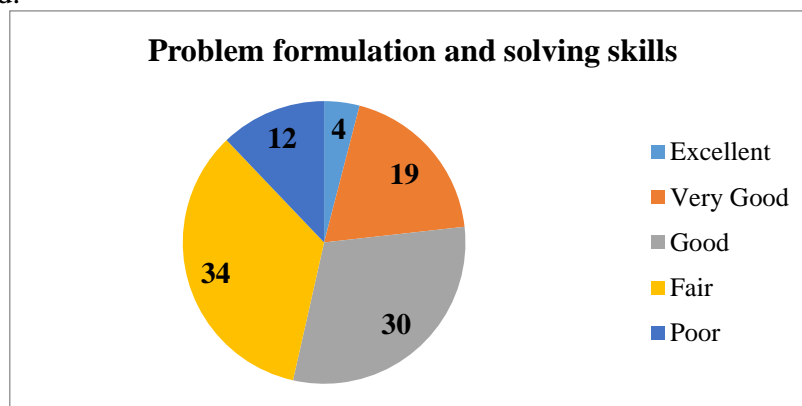
### 1.6.2.1 Question No. 1: Mathematics, Science, Humanities and Professionalism

70% of the students are satisfied with the knowledge in mathematics, basic sciences, humanities and professionalism while 29% are not satisfied.



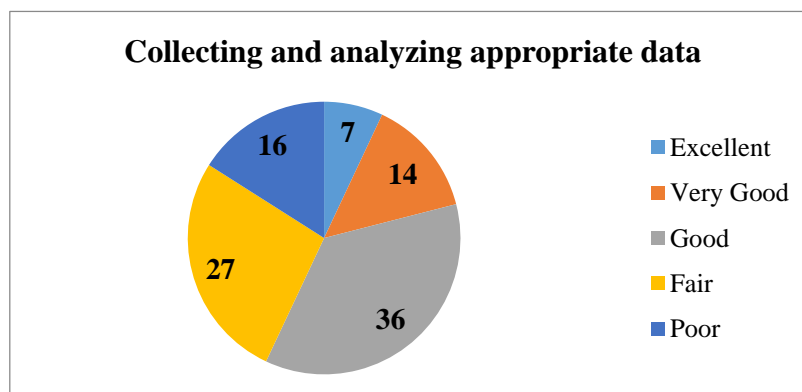
### 1.6.2.2 Question No. 2: Problem Formulation and Solving Skills

53% of the students are satisfied with the problem formulation and solving skills while 46% are not satisfied.



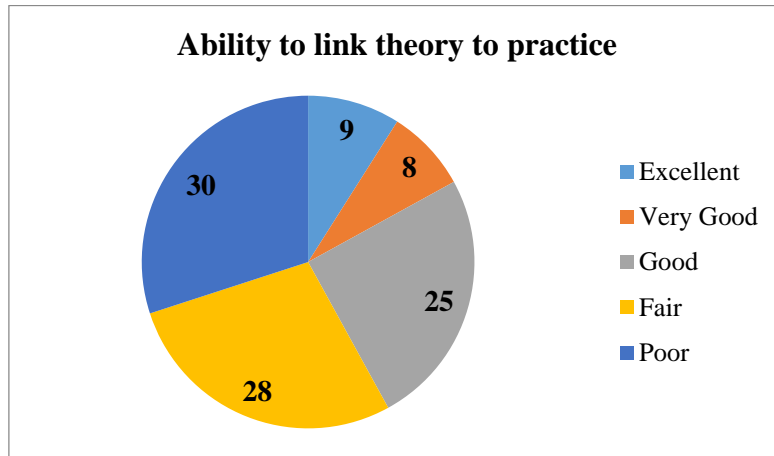
### 1.6.2.3 Question No. 3: Collecting and Analyzing Data

57% of the students are satisfied with the skills required in collection and subsequent analysis of data while 43% are not satisfied.



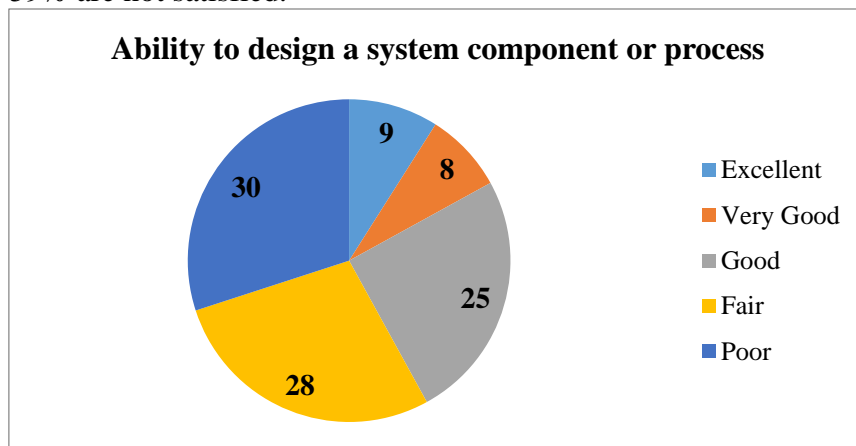
#### 1.6.2.4 Question No. 4: Ability to Link Theory to Practice

42% of the students are satisfied with the skills to link theory to practice while 58% are not satisfied.



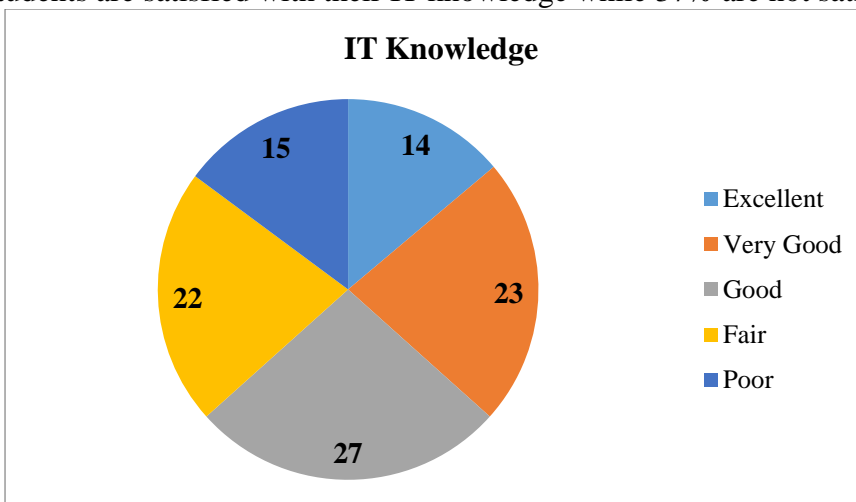
#### 1.6.2.5 Question No. 5: Ability to Design Systems Components or Process

41% of the students are satisfied with the skills required in collection and subsequent analysis of data while 59% are not satisfied.



#### 1.6.2.6 Question No. 6: IT Knowledge

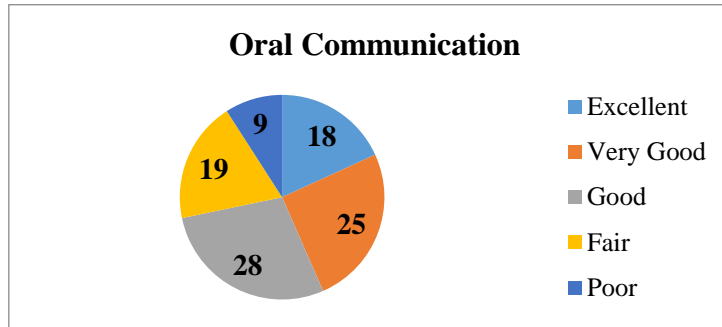
64% of the students are satisfied with their IT knowledge while 37% are not satisfied.





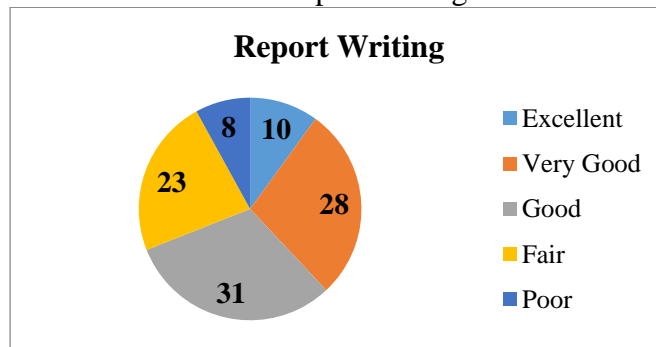
### 1.6.2.7 Question No. 7: Oral Communication

71% of the students are satisfied with their oral communication while 28% are not satisfied.



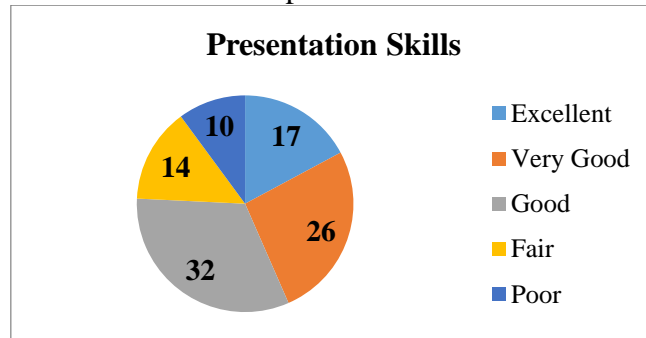
### 1.6.2.8 Question No. 8: Report Writing

69% of the students are satisfied with their report writing skills while 31% are not satisfied.



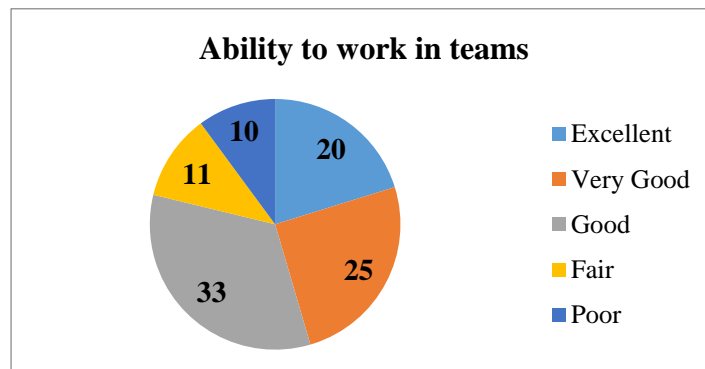
### 1.6.2.9 Question No. 9: Presentation Skills

75% of the students are satisfied with their presentation skills while 24% are not satisfied.



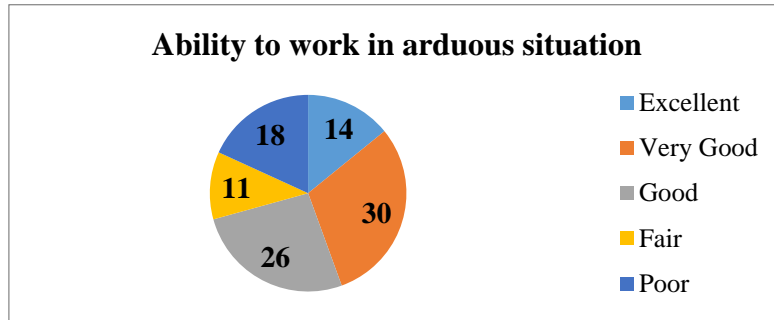
### 1.6.2.10 Question No. 10: Ability to Work in Teams

78% of the students are satisfied with their ability to work in teams while 21% are not satisfied.



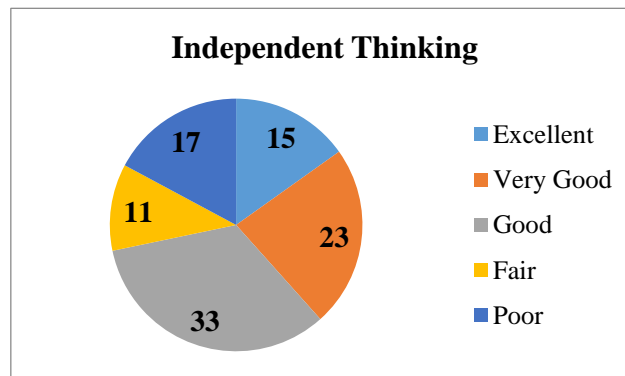
### 1.6.2.11 Question No. 11: Ability to Work in Arduous Situations

70% of the students are satisfied while 29% are not satisfied.



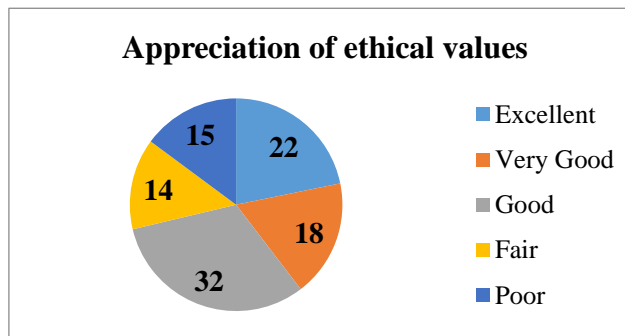
### 1.6.2.12 Question No. 12: Independent Thinking

71% of the students are satisfied while 28% are not satisfied.



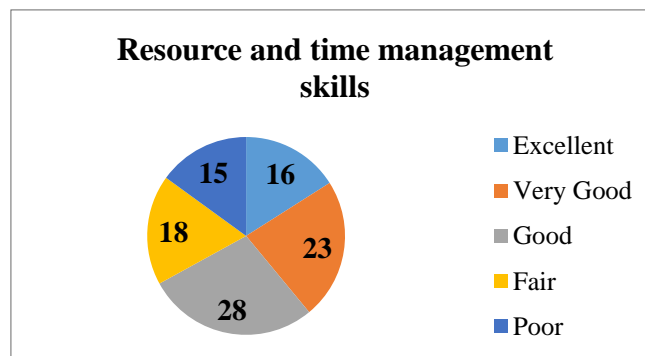
### 1.6.2.13 Question No. 13: Appreciation of Ethical Values

72% of the students are satisfied while 29% are not satisfied.



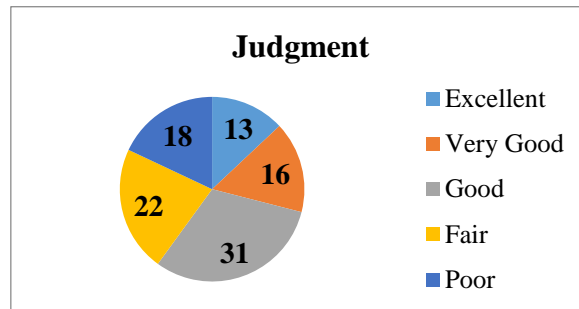
### 1.6.2.14 Question No. 14: Management Skills

67% of the students are satisfied with their management skills while 33% are not satisfied.

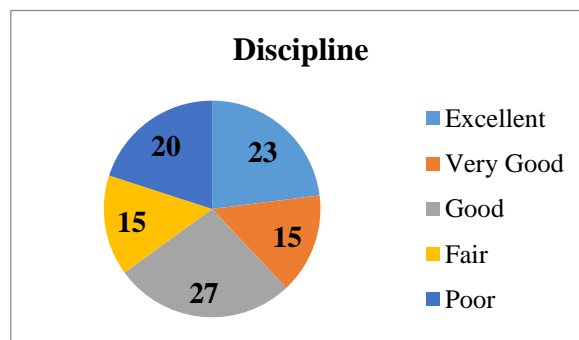


**1.6.2.15 Question No. 15: Judgment**

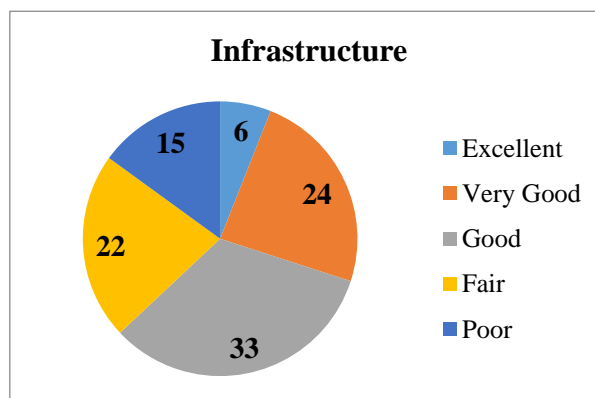
60% of the students are satisfied with their judgment while 40% are not satisfied.

**1.6.2.16 Question No. 16: Discipline**

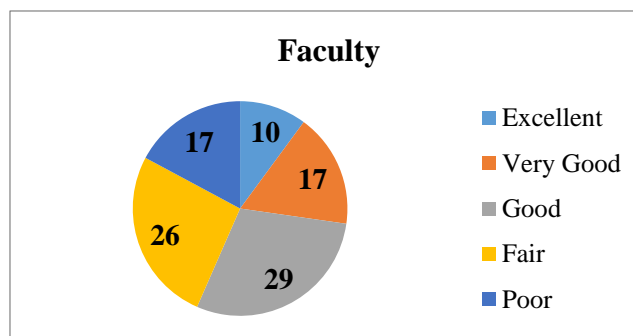
65% of the students are satisfied while 35% are not satisfied.

**1.6.2.17 Question No. 17: Infrastructure**

63% of the students are satisfied with the infrastructure while 37% are not satisfied.

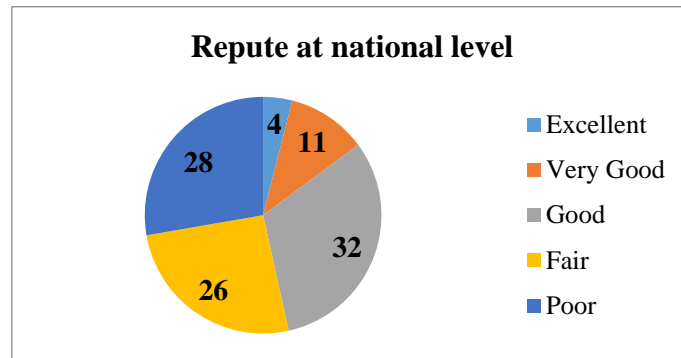
**1.6.2.18 Question No. 18: Faculty**

56% of the students are satisfied with the faculty while 43% are not satisfied.



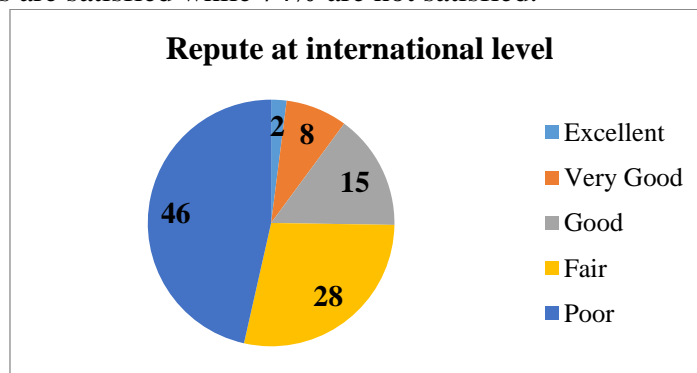
### 1.6.2.19 Question No. 19: Repute at National Level

47% of the students are satisfied while 54% are not satisfied.



### 1.6.2.20 Question No. 20: Repute at International Level

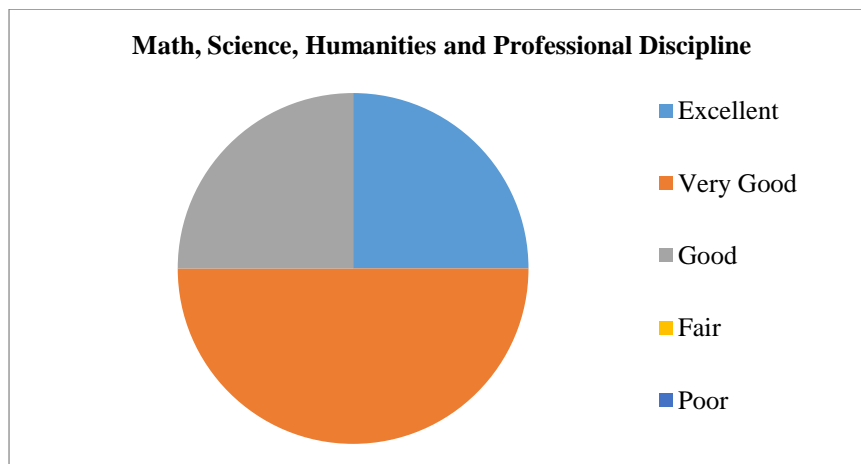
25% of the students are satisfied while 74% are not satisfied.



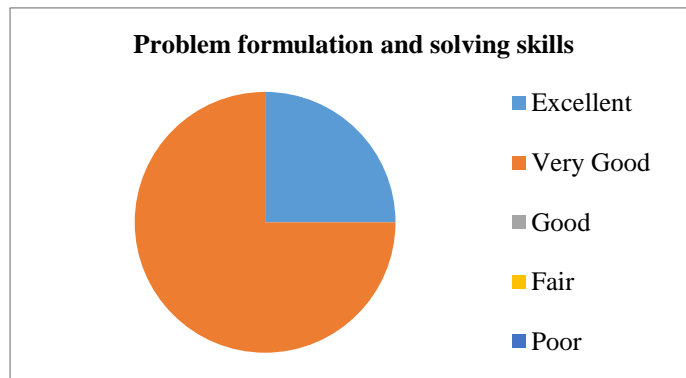
## 1.6.3 Employers' Survey

A total of 4 employers participated in the employer survey. The outcome of the survey is given as follows: -

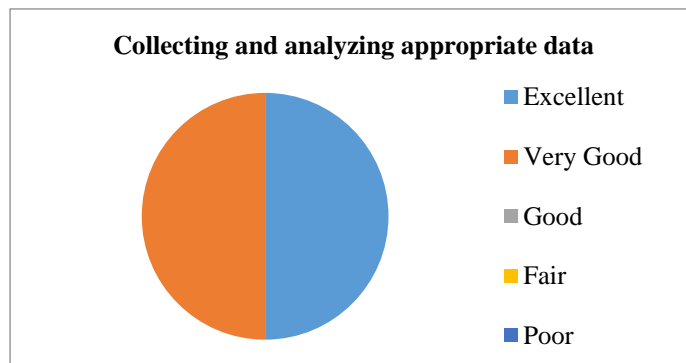
### 1.6.3.1 Question No. 1: Mathematics, Science and Professional Discipline



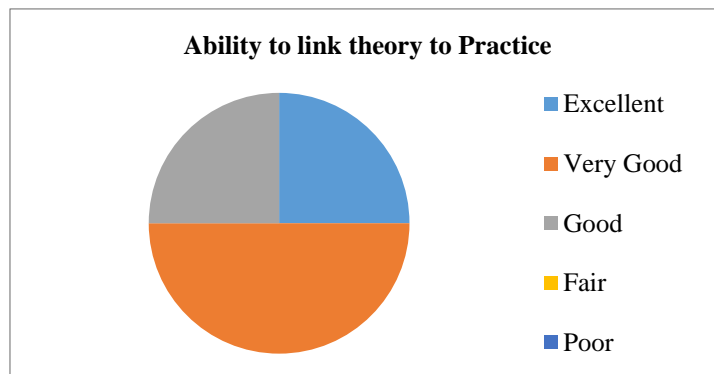
### 1.6.3.2 Question No. 2: Problem Formulation and Solving Skills



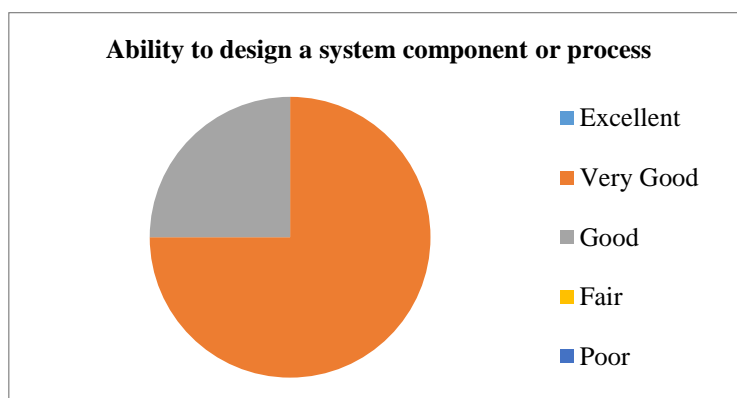
### 1.6.3.3 Question No. 3: Collecting and Analyzing Appropriate Data



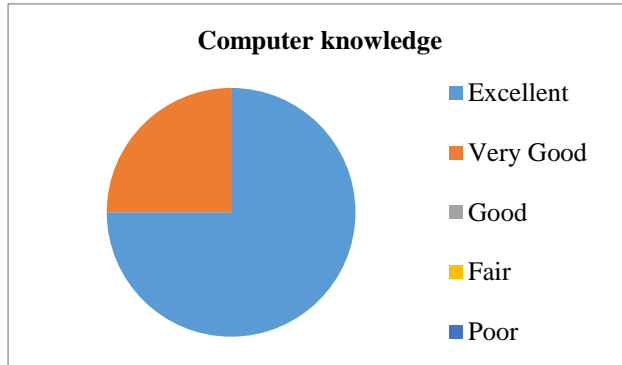
### 1.6.3.4 Question No. 4: Ability to Link Theory with Practice



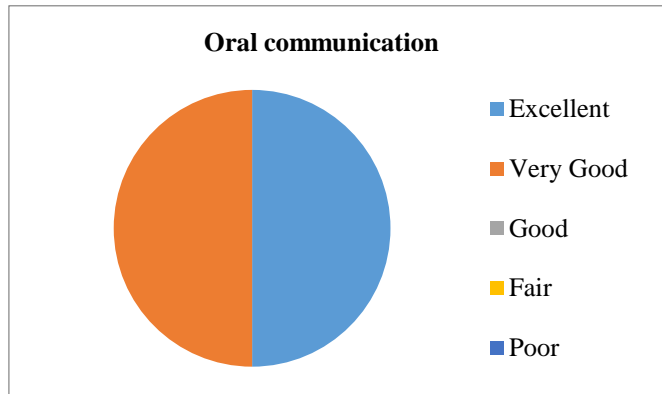
### 1.6.3.5 Question No. 5: Ability to Design System Component or Process



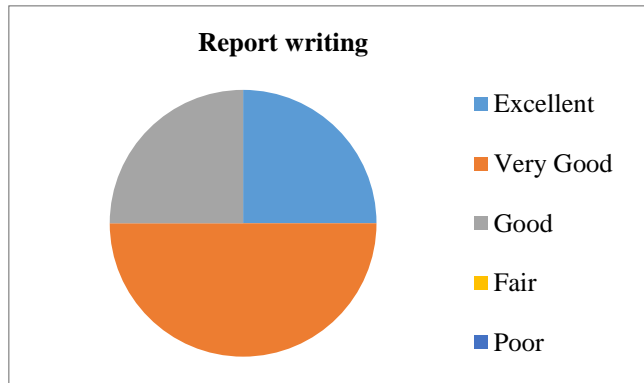
**1.6.3.6 Question No. 6: Computer Knowledge**



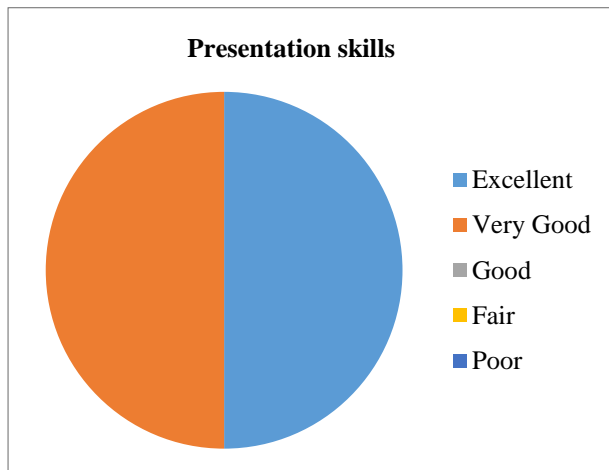
**1.6.3.7 Question No. 7: Oral Communication**



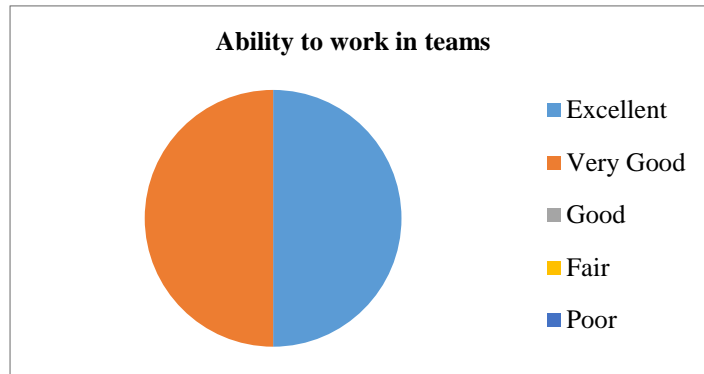
**1.6.3.8 Question No. 8: Report Writing**



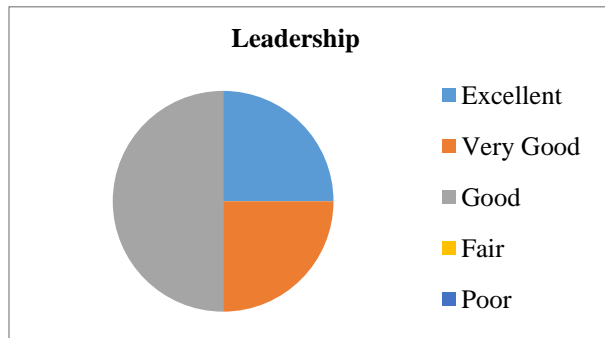
**1.6.3.9 Question No. 9: Presentation Skills**



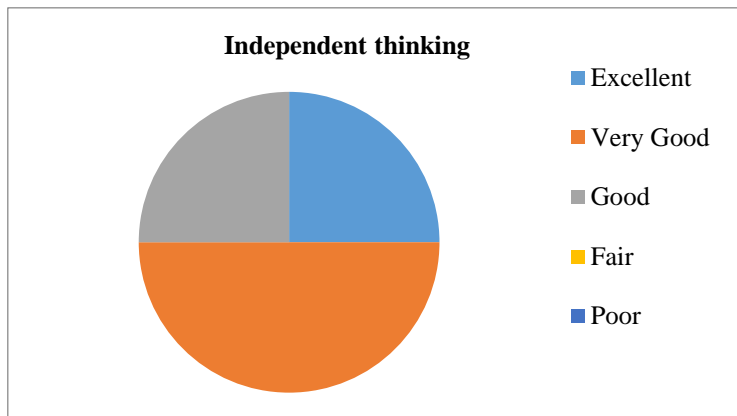
**1.6.3.10 Question No. 10: Ability to Work in Teams**



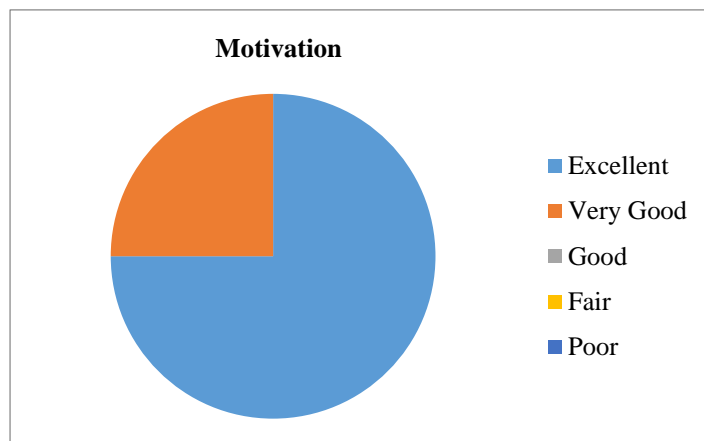
**1.6.3.11 Question No. 11: Leadership**



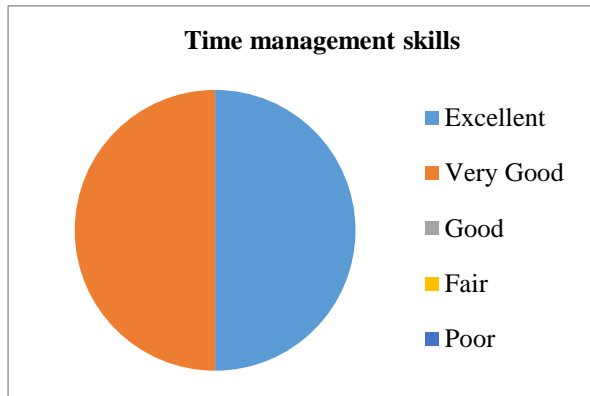
**1.6.3.12 Question No. 12: Independent Thinking**



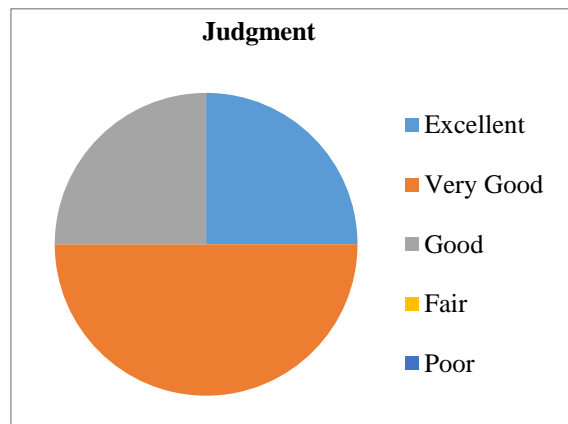
**1.6.3.13 Question No. 13: Motivation**



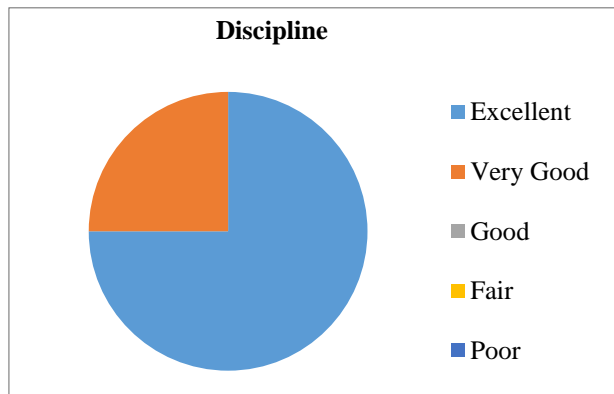
**1.6.3.14 Question No. 14: Time Management Skills**



**1.6.3.15 Question No. 15: Judgment**



**1.6.3.16 Question No. 16: Discipline**





## **II. CURRICULUM DESIGN AND ORGANIZATION**

### **2.1 Degree Title**

Bachelor of Computer in Software Engineering (BCSE)

### **2.2 Definition of the Credit Hour**

One credit hour requires one contact hour a week in class (lecture) or three contact hours a week of laboratory work per semester.

### **2.3 Scheme of Study**

The Scheme of Study is minimum eight years spanned over a period of at least four years. The courses are organized as core courses, elective courses and senior design project. The following table shows the calculations of the total credit hours: -

	<b>Course Type</b>	<b>Credits</b>
1	Core/Required Courses	82 Credits (04 x 04 + 22 x 03)
2	Elective Courses	42 Credits (14 x 03)
3	Senior Design Project	06 Credits (02 + 04)
<b>Total</b>		<b>130 Credits</b>

#### **2.3.1 Semester Wise Breakdown of Courses**

The list of semester wise breakdown including lecture contact hours, lab contact hours, and prerequisites is shown below:-

<b>SEMESTER- 1</b>					
<b>Course Code</b>	<b>Course Title</b>	<b>Lecture Hours</b>	<b>Lab Hours</b>	<b>Credit Hours</b>	<b>Prerequisite</b>
CSC 101	Introduction to Computing	3	3	4 (3-1)	None
CSC 102	Programming Fundamentals	3	3	4 (3-1)	None
MATH 101	Calculus and Analytical Geometry	3	0	3 (3-0)	None
CEN 101	Basic Electronics	3	0	3 (3-0)	None
HUM 111	English-I (Functional English)	3	0	3 (3-0)	None
<b>Total Credit Hours</b>				<b>17 (00 + 17 = 17)</b>	

<b>SEMESTER- 2</b>					
<b>Course Code</b>	<b>Course Title</b>	<b>Lecture Hours</b>	<b>Lab Hours</b>	<b>Credit Hours</b>	<b>Prerequisite</b>
CSC 141	Discrete Structures	3	0	3 (3-0)	None
CSC 103	Object Oriented Programming	2	3	3 (2-1)	Programming Fundamentals
HUM 112	English-II (Communication Skills)	3	0	3 (3-0)	None
-	<i>Supporting Elective – I</i>	-	-	3	-
-	<i>GE/University Elective – I</i>	-	-	3	-
<b>Total Credit Hours</b>				<b>15 (17 + 15 = 32)</b>	

SEMESTER- 3					
Course Code	Course Title	Lecture Hours	Lab Hours	Credit Hours	Prerequisite
SEN 201	Introduction to Software Engineering	3	0	3 (3-0)	Object Oriented Programming
CSC 231	Data Structures and Algorithms	3	0	3 (3-0)	Object Oriented Programming
CEN 211	Digital Logic and Design	3	0	3 (3-0)	Basic Electronics
MATH 211	Linear Algebra	3	0	3 (3-0)	None
HUM 201	Pakistan Studies and Islamic Studies	3	0	3 (3-0)	None
<b>Total Credit Hours</b>				<b>15 (32 + 15 = 47)</b>	

SEMESTER- 4					
Course Code	Course Title	Lecture Hours	Lab Hours	Credit Hours	Prerequisite
CSC 211	Operating Systems	3	3	4 (3-1)	Data Structures and Algorithms
SEN 211	Software Construction	2	3	3 (2-1)	Introduction to Software Eng.
CSC 221	Introduction to Database Systems	3	3	4 (3-1)	Data Structures and Algorithms
HUM 213	English-III (Technical and Report Writing)	3	0	3 (3-0)	None
-	<i>Supporting Elective - II</i>	-	-	3	-
<b>Total Credit Hours</b>				<b>17 (47 + 17 = 64)</b>	

SEMESTER- 5					
Course Code	Course Title	Lecture Hours	Lab Hours	Credit Hours	Prerequisite
SEN 302	Software Requirements Engineering	3	0	3 (3-0)	Introduction to Software Eng.
STAT 301	Probability and Statistics	3	0	3 (3-0)	None
CSC 313	Computer Communication and Networks	2	3	3 (2-1)	None
-	<i>SE Elective</i>	-	3	-	-
-	<i>Supporting Elective – III</i>	-	-	3	-
-	<i>GE/University Elective – II</i>	-	-	3	-
<b>Total Credit Hours</b>				<b>18 (64 + 18 = 82)</b>	

SEMESTER- 6					
Course Code	Course Title	Lecture Hours	Lab Hours	Credit Hours	Prerequisite
CSC 361	Human Computer Interaction	3	0	3 (3-0)	Data Structures and Algorithms
SEN 322	Software Quality Engineering	3	0	3 (3-0)	SRE
SEN 312	Software Design and Architecture	2	3	3 (2-1)	SRE
SEN 351	Formal Methods in Software Engineering	3	0	3 (3-0)	Introduction to Software Eng.
-	<i>SE Elective – II</i>	-	-	3	-
-	<i>SE Application Domain Elective – I</i>	-	-	3	-
<b>Total Credit Hours</b>				<b>18 (82 + 18 = 100)</b>	

SEMESTER- 7					
Course Code	Course Title	Lecture Hours	Lab Hours	Credit Hours	Prerequisite
SEN 498	Senior Design Project – I	0	6	2 (0-2)	None
SEN 432	Software Project Management	3	0	3 (3-0)	Introduction to Software Eng.
SEN 464	Professional Practice	3	0	3 (3-0)	None
-	<i>SE Application Domain Elective – II</i>	-	-	3	-
-	<i>GE/University Elective – III</i>	-	-	3	-
-	<i>GE/University Elective – IV</i>	-	-	3	-
<b>Total Credit Hours</b>				<b>17 (100 + 17 = 117)</b>	

SEMESTER- 8					
Course Code	Course Title	Lecture Hours	Lab Hours	Credit Hours	Prerequisite
SEN 499	Senior Design Project – II	0	12	4 (0-4)	Senior Design Project - I
-	<i>SE Elective – III</i>	-	-	3	-
-	<i>SE Elective – IV</i>	-	-	3	-
-	<i>SE Elective – V</i>	-	-	3	-
<b>Total Credit Hours</b>				<b>13 (117 + 13 = 130)</b>	

### 2.3.2 Elective Computing and Software Engineering Courses

Course Code	Course Title	Credit Hours	Semester
SEN 441	Software Metrics	3 (3-0)	7-8
SEN 231	Software Engineering Economics	3 (3-0)	3-4
SEN 465	Information System Audit	3 (3-0)	7-8
SEN 463	Business Process Automation	3 (3-0)	7-8
SEN 413	Design Patterns	3 (3-0)	7-8
SEN 461	Software Testing	3 (2-1)	7-8
SEN 462	PSP and TSP	3 (3-0)	7-8
CSC 408	Distributed Computing	3 (3-0)	7-8
CSC 205	Introduction to Soft Computing	3 (2-1)	3-4
CSC 312	Real-time systems	3 (3-0)	5-6
CSC 322	Data Warehousing and Data Mining	3 (3-0)	5-6
CSC 351	Artificial Intelligence	3 (3-0)	5-6
CSC 314	Data Security and Encryption	3 (3-0)	5-6
CSC 242	Discrete Structures – II	3 (3-0)	3-4
CSC 343	Automata Theory and Formal Languages	3 (3-0)	5-6
CEN 313	Microprocessor Interfacing	3 (3-0)	5-6
CSC 132	Design and Theory of Algorithms	3 (3-0)	1-2
CSC 333	Analysis of Algorithms	3 (3-0)	5-6
CSC 444	Principles of Programming Languages	3 (3-0)	7-8
CSC 306	Computer Graphics	3 (2-1)	5-6
CSC 452	Artificial Neural Networks	3 (3-0)	7-8
CSC 423	Advance Database Management Systems	3 (2-1)	7-8
CSC 472	Bio-Informatics	3 (3-0)	7-8
CSC 381	Web-Engineering	3 (3-0)	5-6
CSC 473	Digital Image Processing	3 (3-0)	7-8
CEN 212	Computer Architecture	3 (3-0)	3-4
CSC 407	Visual Programming	3 (2-1)	7-8
CSC 104	Advanced Programming	3 (2-1)	1-2
CSC 409	System Programming	3 (2-1)	7-8
CSC 371	Internet Based Software Development	3 (2-1)	5-6

### 2.3.3 Elective Supporting Courses

Course Code	Course Title	Credit hours	Semester
MATH 102	Multivariable Calculus	3 (3-0)	2-3
MATH 203	Advanced Calculus	3 (3-0)	3-4
MATH 322	Numerical and Symbolic Computing	3 (3-0)	5-6
STAT 411	Stochastic Processes	3 (3-0)	7-8
CEN 202	Digital Electronics	3 (2-1)	3-4
MATH 312	Computational Linear Algebra	3 (3-0)	5-6
MATH 441	Mathematical tools for Software Engineering	3 (3-0)	7-8
MATH 331	Operation Research	3 (3-0)	5-6
MATH 321	Simulation and Modeling	3 (3-0)	5-6
CSC 415	Natural Language Processing	3 (3-0)	7-8

### 2.3.4 Elective General Education Courses

Course Code	Course Title	Credit hours	Semester
MGT 215	Economics	3 (3-0)	3-4
HUM 216	Sociology	3 (3-0)	3-4
HUM 217	Psychology	3 (3-0)	3-4
HUM 218	International Relations	3 (3-0)	3-4
MGT 202	Human Resource Management	3 (3-0)	3-4
MGT 303	Marketing	3 (3-0)	5-6
MGT 204	Accounting and Finance	3 (3-0)	3-4
HUM 114	Engineering Ethics	3 (3-0)	1-2
MGT 301	Engineering Management	3 (3-0)	5-6

## 2.4 Curriculum Breakdown

The following table shows the number of courses offered semester wise as Mathematical or Basic Science, Humanities, Core and Electives: -

Semester	Mathematics	Core Courses	Humanities	SDP	Electives	Total
1	3	11	3	-	-	17
2	-	6	3	-	6	15
3	3	9	3	-	-	15
4	-	11	3	-	3	17
5	3	6	-	-	9	18
6	-	12	-	-	6	18
7	-	6	-	2	9	17
8	-	-	-	4	9	13
<b>Total</b>	<b>9</b>	<b>61</b>	<b>12</b>	<b>6</b>	<b>42</b>	<b>130</b>

## 2.5 Approved Course Syllabi

The currently approved course syllabi follow the HEC Computer Science Curriculum. The course profile of each course is generated by faculty members before start of each semester. Course information of some of the courses is given below: -

<b>CSC 101 INTRODUCTION TO COMPUTING</b>	
<b>Course Structure:</b> Lectures: 3, Labs: 1	<b>Credit Hours: 4</b>
<b>Prerequisites:</b> None	
<b>Objectives:</b> This course focuses on a breadth-first coverage of computer science discipline, introducing computing environments, general application software, basic computing hardware, operating systems, desktop publishing, Internet, software applications and tools and computer usage concepts; Introducing Software engineering and Information technology within the broader domain of computing, Social issues of computing.	
<b>Course Outline:</b> Number Systems, Binary numbers, Boolean logic, History computer system, basic machine organization, Von Neumann Architecture, Algorithm definition, design, and implementation, Programming paradigms and languages, Graphical programming, Overview of Software Engineering and Information Technology, Operating system, Compiler, Computer networks and internet, Computer graphics, AI, Social and legal issues.	
<b>Reference Material:</b>	
1. Computers: Information Technology in Perspective, 9/e by Larry Long and Nancy Long,	
2. Prentice Hall, 2002 / ISBN: 0130929891	
3. <i>An Invitation to Computer Science</i> , Schneider and Gersting, Brooks/Cole Thomson Learning, 2000	
4. <i>Computer Science: An overview of Computer Science</i> , Sherer,	
<b>CSC 102 PROGRAMMING FUNDAMENTALS</b>	
<b>Course Structure:</b> Lectures: 3, Labs: 1	<b>Credit Hours: 4</b>
<b>Prerequisites:</b> None	

<b>Objectives:</b> The course is designed to familiarize students with the basic structured programming skills. It emphasizes upon problem analysis, algorithm designing, and program development and testing.	
<b>Course Outline:</b> Overview of computers and programming. Overview of language for e.g. C language C. Basics of structured and Modular programming. Basic Algorithms and problem solving, development of basic algorithms, analyzing problem, designing solution, testing designed solution. Fundamental programming constructs, translation of algorithms to programs, data types, control structures, functions, arrays, records, files, testing programs.	
<b>Reference Material:</b> 1. Problem Solving and Program Design in C / 6E Hanly & Koffman Addison-Wesley   Published: 02/06/2009 ISBN-10: 0321535421   ISBN-13: 9780321535429 2. C How to Program, 5/E (Harvey & Paul) Deitel & Deitel, ISBN-10: 0132404168 ISBN-13: 9780132404167 Publisher: Prentice Hall Copyright: 2007	
<b>CSC 103 OBJECT ORIENTED PROGRAMMING</b>	
<b>Course Structure:</b> Lectures: 2, Labs: 1	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> Programming Fundamentals	
<b>Objectives:</b> The course aims to focus on object-oriented concepts, analysis and software development.	
<b>Course Outline:</b> Evolution of Object Oriented (OO) programming, OO concepts and principles, problem solving in OO paradigm, OO program design process, classes, methods, objects and encapsulation; constructors and destructors, operator and function overloading, virtual functions, derived classes, inheritance and polymorphism. I/O and file processing, exception handling	
<b>Reference Material:</b> 1. C++ How to Program, 6/E (Harvey & Paul) Deitel & Deitel ISBN-10: 0136152503 ISBN-13: 9780136152507 Publisher: Prentice Hall 2. Java How to Program, 7/E (Harvey & Paul) Deitel & Deitel ISBN-10: 0132222205 ISBN-13: 9780132222204 Publisher: Prentice Hall	
<b>CSC 141 DISCRETE STRUCTURES</b>	
<b>Course Structure:</b> Lectures: 3 / Labs: 0	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Objectives:</b> Introduces the foundations of discrete mathematics as they apply to Computer Science, focusing on providing a solid theoretical foundation for further work. Further, this course aims to develop understanding and appreciation of the finite nature inherent in most Computer Science problems and structures through study of combinatorial reasoning, abstract algebra, iterative procedures, predicate calculus, tree and graph structures. In this course more emphasis shall be given to statistical and probabilistic formulation with respect to computing aspects.	
<b>Course Outline:</b> Introduction to logic and proofs: Direct proofs; proof by contradiction, Sets, Combinatory, Sequences, Formal logic, Propositional and predicate calculus, Methods of Proof, Mathematical Induction and Recursion, loop invariants, Relations and functions, Pigeonhole principle, Trees and Graphs, Elementary number theory, Optimization and matching. Fundamental structures: Functions; relations (more specifically recursions); pigeonhole principle; cardinality and count-ability, probabilistic methods.	
<b>Reference Material:</b> 1. Kenneth H. Rosen, <i>Discrete Mathematics and Its Applications</i> , 6 <sup>TH</sup> edition, 2006, McGraw Hill Book Co. 2. Richard Johnsonbaugh, <i>Discrete Mathematics</i> , 7 <sup>TH</sup> edition, 2008, Prentice Hall Publishers. 3. Kolman, Busby & Ross, <i>Discrete Mathematical Structures</i> , 4 <sup>th</sup> edition, 2000, Prentice-Hall Publishers. 4. Ralph P. Grimaldi, <i>Discrete and Combinatorial Mathematics: An Applied Introduction</i> , Addison-Wesley Pub. Co., 1985.	
<b>CSC 211 OPERATING SYSTEMS</b>	
<b>Course Structure:</b> Lectures: 3, Labs: 1	<b>Credit Hours:</b> 4
<b>Prerequisites:</b> Data Structures and Algorithms	
<b>Objectives:</b> To help students gain a general understanding of the principles and concepts governing the functions of operating systems and acquaint students with the layered approach that makes design, implementation and operation of the complex OS possible.	
<b>Course Outline:</b> History and Goals, Evolution of multi-user systems, Process and CPU management, Multithreading, Kernel and User Modes, Protection, Problems of cooperative processes, Synchronization, Deadlocks, Memory management and virtual memory, Relocation, External Fragmentation, Paging and Demand Paging, Secondary storage, Security and Protection, File systems, I/O systems, Introduction to distributed operating systems. Scheduling and dispatch, Introduction to concurrency. Lab assignments	

involving different single and multithreaded OS algorithms.	
<b>Reference Material:</b>	
<ol style="list-style-type: none"> <li>1. <i>Applied Operating Systems Concepts</i>, 7<sup>th</sup> Edition, Silberschatz A., Peterson, J.L., &amp; Galvin P.C. 2004.</li> <li>2. <i>Modern Operating Systems</i>, 3rd Edition, Tanenbaum A.S., 2008.</li> </ol>	
<b>SEN 102 INTRODUCTION TO SOFTWARE ENGINEERING</b>	
<b>Course Structure:</b> Lectures: 2, Labs: 1	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> Object Oriented Programming	
<b>Objectives:</b> To study various software development models and phases of software development life cycle. The concepts of project management, change control, process management, software development and testing are introduced through hands-on Team Projects.	
<b>Course Outline:</b> Introduction to Computer-based System Engineering; Project Management; Software Specification; Requirements Engineering, System Modeling; Requirements Specifications; Software Prototyping; Software Design: Architectural Design, Object-Oriented Design, UML modeling, Function-Oriented Design, User Interface Design; Quality Assurance; Processes & Configuration Management; Introduction to advanced issues: Reusability, Patterns; Assignments and projects on various stages and deliverables of SDLC.	
<b>Reference Material:</b>	
<ol style="list-style-type: none"> <li>1. <i>Software Engineering 8E</i> by Sommerville Addison Wesley, 2006</li> <li>2. <i>Software Engineering: A Practitioner's Approach /7E</i>, Roger Pressman, McGraw-Hill, 2009</li> </ol>	
<b>CSC 313 COMPUTER COMMUNICATION AND NETWORKS</b>	
<b>Course Structure:</b> Lectures: 2, Labs: 1	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Objectives:</b> To introduce students to the concept of computer communication. Analogue & digital transmission. Network Layers, Network models (OSI, TCP/IP) and Protocol Standards. Emphasis is given on the understanding of modern network concepts.	
<b>Course Outline:</b> Analogue and digital Transmission, Noise, Media, Encoding, Asynchronous and Synchronous transmission, Protocol design issues. Network system architectures (OSI, TCP/IP), Error Control, Flow Control, Data Link Protocols (HDLC, PPP). Local Area Networks and MAC Layer protocols (Ethernet, Token ring), Multiplexing, Switched and IP Networks, Inter-networking, Routing, Bridging, Transport layer protocols TCP/IP, UDP. Network security issues. Programming exercises, labs or projects involving implementation of protocols at different layers.	
<b>Reference Material:</b>	
<ol style="list-style-type: none"> <li>1. Introduction to Computer Networks /4, A. S. Tanenbaum, Prentice Hall 2003</li> <li>2. Computer Networks and Internets, 5/E, 2008 Douglas E. Comer, Purdue University ISBN-10: 0136061273 ISBN-13: 9780136061274 Publisher: Prentice Hall</li> <li>3. Data and Computer Communications by William Stallings Published by Macmillan Pub. Co., 8<sup>th</sup> Edition 2006</li> </ol>	
<b>CSC 361 HUMAN COMPUTER INTERACTION</b>	
<b>Course Structure:</b> Lectures: 2, Labs: 1	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> Data Structures and Algorithms	
<b>Objectives:</b> This course introduces the human issues of usability and its importance. It considers the implications of human understanding on the usability of computer systems and the importance of understanding the context of use. It describes guidelines for use of different media and interface styles. Topics include Usability Design principals, standards and models, evaluation techniques. Groupware, pervasive and ubiquitous applications.	
<b>Course Outlines:</b> The Human, Computer and Interaction, Usability paradigm and principles, Introduction to design basics, HCI in software process, Design rules, prototyping, evaluation techniques, task analysis, Universal design and User support and Computer Supported Cooperative Work. Introduction to specialized topics such as Groupware, pervasive and ubiquitous applications.	
<b>Resources:</b>	
<ol style="list-style-type: none"> <li>1. Human-Computer Interaction, 3/E <b>Alan Dix</b>, <i>Computing Dept, Lancaster University</i> <b>Janet E. Finlay</b>, <i>Leeds Metropolitan University</i>, <b>Gregory D. Abowd</b>, <i>Georgia Institute of Technology</i>, <b>Russell Beale</b>, <i>University of Birmingham</i> ISBN-10: 0130461091 ISBN-13: 9780130461094 Publisher: Prentice Hall</li> <li>2. Designing the User Interface: Strategies for Effective Human-Computer Interaction, 4/E</li> </ol>	

<b>SEN498/499 SENIOR DESIGN PROJECT</b>	
<b>Course Structure:</b> Lectures: 0, Labs: 6	<b>Credit Hours:</b> 6
<b>Prerequisites:</b> Introduction to Software Development, Data Base Systems, Computer Architecture	
<b>Objectives:</b> The software project involves research, conceive, plan and develop a real and substantial project related to computer science. It provides an opportunity to the students to crystallize their acquired professional competence in the form of a demonstrable software product. Make oral and written project presentations.	
<b>Resources:</b> 1. <i>Software Project Management in Practice</i> by Jalote, Pankaj.	
<b>CSC 221 INTRODUCTION TO DATABASE SYSTEMS</b>	
<b>Course Structure:</b> Lectures: 3, Labs: 1	<b>Credit Hours:</b> 4
<b>Prerequisites:</b> Data Structures and Algorithms	
<b>Objectives:</b> The course aims to introduce basic database concepts, different data models, data storage and retrieval techniques and database design techniques. The course primarily focuses on relational data model and DBMS concepts.	
<b>Course Outline:</b> Basic database concepts; Entity Relationship modelling, Relational data model and algebra, Structured Query language; RDBMS; Database design, functional dependencies and normal forms; Transaction processing and optimization concepts; concurrency control and recovery techniques; Database security and authorization. Small Group Project implementing a database. Physical database design: Storage and file structure; indexed files; b-trees; files with dense index; files with variable length records; database efficiency and tuning.	
<b>Reference Material:</b> 1. <i>Database Systems 8E</i> , C.J.Date, Addison Wesley Pub. Co. (2004). 2. <i>Database Systems: A Practical Approach to Design, Implementation and Management 5E</i> , R.Connolly and P.Begg, Addison-Wesley Pub. Co (2009). 3. <i>Fundamentals of Database Systems, 5/E</i> , Elmasri and Navathe, Addison-Wesley, ISBN: 0-201-74153-9.	
<b>MATH 101 CALCULUS AND ANALYTIC GEOMETRY</b>	
<b>Course Structure:</b> Lectures: 3, Labs: 0	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Objectives:</b> To provide foundation and basic ground for calculus and analytical geometry background.	
<b>Course Outline:</b> Complex Numbers, DeMoivre's Theorem and its Applications, Simple Cartesian Curves, Functions and Graphs, Symmetrical Properties, Curve Tracing, Limit and Continuity, Differentiation of Functions. Derivative as Slope of Tangent to a Curve and as Rate of Change, Application to Tangent and Normal, Linearization, Maxima/Minima and Point of Inflexion, Taylor and Maclaurin Expansions and their convergence. Integral as Anti-derivative, Indefinite Integration of Simple Functions. Methods of Integration: Integration by Substitution, by Parts, and by Partial Fractions, Definite Integral as Limit of a Sum, Application to Area, Arc Length, Volume and Surface of Revolution.	
<b>Reference Material:</b> 1. <i>Swokowski, Olinick and Pence, Calculus and Analytical Geometry, 6<sup>th</sup> edition, 1994, Brooks/Cole Publishers.</i> 2. <i>Howard Anton, Calculus, 7<sup>th</sup> edition. 2002, John Wiley and Sons (WIE).</i> 3. William E. Boyce Richard C. Diprima, <i>Calculus</i> , John Wiley & Sons, ISBN: 0471093335. 4. Thomas Finny, <i>Calculus and Analytical Geometry</i> , 10th edition, John Wiley and Sons. 5. Erwin Kreyzig, <i>Advanced Engineering Mathematics</i> , 7th edition, 1993, John Wiley & Sons Inc.	
<b>STAT 301 PROBABILITY AND STATISTICS</b>	
<b>Course Structure:</b> Lectures: 3, Labs: 0	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Objectives:</b> To introduce the concepts of data analysis, presentation, counting techniques, probability and decision making.	
<b>Course Outline:</b> Introduction to Statistics, Descriptive Statistics, Statistics in decision making, Graphical representation of Data Stem-and Lead plot, Box-Cox plots, measures of central tendencies and dispersion, moments of frequency distribution; Counting techniques, introduction to probability, sample space, events, laws of probability, Conditional probability and Baye's theorem with application to random variable (Discrete and continuous) Binomial, Poisson, Geometric, Negative Binomial Distributions; Exponential Gamma and Normal distributions. Regression and Correlation, Estimation and testing of hypotheses, use of elementary statistical packages for explanatory Data analysis.	
<b>Reference Material:</b> 1. Ronald Walpole, Myers, Myers, Ye, "Probability & Statistics for Engineers & Scientists", 8 <sup>th</sup> edition, 2008, <b>Prentice Hall</b> Publisher.	

2. Lay L. Devore, Probability and Statistics for Engineering and the Sciences, 2003, Duxbury Publishers.	
3. G. Cowan, <i>Statistical Data Analysis</i> , 1998, Clarendon, Oxford.	
<b>MATH 211 LINEAR ALGEBRA</b>	
<b>Course Structure:</b> Lectures: 3, Labs: 0	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Objectives:</b> To provide fundamentals of solution for system of linear equations, operations on system of equations, matrix properties, solutions and study of their properties.	
<b>Course Outline:</b> Vectors, Vector Spaces, Matrices & Determinants, Cofactor and Inverse, Rank, Linear Independence, Solution of system of Linear systems, Positive Definite matrix, Linear Transformations, Operations on matrices, Inner products, orthogonality and least squares, Eigenvalue & Eigenvectors. Applications to Systems of Equations and to Geometry, Singular Value Decomposition.	
<b>Reference Material:</b>	
1. Bernard Kolman, David Hill, Elementary Linear Algebra with Applications, 9 <sup>th</sup> edition, Prentice Hall PTR, 2007.	
2. Gilbert Strang, Strang, Brett Coonley, Andy Bulman-Fleming, Andrew Bulman-Fleming, Strang's Linear Algebra And Its Applications, 4 <sup>th</sup> edition, Brooks/Cole, 2005	
3. Howard Anton, Chris Rorres, Elementary Linear Algebra: Applications Version, 9 <sup>th</sup> edition, Wiley, 2005.	
4. David C. Lay, Linear Algebra and Its Applications, 2 <sup>nd</sup> edition, Addison-Wesley, 2000.	
<b>HUM 111 ENGLISH-I (FUNCTIONAL ENGLISH)</b>	
<b>Course Structure:</b> Lectures: 3, Labs: 0	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Objectives:</b> Enhance language skills and develop critical thinking.	
<b>Course Contents:</b> 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, Introduction.	
<b>Reference Material:</b>	
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	
3. 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.	
4. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.	
<b>HUM 112 ENGLISH – II (TECHNICAL AND REPORT WRITING)</b>	
<b>Course Structure:</b> Lectures: 3, Labs: 0	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Objectives:</b> Enable the students to meet their real life communication needs.	
<b>Course Contents:</b> Paragraph writing, Practice in writing a good, unified and coherent paragraph, Essay writing, Introduction, CV and job application, Translation skills, Urdu to English, Study skills, Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension, Academic skills, Letter/memo writing, minutes of meetings, use of library and internet, Presentation skills, Personality development (emphasis on content, style and pronunciation)	
<b>References Materials:</b>	
1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6.	
2. Intermediate by Marie-ChristineBoutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).	
3. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).	
4. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.	
5. Reading and Study Skills by John Langan and Study Skills by RiachardYorky.	



<b>HUM 213 ENGLISH – III (TECHNICAL AND REPORT WRITING)</b>	
<b>Course Structure:</b> Lectures: 3, Labs: 0	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Objectives:</b> Enhance language skills and develop critical thinking	
<b>Course Contents:</b> 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	
<b>Reference Material:</b>	
<ol style="list-style-type: none"> <li>1. Advanced by Ron White. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 435407 3 (particularly suitable for discursive, descriptive, argumentative and report writing).</li> <li>2. College Writing Skills by John Langan. Mc=Graw-Hill Higher Education. 2004.</li> <li>3. Patterns of College Writing (4th edition) by Laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press.</li> <li>4. The Mercury Reader. A Custom Publication. Compiled by northerIllinoisUniversity. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and Maurice Scharton. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students).</li> </ol>	
<b>HUM 201 PAKISTAN STUDIES AND ISLAMIC STUDIES</b>	
<b>Course Structure:</b> Lectures: 3, Labs: 0	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Objectives:</b> 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. To provide Basic information about Islamic Studies. To enhance understanding of the students regarding Islamic Civilization. To improve Students skill to perform prayers and other worships. To enhance the skill of the students for understanding of issues related to faith and religious life.	
<b>Course Contents:</b> Historical Perspective, Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-i-Azam Muhammad Ali Jinnah, Factors leading to Muslim separatism, People and Land, Indus Civilization, Muslim advent, Location and geo-physical features, Government and Politics in Pakistan, Political and constitutional phases, Contemporary Pakistan, Economic institutions and issues, Society and social structure, Ethnicity, Foreign policy of Pakistan and challenges, Futuristic outlook of Pakistan, Introduction to Quranic Studies, Basic Concepts of Quran, History of Quran, Uloom-ul-Quran, Study of Selected Text of Holly Quran, Verses of Surah Al-Baqra Related to Faith(Verse No-284-286), Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18), Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11), Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77), Verses of Surah Al-Inam Related to Ihkam(Verse No-152-154), Study of Selected Text of Holy Quran, Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.), Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment, Verses of Surah Al-Saf Related to Tafakar,Tadabar (Verse No-1,14), Seerat of Holy Prophet (S.A.W), Life of Muhammad Bin Abdullah ( Before Prophet Hood), Life of Holy Prophet (S.A.W) in Makkah, Important Lessons Derived from the life of Holy Prophet in Makkah, Seerat of Holy Prophet (S.A.W), Life of Holy Prophet (S.A.W) in Madina, Important Events of Life Holy Prophet in Madina, Important Lessons Derived from the life of Holy Prophet in Madina, Introduction To Sunnah, Basic Concepts of Hadith, History of Hadith, Kinds of Hadith, Uloom –ul-Hadith, Sunnah & Hadith, Legal Position of Sunnah, Selected Study from Text of Hadith, Introduction To Islamic Law & Jurisprudence, Basic Concepts of Islamic Law & Jurisprudence, History & Importance of Islamic Law & Jurisprudence, Sources of Islamic Law & Jurisprudence, Nature of Differences in Islamic Law, Islam and Sectarianism, Islamic Culture & Civilization, Basic Concepts of Islamic Culture & Civilization, Historical Development of Islamic Culture & Civilization, Characteristics of Islamic Culture & Civilization, Islamic Culture & Civilization and Contemporary Issues, Islam & Science, Basic Concepts of Islam & Science, Contributions of Muslims in the Development of Science, Quranic& Science, Islamic Economic System, Basic Concepts of Islamic Economic System, Means of Distribution of wealth in Islamic Economics, Islamic Concept of Riba, Islamic Ways of Trade & Commerce, Political System of Islam, Basic Concepts of Islamic Political System, Islamic Concept of Sovereignty, Basic Institutions of Govt. in Islam, Islamic History, Period of Khlaft-E-Rashida, Period of Ummayyads, Period of Abbasids, Social System of Islam, Basic Concepts of Social System of Islam, Elements of Family, Ethical Values of Islam	

**Reference Material:**

1. Burki, Shahid Javed. State & Society in Pakistan, The Macmillan Press Ltd 1980.
2. Akbar, S. Zaidi. Issue in Pakistan's Economy. Karachi: Oxford University Press, 2000.
3. S.M. Burke and Lawrence Ziring. Pakistan's Foreign policy: An Historical analysis. Karachi: Oxford University Press, 1993.
4. Mehmood, Safdar. Pakistan Political Roots & Development. Lahore, 1994.
5. Wilcox, Wayne. The Emergence of Bangladesh., Washington: American Enterprise, Institute of Public Policy Research, 1972.
6. Mehmood, Safdar. Pakistan Kayyun Toota, 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: Wm Dawson & 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.
15. Hameed ullah Muhammad, "Emergence of Islam", IRI,
16. Hameed ullah Muhammad, "Muslim Conduct of State"
17. Hameed ullah Muhammad, 'Introduction to Islam
18. Mulana Muhammad Yousaf Islahi,"
19. Hussain Hamid Hassan, "An Introduction to the Study of Islamic Law" leaf Publication Islamabad, Pakistan.
20. Ahmad Hasan, "Principles of Islamic Jurisprudence" Islamic Research Institute, International Islamic University, Islamabad (1993)
21. Mir Waliullah, "Muslim Jurisprudence and the Quranic Law of Crimes", Islamic Book Service (1982).
22. H.S. Bhatia, "Studies in Islamic Law, Religion and Society" Deep & Deep, Publications New Delhi (1989)
23. Dr. Muhammad Zia-ul-Haq, "Introduction to Al Sharia Al Islamia" Allama Iqbal Open University, Islamabad (2001)

**HUM 114 ENGINEERING ETHICS****Course Structure:** Lectures: 3, Labs: 0**Credit Hours:** 3**Prerequisites:** None

**Objectives:** A Computing graduate as professional has some responsibilities with respect to the society. This course develops student understanding about historical, social, economic, ethical, and professional issues related to the discipline of Computing. It identifies key sources for information and opinion about professionalism and ethics. Students analyze, evaluate, and assess ethical and professional computing case studies.

**Course Outline:** Historical, social, and economic context of Computing (software engineering, Computer Science, Information Technology); Definitions of Computing (software engineering, Computer Science, Information Technology) subject areas and professional activities; professional societies; professional ethics; professional competency and life-long learning; uses, misuses, and risks of software; information security and privacy; business practices and the economics of software; intellectual property and software law (cyber law); social responsibilities, software related contracts, Software house organization

**Resources:**

1. *Professional Issues in Software Engineering*, M.F. Bott et al.

**CSC 343 THEORY OF AUTOMATA AND FORMAL LANGUAGES****Course Structure:** Lectures: 3 Labs: 0**Credit Hours:** 3**Prerequisites:** Discrete Structures

**Objectives:** The course aims to develop an appreciation of the theoretical foundations of computer science through study of mathematical & abstract models of computers and the theory of formal languages. *Theory of formal languages* and use of various abstract machines as 'recognizers' and parsing will be studied for identifying/validating the synthetic characteristics of programming languages. Some of the abstract machines shall also study as 'Transducers'.

**Course Outline:** *Finite State Models:* Language definitions preliminaries, Regular expressions/Regular languages, Finite automata (FAs), Transition graphs (TGs), NFAs, Kleene's theorem, Transducers

(automata with output), Pumping lemma and non regular language <i>Grammars and PDA</i> : Context free grammars, Derivations, derivation trees and ambiguity, Simplifying CFLs , Normal form grammars and parsing, Decidability, Chomsky's hierarchy of grammars <i>Turing Machines Theory</i> : Turing machines, Post machine, Variations on TM, TM encoding, Universal Turing Machine, Context sensitive Grammars, Defining Computers by TMs.	
<b>Text Books/Reference Books:</b>	
1. An Introduction to Formal Languages and Automata, By Peter Linz, 4 <sup>th</sup> edition, Jones & Bartlett Publishers, 2006	
2. Theory of Automata, Formal Languages and Computation, By S. P. Eugene, Kavier, 2005, New Age Publishers, ISBN (10): 81-224-2334-5, ISBN (13) : 978-81-224-2334-1.	
3. John Hopcroft and Jeffrey Ullman, <i>Introduction to Automata Theory, Languages, and Computation</i> , 2 <sup>nd</sup> edition, 2001, Addison-Wesley.	
4. Introduction to Languages and the Theory of Computation, By John C. Martin 3 <sup>rd</sup> edition, 2002, McGraw-Hill Professional.	
<b>COURSE NAME: DESIGN AND ANALYSIS OF ALGORITHMS</b>	
<b>Course Structure:</b> Lectures: 3 / Labs: 0	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> Discrete Structure, Data Structures and Algorithms	
<b>Objectives:</b> Detailed study of the basic notions of the design of algorithms and the underlying data structures. Several measures of complexity are introduced. Emphasis on the structure, complexity, and efficiency of algorithms.	
<b>Course Outline:</b> Introduction; Asymptotic notations; Recursion and recurrence relations; Divide-and-conquer approach; Sorting; Search trees; Heaps; Hashing; Greedy approach; Dynamic programming; Graph algorithms; Shortest paths; Network flow; Disjoint Sets; Polynomial and matrix calculations; String matching; NP complete problems; Approximation algorithms.	
<b>Reference Material:</b>	
1. <i>Introduction to Algorithms /2E</i> , T. H. Cormen, C. E. Leiserson, and R. L. Rivest, MIT Press, McGraw-Hill, New York, NY, 2001.	
2. Algorithms in C++; Robert Sedgewick	
<b>CSC 351 ARTIFICIAL INTELLIGENCE</b>	
<b>Course Structure:</b> Lectures: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> Data Structures and Algorithms	
<b>Objectives:</b> This course studies four main objectives of AI. Modelling the environment by constructing computer representations of the real world. Perception and reasoning - obtaining and creating information/ <i>knowledge</i> to populate a computational representation. Taking actions by using the knowledge of the environment and desired goals to plan and execute actions. Learning from past experience.	
<b>Course Outline:</b> Artificial Intelligence: Introduction, Intelligent Agents. Problem-solving: Solving Problems by Searching, Informed Search and Exploration, Constraint Satisfaction Problems, Adversarial Search. Knowledge and reasoning: Logical Agents, First-Order Logic, Inference in First-Order Logic, Knowledge Representation. Planning and Acting in the Real World. Uncertain knowledge and reasoning: Uncertainty, Probabilistic Reasoning, Probabilistic Reasoning over Time, Making Simple Decisions, Making Complex Decisions. Learning: Learning from Observations, Knowledge in Learning, Statistical Learning Methods, Reinforcement Learning. Communicating, perceiving, and acting: Communication, Probabilistic Language Processing, Perception and Robotics. Introduction to LISP/PROLOG and Expert Systems (ES) and Applications.	
<b>Reference Material:</b>	
1. Artificial Intelligence: Structures and Strategies for Complex Problem Solving: International Edition By George F. Luger, 6 <sup>th</sup> edition: Pearson Education, 2008.	
2. Artificial Intelligence: A Modern Approach, By Stuart Jonathan Russell, Peter Norvig, John F. Canny, 2 <sup>nd</sup> Edition, Prentice Hall, 2003.	
<b>CEN 212 COMPUTER ARCHITECTURE</b>	
<b>Course Structure:</b> Lectures: 3, Labs: 0	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> Digital Logic and Design	
<b>Objectives:</b> Get a deeper understanding of how computers work, working knowledge of various subsystems and the general principles that affect their performance, analyze the performance of systems and quantify the performance measurements, fundamentals of all technologies, and advanced architectural features that boost the performance of computers.	
<b>Course Outlines:</b> Fundamentals of Computer Design including performance measurements & quantitative principles, principles of Instruction Set Design, Operands, addressing modes and encoding, pipelining of	

Processors: Issues and Hurdles, exception handling features, Instruction-Level Parallelism and Dynamic handling of Exceptions, Memory Hierarchy Design, Cache Design, Performance Issues and improvements, Main Memory Performance Issues, Storage Systems, Multiprocessors and Thread Level Parallelism. Case Studies.	
<b>Resources:</b>	
1. <i>Computer Architecture: A Quantitative Approach</i> by Hennessy & Patterson, Morgan & Kauffman Series (2006) <u>Fourth Edition</u> .	
2. <i>Computer Organization &amp; Design : The Hardware/Software Interface</i> By Patterson & Hennessy, Morgan & Kauffman Series (2008) <u>Fourth Edition</u> .	
<b>SEN 211 SOFTWARE CONSTRUCTION</b>	
<b>Course Structure:</b> Lectures: 2 / Labs: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> Introduction to Software Engineering	
<b>Objectives:</b> At the end of the course students should understand the overall structure of a compiler, and will know significant details of a number of important techniques commonly used. They will be aware of the way in which language features raise challenges for compiler builders.	
<b>Course Outline:</b> Compiler techniques and methodology. Organization of compilers. Lexical and syntax analysis. Parsing techniques. Object code generation and optimization, detection and recovery from errors. Contrast between compilers and interpreters.	
<b>Reference Material:</b>	
1. <i>Compilers: Principles, Techniques, and Tools</i> By Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Contributor Jeffrey D. Ullman ,Addison-Wesley Pub. Co., 2 <sup>nd</sup> edition,1987 Original from the University of Michigan	
2. <i>Modern Compiler Design</i> , By Dick Grune, Henri E. Bal, Cerial J. H. Jacobs, Koen G. Langendoen, John Wiley, 2000.	
3. <i>Modern Compiler Implementation in C</i> , By Andrew W. Appel, Maia Ginsburg, Contributor Maia Ginsburg, Cambridge University Press, 2004.	
4. <i>Modern Compiler Design</i> by Dick Grune, Henri E. Bal, Cerial J. H. Jacobs, Koen G. Langendoen, 2003, John Wiley & Sons.	
<b>MATH 102 MULTIVARIABLE CALCULUS</b>	
<b>Course Structure:</b> Lectures: 3 / Labs: 0	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> Calculus and Analytical Geometry	
<b>Objectives:</b> The goals are to develop the skills to have ground knowledge of multivariate calculus and appreciation for their further computer science courses.	
<b>Course Outline:</b> Functions of Several Variables and Partial Differentiation. Multiple Integrals, Line and Surface Integrals. Green's and Stoke's Theorem. Fourier Series: periodic functions, Functions of any period P-2L, Even & odd functions, Half Range expansions, Fourier Transform. Laplace Transform, Z-Transform.	
<b>Reference Material:</b>	
1. James Stewart, <i>Multivariable Calculus</i> , 6 <sup>th</sup> edition, 2007, Cengage Learning publishers.	
2. Swokowski, Olinick and Pence, <i>Calculus and Analytical Geometry</i> , 6 <sup>th</sup> edition, 1994, Thomson Learning EMEA, Ltd.	
3. Bernard Kolman, William F. Trench, <i>Elementary Multivariable Calculus</i> , 1971, Academic Press.	
4. Howard Anton, Albert Herr, <i>Multivariable Calculus</i> , 5 <sup>th</sup> edition, 1995, John Wiley.	
<b>MATH 322 NUMERICAL AND SYMBOLIC COMPUTING</b>	
<b>Course Structure:</b> Lectures: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> Calculus and Analytical Geometry	
<b>Objectives:</b> On completion of this unit, students will be able to demonstrate programming proficiency using structured programming techniques to implement numerical methods for solutions using computer-based programming techniques using MATLAB for all methods. The course must serve the purpose of scientific software development for science and engineering problems.	
<b>Course Outline:</b> The concepts of efficiency, reliability and accuracy of a method. Minimising computational errors. Theory of Differences, Difference Operators, Difference Tables, Forward Differences, Backward Differences and Central Differences. Mathematical Preliminaries, Solution of Equations in one variable, Interpolation and Polynomial Approximation, Numerical Differentiation and Numerical Integration, Initial Value Problems for Ordinary Differential Equations, Direct Methods for Solving Linear Systems, Iterative Techniques in Matrix Algebra, Solution of non-linear equations.	
<b>Reference Material:</b>	
1. <i>Numerical Methods in Scientific Computing</i> GermundDahlquist and ÅkeBjörck .	

2. Numerical Methods for Scientific Computing : J.H. Heinbockel	
3. Numerical Analysis: I.A. Khubaza	
4. Numerical Analysis and Programming : Shan S Kuo	
5. Numerical Analysis by Berden Fairs	
6. Numerical Analysis by Gerald	
<b>CSC 306 COMPUTER GRAPHICS</b>	
<b>Course Structure:</b> Lectures: 2 / Labs: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> Object Oriented Programming	
<b>Objectives:</b> Study of various algorithms in computer graphics and their implementation in any programming language.	
<b>Course Outline:</b> Graphics hardware. Fundamental algorithms. Applications of graphics. Interactive graphics programming — graph plotting, windows and clipping, and segmentation. Programming raster display systems, Differential Line Algorithm, panning and zooming. Raster algorithms and software — Scan-Converting lines, characters and circles. Scaling, Rotation, Translation, Region filling and clipping. Two and three dimensional imaging geometry (Perspective projection and Orthogonal projection) and transformations. Curve and surface design, rendering, shading, colour and animation.	
<b>Reference Material:</b>	
1. Computer Graphics, Principles and Practice, J. D. Foley, A. van Dam, S. K. Feiner and J. F. Hughes, Addison-Wesley ISBN: 0-201-12110-7.	
2. <i>Computer Graphics</i> , F.S.Hill,Maxwell MacMillan ISBN: 0-02-354860-6.	
3. Interactive Computer Graphics: Functional, Procedural and Device-level methods; Peter Burger and Duncan. F. Gillies; Addison-Wesley, (2003)	
<b>CSC 473 DIGITAL IMAGE PROCESSING</b>	
<b>Course Structure:</b> Lectures:3 Labs: 0	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> None	
<b>Objective:</b> The aim of this module is to understand the main terms & concepts of Information Systems & their applications in everyday business. The main objectives of this module are to make business students aware of the increasing importance of IT, computers and telecom and to manage IT systems in modern organisational structure. Another important objective of this module is to learn about various information systems used in industries and select the appropriate information system for the required application. Restoration in the Presence of Noise Only–Spatial Filtering, Mean Filters, Order-Statistics Filters, Adaptive Filters, Periodic Noise Reduction by Frequency Domain Filtering, Bandreject Filters, Bandpass Filters, Notch Filters. Estimating the Degradation Function, Estimation by Image Observation, Estimation by Experimentation, Estimation by Modeling, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering. Image Segmentation, Detection of Discontinuities, Point Detection, Line Detection, Edge Detection, Edge Linking and Boundary Detection, Local Processing, Global Processing via the Hough Transform, Thresholding, The Role of Illumination, Basic Global Thresholding, Basic Adaptive Thresholding, Local Thresholding, Thresholds Based on Several Variables, Region-Based Segmentation, Region Growing, Region Splitting and Merging	
<b>CSC 409 SYSTEM PROGRAMMING</b>	
<b>Course Structure:</b> Lectures: 2 / Labs: 3	<b>Credit Hours:</b> 3
<b>Prerequisites:</b> Operating Systems	
<b>Objectives:</b> Demonstrate mastery of the internal operation of Unix system software including assemblers, loaders, macro-processors, interpreters, inter-process communication.	
<b>Course Outline:</b> System Programming overview: Application Vs. System Programming, System Software, Operating System, Device Drivers, OS Calls. Window System Programming for Intel386 Architecture: 16 bit Vs 32 bit, Programming, 32 bit Flat memory model, Windows Architecture. Virtual Machine (VM)Basics, System Virtual Machine, Portable Executable Format, Ring O Computer, Linear Executable format, Virtual Device Driver (V + D), New Executable format, Module Management, COFF obj format 16 bit. (Unix) other 32-bit O.S Programming for I 386; Unix Binaryble format (ELF), Dynamic shared objects, Unix Kernel Programming (Ring O), Unix Device Architecture (Character & Block Devices), Device Driver Development, Enhancing Unix Kernel.	
<b>Reference Material:</b>	
1. <i>The UNIX Programming Environment</i> , B. Kernighan & R. Pike Prentice-Hall, 1984.	
2. <i>System Software</i> , Leland L. Beck, Addison-Wesley Longmsan, 1990, ISBN: 0-201-50945-8.	

<b>CSC 408 DISTRIBUTED COMPUTING</b>	
<b>Course Structure:</b> Lectures: 3 Labs: 0	<b>Credit Hours:</b> 3
<b>Course Outlines:</b> Why use parallel and distributed systems? Why not use them? Speedup and Amdahl's Law, Hardware architectures: multiprocessors (shared memory), networks of workstations (distributed memory), clusters (latest variation). Software architectures: threads and shared memory, processes and message passing, distributed shared memory (DSM), distributed shared data (DSD). Possible research and project topics, Parallel Algorithms, Concurrency and synchronization, Data and work partitioning, Common parallelization strategies, Granularity, Load balancing, Examples: parallel search, parallel sorting, etc. Shared-Memory Programming: Threads, Pthreads, Locks and semaphores, Distributed-Memory Programming: Message Passing, MPI, PVM. Other Parallel Programming Systems, Distributed shared memory, Aurora: Scoped behavior and abstract data types, Enterprise: Process templates. Research Topics	
<b>Text Books/Reference Books:</b>	
1. B. Wilkinson and M. Allen, <i>Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers</i> , 1/e, Prentice Hall, 1999.	
2. W. Stevens, <i>Advanced Programming in the Unix Environment</i> , Addison Wesley, 1993.	
<b>CSC 322 DATA WAREHOUSING AND DATA MINING</b>	
<b>Course Structure:</b> Theory 3, Lab 0	<b>Credit Hours:</b> 3
<b>Prerequisite:</b> Introduction to Database Systems	
<b>Objective:</b> To provide the Introduction of Data warehouse and its purpose. And enable the students to understand different features / issues in data warehousing and its designing.	
<b>Course Outline:</b> Introduction to Data Warehouse and Data Marts, Comparison of OLTP Systems & Data Warehousing, Data Warehouse Architecture, Dimensional Modeling, Comparison Of DM & ER Models, Extraction, Cleansing and Loading process and techniques, Designing a Data warehouse, End user tools, OLAP.	

## 2.6 Assessment of the Curriculum

The assessment of the curriculum is evaluated through the following standards: -

### 2.6.1 Course vs. Program Objectives

The following table shows how the curriculum is consistent with the program objectives.

Course		Objectives			
Code	Title	Core Concept	Practical Skills	Professionalism	Research Culture
<b>Core Courses</b>					
CSC 101	Introduction to Computing	✓	✓	✓	
CSC 102	Programming Fundamentals	✓	✓	✓	
MATH 101	Calculus and Analytical Geometry	✓		✓	
CEN 101	Basic Electronics	✓	✓	✓	
HUM 111	English-I (Functional English)	✓		✓	
CSC 141	Discrete Structures	✓		✓	
CSC 103	Object Oriented Programming	✓	✓	✓	
HUM 112	English-II (Communication Skills)	✓		✓	
SEN 201	Introduction to Software Engineering	✓		✓	
CSC 231	Data Structures and Algorithms	✓	✓	✓	
CEN 211	Digital Logic and Design	✓		✓	
MATH 211	Linear Algebra	✓		✓	
HUM 201	Pakistan Studies and Islamic Studies	✓		✓	
CSC 211	Operating Systems	✓	✓	✓	
SEN 211	Software Construction	✓	✓	✓	
CSC 221	Introduction to Database	✓	✓	✓	

	Systems				
HUM 213	English-III (Technical and Report Writing)	✓		✓	
SEN 302	Software Requirements Engineering	✓	✓	✓	✓
STAT 301	Probability and Statistics	✓		✓	
CSC 313	Computer Communication and Networks	✓	✓	✓	
CSC 361	Human Computer Interaction	✓	✓	✓	✓
SEN 322	Software Quality Engineering	✓		✓	✓
SEN 312	Software Design and Architecture	✓		✓	✓
SEN 351	Formal Methods in Software Engineering	✓		✓	✓
SEN 498	Senior Design Project - I	✓	✓	✓	✓
SEN 432	Software Project Management	✓	✓	✓	✓
SEN 464	Professional Practice	✓		✓	✓
SEN 499	Senior Design Project - II	✓	✓	✓	✓
<b>Electives</b>					
SEN 441	Software Metrics			✓	✓
SEN 231	Software Engineering Economics			✓	✓
SEN 465	Information System Audit			✓	✓
SEN 463	Business Process Automation			✓	✓
SEN 413	Design Patterns	✓	✓	✓	✓
SEN 461	Software Testing	✓	✓	✓	✓
SEN 462	PSP and TSP		✓	✓	✓
CSC 408	Distributed Computing	✓	✓	✓	✓
CSC 205	Introduction to Soft Computing			✓	✓
CSC 312	Real-time systems		✓	✓	✓
CSC 322	Data Warehousing and Data Mining		✓	✓	✓
CSC 351	Artificial Intelligence	✓		✓	✓
CSC 314	Data Security and Encryption		✓	✓	✓
CSC 242	Discrete Structures – II			✓	✓
CSC 343	Automata Theory and Formal Languages	✓		✓	
CEN 313	Microprocessor Interfacing		✓	✓	
CSC 132	Design and Theory of Algorithms	✓	✓	✓	✓
CSC 333	Analysis of Algorithms	✓	✓	✓	✓
CSC 444	Principles of Programming Languages		✓	✓	
CSC 306	Computer Graphics	✓	✓		✓
CSC 452	Artificial Neural Networks		✓	✓	✓
CSC 423	Advance Database Management Systems		✓	✓	✓
CSC 472	Bio-Informatics		✓	✓	✓
CSC 381	Web-Engineering	✓	✓	✓	✓
CSC 473	Digital Image Processing		✓	✓	✓
CEN 212	Computer Architecture	✓	✓	✓	✓
CSC 407	Visual Programming			✓	✓
CSC 104	Advanced Programming			✓	✓
CSC 409	System Programming		✓	✓	✓
CSC 371	Internet Based Software Development			✓	✓

Supporting Electives					
MATH 102	Multivariable Calculus	✓		✓	
MATH 203	Advanced Calculus			✓	
MATH 322	Numerical and Symbolic Computing	✓	✓	✓	
STAT 411	Stochastic Processes			✓	✓
CEN 202	Digital Electronics		✓	✓	
MATH 312	Computational Linear Algebra		✓	✓	
MATH 441	Mathematical tools for Software Engineering		✓	✓	✓
MATH 331	Operation Research			✓	✓
MATH 321	Simulation and Modeling		✓	✓	✓
CSC 415	Natural Language Processing		✓	✓	✓
General Education					
MGT 215	Economics			✓	
HUM 216	Sociology			✓	
HUM 217	Psychology			✓	
HUM 218	International Relations			✓	
MGT 202	Human Resource Management		✓	✓	
MGT 303	Marketing		✓	✓	
MGT 204	Accounting and Finance		✓	✓	
HUM 114	Engineering Ethics			✓	
MGT 301	Engineering Management		✓	✓	

#### 2.4.1 Course vs. Theoretical Background, Problem Analysis and Solution Design

The following table shows how the curriculum stresses on problem analysis, theoretical background and solution design.

Course		Approaches		
Code	Title	Theoretical Background	Problem Analysis	Solution Design
Core Courses				
CSC 101	Introduction to Computing	✓		
CSC 102	Programming Fundamentals	✓	✓	
MATH 101	Calculus and Analytical Geometry	✓	✓	
CEN 101	Basic Electronics	✓	✓	✓
HUM 111	English-I (Functional English)	✓		
CSC 141	Discrete Structures	✓		
CSC 103	Object Oriented Programming	✓	✓	✓
HUM 112	English-II (Communication Skills)	✓		
SEN 201	Introduction to Software Engineering	✓	✓	
CSC 231	Data Structures and Algorithms	✓	✓	✓
CEN 211	Digital Logic and Design	✓	✓	
MATH 211	Linear Algebra	✓	✓	
HUM 201	Pakistan Studies and Islamic Studies	✓		
CSC 211	Operating Systems	✓	✓	
SEN 211	Software Construction	✓	✓	✓
CSC 221	Introduction to Database Systems	✓	✓	✓
HUM 213	English-III (Technical and Report Writing)	✓		
SEN 302	Software Requirements Engineering	✓	✓	✓
STAT 301	Probability and Statistics	✓	✓	
CSC 313	Computer Communication and Networks	✓	✓	
CSC 361	Human Computer Interaction	✓	✓	✓



SEN 322	Software Quality Engineering	✓	✓	
SEN 312	Software Design and Architecture	✓	✓	✓
SEN 351	Formal Methods in Software Engineering	✓	✓	
SEN 498	Senior Design Project - I	✓	✓	✓
SEN 432	Software Project Management	✓	✓	✓
SEN 464	Professional Practice	✓		
SEN 499	Senior Design Project - II	✓	✓	✓
<b>Electives</b>				
SEN 441	Software Metrics	✓	✓	
SEN 231	Software Engineering Economics	✓		
SEN 465	Information System Audit	✓		
SEN 463	Business Process Automation	✓		
SEN 413	Design Patterns	✓	✓	✓
SEN 461	Software Testing	✓	✓	
SEN 462	PSP and TSP	✓	✓	
CSC 408	Distributed Computing	✓	✓	✓
CSC 205	Introduction to Soft Computing	✓	✓	
CSC 312	Real-time systems	✓	✓	
CSC 322	Data Warehousing and Data Mining	✓	✓	✓
CSC 351	Artificial Intelligence	✓	✓	
CSC 314	Data Security and Encryption	✓	✓	
CSC 242	Discrete Structures – II	✓	✓	
CSC 343	Automata Theory and Formal Languages	✓	✓	✓
CEN 313	Microprocessor Interfacing	✓	✓	
CSC 132	Design and Theory of Algorithms	✓	✓	✓
CSC 333	Analysis of Algorithms	✓	✓	
CSC 444	Principles of Programming Languages	✓	✓	
CSC 306	Computer Graphics	✓		✓
CSC 452	Artificial Neural Networks	✓	✓	✓
CSC 423	Advance Database Management Systems	✓		✓
CSC 472	Bio-Informatics	✓		
CSC 381	Web-Engineering	✓	✓	✓
CSC 473	Digital Image Processing	✓	✓	✓
CEN 212	Computer Architecture	✓	✓	✓
CSC 407	Visual Programming	✓		✓
CSC 104	Advanced Programming	✓		✓
CSC 409	System Programming	✓		✓
CSC 371	Internet Based Software Development	✓		✓
<b>Supporting Electives</b>				
MATH 102	Multivariable Calculus	✓	✓	
MATH 203	Advanced Calculus	✓	✓	✓
MATH 322	Numerical and Symbolic Computing	✓	✓	
STAT 411	Stochastic Processes	✓	✓	✓
CEN 202	Digital Electronics	✓	✓	
MATH 312	Computational Linear Algebra	✓	✓	
MATH 441	Mathematical tools for Software Engineering	✓		✓
MATH 331	Operation Research	✓	✓	
MATH 321	Simulation and Modeling	✓	✓	✓
CSC 415	Natural Language Processing	✓	✓	✓
<b>General Education</b>				
MGT 215	Economics	✓	✓	
HUM 216	Sociology	✓		
HUM 217	Psychology	✓		
HUM 218	International Relations	✓		

MGT 202	Human Resource Management	✓	✓	✓
MGT 303	Marketing	✓	✓	✓
MGT 204	Accounting and Finance	✓	✓	
HUM 114	Engineering Ethics	✓		
MGT 301	Engineering Management	✓		

### 2.6.2 Curriculum vs. Core Requirements

The following table shows how the curriculum satisfies the minimum program requirements.

Program	Mathematics	Core	Humanities	Electives
BCSE	9	67	12	42

### 2.6.3 Curriculum and Requirements of NCEAC

The program satisfies the curriculum requirements as set by NCEAC.

### 2.6.4 Curriculum and Requirements in General Education, Arts and Professionalism

The program also has sufficient general education, arts and professionalism related courses.

### 2.6.5 IT Education

IT component is high and courses cover the depths as well as the breadths of the area. Specialists courses train and develop problem solving skills of the students in IT related area.

### 2.6.6 Oral and Written Skills

The presentation and written skills are also improved through humanities. Students are taught a course in Technical and Business Writing and learn various aspects of communication, public speaking and presentations. In addition to this, each semester project is concluded with a presentation by the student in front of the whole class as well as a submission of a report. This exercise amply polishes the presentation skills of the students.

The SDP carried out by students are submitted in the form of presentations to project evaluation committee. The three main presentations consist of Proposal Defense, Mid Project Evaluation and Final Evaluation. This gives the students ample training in presentation skills. The project assessment also carries weight-age for project documentation according to software documentation standards and a student's project is not deemed completed unless his project documentation is evaluated and considered adequate. Furthermore a project report is submitted in the end by the students.

### **III. LABORATORIES AND COMPUTING FACILITIES**

#### **3.1 Lab Details**

There are four Computer Labs in DSE equipped with hp desktop PCs with Intel i5Processor and 4GB RAM. Following Table shows the breakdown of hardware and software in each lab.

<b>Sr.</b>	<b>Lab Name</b>	<b>Lab In charge</b>	<b>No. of PC</b>	<b>Specs.</b>	<b>Software Available</b>	<b>Misc</b>
1.	Lab 1 (SE)	Mr. Imran Malik	45	HP Pro. Desk 400 G2 MT Core i5 3.2 GHZ, 4GB RAM, 500GB Hard disk, DVD ROM, 19" LED.	DEV C++, Adobe Acrobat Reader, Firefox browser, Chrome Browser, Java Development Kit, Packet Tracer, Skype NetBeans, VmWare Ubuntu, Fedora Visual paradigm	Printer HP400
2.	Lab 2 (SE)	Mr. M. Usman	45			
3.	Lab 3 (SE)	Mr. Shahid Abid	42			Printer HP1320
4.	Lab 4 (SE)	Mr. Irfan Haider	42			

#### **3.2 Assessment of Lab Facilities**

The lab facilities at DSE are assessed as follows:-

##### **3.2.1 Laboratory Manuals, Documentation and Instructions for Students**

The Laboratory manuals, documentation and instructions for students are maintained in each lab and the lab in charge is the custodian. The courses that have lab sessions are executed by respective faculty member. The faculty member is responsible for conduct and maintenance of lab sessions. In this regard experiment handouts are given to students prior to lab conduct. Furthermore, a pre lab is carried out explaining the objectives and outcomes of each experiment.

##### **3.2.2 Availability of Support Personnel**

Each lab has two staff members including lab in charge and lab Attendants. The lab in charge is responsible for overall lab maintenance while the attendant performs the general tasks and supports the lab in charge in his duties. The faculty members are responsible for conduct of experiments. Furthermore, network assistants are also available per two labs. They respond to network, internet and system related complaints. Similarly, CMS personnel are also available for help in access related problems.

### **3.2.3 Adequate Infrastructure**

The computer labs have adequate computers and equipment to support the experiments. Different tools are available that support the software development life cycle. A comprehensive Campus Management System (CMS) that facilitates the course tasks including attendance management and grading as well as dissemination of course material is available for use at DSE.

## **IV. STUDENT SUPPORT AND GUIDANCE**

### **4.1 Program Guidance**

The students on joining DSE are given an orientation seminar that covers the following aspects: -

- 4.1.1 Degree program
- 4.1.2 Semester system
- 4.1.3 Graduation requirements
- 4.1.4 Course registration
- 4.1.5 Examinations policy
- 4.1.6 Retest policy
- 4.1.7 Failure conditions
- 4.1.8 Termination conditions
- 4.1.9 Use of unfair means
- 4.1.10 CMS
- 4.1.11 Relevant program requirements

In addition to this, these instructions are also available to students on the university website as well as CMS.

### **4.2 Student Counseling and Advisory System**

The senior faculty members are designated as class coordinators to provide guidance in all the academic/ personal affairs of the students. The students are encouraged to seek help for timely solution of their problems. Counseling builds confidence in the students and they never feel alone when facing any problem relating to academics or other matters.

Complete involvement of parents is required for the students grooming at the University in academic/ outlook. At the end of the semester, parents/guardians are informed of the student's performance. The attendance record of the student is also communicated to seek parental guidance for the required remedial measures.

The Institute frequently arranges lectures /seminars/workshops on contemporary academic and social issues. Eminent scholars from Pakistan and abroad are invited to speak on a variety of topics.

### **4.3 Membership of Professional Societies**

Students are encouraged to join professional societies. Student chapter of Microsoft is present in FUI. The department makes best efforts approach to make students aware of other professional societies by subscribing to various magazines and journals and displaying posters on notice boards.

#### 4.4 Frequency of Courses

DSE offers both core and elective courses as per requirements of the program. The courses provided follow a sequence wherein the pre requisites are offered in prior semesters. The humanities courses are offered by permanent faculty in the department. The course allocation and offering is done well in advance to the start of the semester.

#### 4.5 Effective Student-Teacher Interaction and Faculty Coordination

Since the number of sections is larger, multiple faculty members teach the same course to different sections. A coordinator is nominated in each semester for each course that monitors the progress in each section. The examination paper is set in consultation with the faculty members of each course.

Faculty members carry out interactions with students during office hours through appointments. This provides a running feedback to the faculty members. The Class Representative (CR) and The Girl Representative (GR) meet with Head of Department and Program Coordinator at regular intervals.

#### 4.6 Program Completion Guidance, Course Decisions and Career Choices

Students are briefed about the program and the requirements during orientation. The parents also join in the orientation seminars. Furthermore, students are given a handbook of university requirements to consult policies as well. MSA gives professional advice to the students on program while course advisors give guidance on course related decisions. Program coordinator guides students in career choices. The following table lists the course advisors of each class.

Sr#	Faculty Name	Class
1.	Mr. M. Aqeel Iqbal	Graduating Batch
2.	Dr. Shaheen Tanoli	MS/PhD
3.	Mr. Sohaib Altaf	BCSE-8A
4.	Mr. Umer Mehmood	BCSE-8B
5.	Dr. Umair Abdullah	BCSE-6A
6.	Mr. Zia-ur-Rehman Kiani	BCSE-6B
7.	Mr. Sajid Ali Khan	BCSE-6C
8.	Ms. Asma Naveed	BCSE-6D
9.	Ms. Sana Akbar	BCSE-6E
10.	Dr. Asma Azeem	BCSE-4A
11.	Ms. Tehmina Karamat	BCSE-4B
12.	Mr. Ejaz Gul	BCSE-4C
13.	Mr. Sheeraz Akram	BCSE-4D
14.	Mr. M. Shoaib	BCSE-4E
15.	Dr. Shariq Hussain	BCSE-2A
16.	Ms. Aamina Akbar	BCSE-2B

17.	Dr. Arif Jamal	BCSE-2C
18.	Raja M. Imran	BCSE-2D
19.	Mr. M. Ishtiaq	BCSE-2E
20.	Mr. M. Fahad Khan	BCSE-2F
21.	Mr. M. Usman Khan	BCSE-2G

## **V. PROCESS CONTROL**

### **5.1 Eligibility**

The University is open to all students irrespective of sex, religion, colour, creed, class and domicile who are academically qualified for admission to the courses of study offered by the University.

The admission is offered strictly on the basis of merit determined by the University as per its admission criteria. Since medium of instruction of the University is English, students are also checked for their English language skills.

### **5.2 Applications & Admissions**

Prescribed admission forms are available from the Office of the Manager Student Affairs and various locations notified in the advertisement. Online application form may also be downloaded from the university website [www.fui.edu.pk](http://www.fui.edu.pk) . Applications are received after the appearance of advertisement in the national press.

Foreign students seeking admission in the University can submit their applications along with application fee through their respective Embassies/High Commissions.

The admission forms and salient features of the prospectus are also hosted on the website [www.fui.edu.pk](http://www.fui.edu.pk). The candidate may download the application form and mail it along with a bank draft of Rs.1100/- for inland and US\$60.00 for expatriate/foreign candidates.

#### **5.2.1 Entrance Examination**

Entry test will be held at FURC. No admission will be given without entry test

#### **5.2.2 Selection Procedure**

The applications for admission are reviewed by the Admission Committee. It is mandatory for all the applicants, to appear in the Entry Test. The candidate can apply only as Pakistani Resident or Expatriate/Foreigner. The applications to change the status from Pakistani to expatriate will only be considered if there are seats left in the Expatriate/ Foreign Category.

The relative weight-age of all the components of the Admission process i.e. the academic achievements in SSC, HSSC or its equivalent examination, and the Entry Test marks are added to determine the final merit.

The weight-age for calculation of the merit is as under:-

<b>Benchmark</b>	<b>Weight-age</b>
SSC/Equivalent	10%
HSSC/Equivalent	40%
Entry Test	50%

Verified Hafiz-i-Quran and NCC training shall get credit according to the Government admission policy.

The decision of the Admission Committee is irrevocable and non-negotiable. The authorities are not bound to explain the reasons for their decisions to the applicants, their parents or guardians.



### **5.2.3 Documents Submitted After Admission**

A candidate, who is eligible for admission, must submit attested copies of the following documents (as indicated against each) along with the application form and the Deposit slip covering the application fee.

- 5.2.3.1 SSC or equivalent foreign qualification certificate (two copies).
- 5.2.3.2 HSSC or an equivalent foreign qualification certificate (two copies).
- 5.2.3.3 Equivalence certificate (one copy) from Inter Board Committee of Chairmen, Islamabad (in case of foreign qualification)
- 5.2.3.4 National Identity Card/Form B of the candidate (two copies).
- 5.2.3.5 National Identity Card of Father/Guardian (two copies).
- 5.2.3.6 Recent three colored photographs of the applicant.

## **5.3 Registration**

The following registration procedure is strictly followed at the beginning of each semester: The admitted student will be registered with FUI. A student shall be registered in the course(s) being offered by the University on the prescribed registration form and on CMS before or within one week of the commencement of the classes or as dates announced through notice board.

The form is available at the Students Affairs Office and Admission Office. The completed form should be submitted to respective advisor after the approval from the Head of the Department for onward submission to the office of the Student's Affairs.

The fee in full for the registered semester must be paid through payment slip to the Bank and a copy each to Student Affairs Office and Accounts Office.

Students not registered as above will not be allowed to attend classes. A student will not be enrolled for more than 18 credits in a semester. A student may register, with prior permission of the HOD for additional non-credit course(s) out of the prescribed course work. On successful completion of non-credit course(s), a mention will be made in the student's transcripts.

A student may add or drop course(s) or convert a credit course into a non-credit or vice-versa, within two weeks from the date of commencement of a semester on the recommendations of the teacher(s) and the HOD.

No registration or change of course(s) shall be allowed after three weeks from the date of commencement of the semester.

## **5.4 Merit Scholarships**

These are granted to the excelling students of the University as per University rules. Five students per batch of undergraduates and graduates programs achieving distinctions in local examination are granted Merit Scholarship. The scholarships are awarded on the overall results of the current semester. Scholarships for the Children of Industrial Workers are also awarded. Special scholarships are offered to the children of industrial workers, in collaboration with Workers Welfare Fund. These Scholarships include 100% tuition fee, hostel charges etc.

## 5.5 Examinations

A student shall be eligible to appear in the terminal examination provided that he/she:-

- 5.5.1 Has been on the rolls of the department during that semester.
- 5.5.2 Has registered himself/herself with the University and has cleared all the University dues.
- 5.5.3 Has attended, 75% of the lectures/seminars and labs in each course.
- 5.5.4 A student not having required percentage of attendance of lectures/seminars/labs shall not be allowed to appear in the terminal examination of the concerned course and shall be treated as having failed in that course.
- 5.5.5 A date-wise record of the attendance of students shall be maintained by each teacher.
- 5.5.6 Mid Term Examination of one and a half (1 ½) hours duration (maximum 25 marks for Lab and 25 marks for courses without Lab) for each course is to be conducted on the date and time notified by the FUI Campus.
- 5.5.7 Final Term Examination of minimum of three hours duration (maximum 50 marks) for each course shall be conducted at the end of each semester.
- 5.5.8 Internal Assessment of each student will be awarded in each course on the basis of project (maximum of 5 marks), class assignments, quizzes, projects, labs; case studies for 25 marks are reserved both in labs and theory

## 5.6 Grades, Promotion and Merit

The minimum pass marks for each course shall be 50%. Candidates obtaining less than 50% marks in any course shall be deemed to have failed in that course. Less than 50% marks secured by a student in any course shall not be counted towards the aggregate marks.

- 5.6.1 If a student fails to appear in the midterm or terminal examination in a course(s) on medical or any other reasons, he/she shall be treated as absent and failed.
- 5.6.2 A student shall repeat the course(s) in which he/she had failed, as soon as the course(s) are offered again. Students will not be allowed to repeat more than two courses (6-8 credit hours) in a regular or summer semester. The course will only be offered if the numbers of students are ten or more to register the repeat course.
- 5.6.3 A student will be permitted to improve their D and D+ grades as improvements. A student can improve maximum six (6) courses at undergraduate level and three (3) courses at graduate level, but will not be awarded GPA more than 3.5 in improved courses.

### 5.6.4 GPA (Calculation)

The Semester Grade Point Average (GPA) is computed as follows:

$$SGPA = \frac{\text{Sum of (Credit Hours x Grade Point Credit)}}{\text{Sum of Credit hours}}$$

- 5.6.4.1 On successful completion of the requirements of a degree, each candidate shall be awarded the degree for which he/she was enrolled by the University. A separate

transcript shall also be issued to each candidate showing the letter grades obtaining in each course along with SGPA of each semester and CGPA.

- 5.6.4.2 Students having less than 2.00 CGPA and 2.50 CGPA (for MBA programs only) in the last semester will not graduate.

### **5.6.5 Probation**

A student is required to maintain a minimum Cumulative Grade Point Average (CGPA) of 2.00 in each semester otherwise he/she is placed on probation. A student of four years programs who has earned his/her third consecutive probation and second consecutive probation of two years programs are declared as ceased student of the university.

### **5.6.6 Academic Awards/Medals**

Following University Medals/Certificates will be awarded to the students during the University Convocation:

- 5.6.6.1 Best Graduate Medal: Awarded to the overall best student of each faculty at the Campus.
- 5.6.6.2 Gold Medal: Securing first position in each degree program.
- 5.6.6.3 Silver Medal: Securing second position in each degree program.
- 5.6.6.4 Distinction Certificates: Attaining 3.75 CGPA or above in each degree program.
- 5.6.6.5 Merit Certificates: Attaining 3.50 CGPA or above in each degree program.

## **VI. FACULTY**

### **6.1 Introduction**

As a reputed institution of higher scientific and technical education in the country, FUI strives to employ experienced and qualified faculty members in its institutes. All faculty members of DSE hold an MS Degree or PhD degree from reputed local and foreign universities. Most of the faculty members are also undergoing PhD studies inland. Eminent professors from within the country also visit as part-time visiting faculty.

### **6.2 Full Time Faculty**

	<b>Name</b>	<b>Academic Degree</b>	<b>Degree Awarding Institution (s)</b>	<b>Specialization</b>	<b>Year</b>
1	Dr. Aftab Ahmad	PhD (SE)	Brunel University, UK	Software Engineering	1981
2	Dr. Shaheen Tanoli	PhD (CS)	UET Lahore	Computer Science	2011
3	Dr. Umair Abdullah	PhD (CS)	Foundation University Islamabad	Computer Science	2013
4	Dr. Asma Azim	PhD (CS)	Joseph Fourier University (Grenoble I), France	Computer Science	
5	Dr. Arif Jamal Malik	PhD (CS)	NU-FAST	Computer Science	2014
6	Dr. Shariq Hussain	PhD (CS)	University of Science and Technology, Beijing, China	Computer Science	2014
7	Mr. M. Aqeel Iqbal	MS (SE)	NUST	Software Engineering	2004
8	Mr. Ejaz Gul	MS (CS)	University of Pittsburgh, USA	Computer Science	1987
9	Ms. Tehmina Karamat	M.Phil (MC)	University of Bradford	Mobile Computing	2008
10	Mr. Sheeraz Akram	MS (CS)	LUMS	Computer Science	2006
11	Mr. Sohaib Altaf	MS (CS)	MAJU	Computer Science	2005
12	Mr. Muhammad Ishtiaq	MS CS	NU-FAST	Computer Science	2009
13	Mr. Zia Ur Rehman Kiani	MS (SE) MS (CS)	Blekinge Institute of Technology (BTH), Karlskrona, Sweden Grenoble Institute of Technology (INP), Grenoble, France	Software Engineering Graphics, Vision and Robotics	
14	Ms. Asma Naveed	MS (CS)	Riphah International, University	Computer Science	2013
15	Mr. M. Fahad Khan	MS (CS)	IQRA University, ISB Campus	Network Systems	2014
16	Mr. Muhammad Shoaib	MS (CS)	IQRA University	Computer Science	2008
17	Mr. Sajid Ali Khan	MS(CS)	SZABIST ISLAMABAD	Computer Science	2012
18	Ms. Sana Akbar	MS(SE)	International Islamic University, Islamabad	Software Engineering	2012
19	Engr. Aamina Akbar	MS (EE)	UET, Taxila	Telecommunication	2013
20	Mr. M. Usman Khan	MS (CE)	NUST	Comp. Engineering	2007
21	Mr. Raja Imran Ali	BS (TE)	Sydney University, Australia	Telecommunication	2007

22	Engr. Umar Mahmud	MS (CS)	NUST	Software Engineering	2006
23	Mr. Ayaz Mehmood	MS (SE)	Bahria University, Islamabad	Software Engineering	2012
24	Mr. Babar Yaqoob	MS (CS)	UAAR, Rawalpindi	Computer Science	2014
25	Mr. Ameer Sultan	MPhil (ENG)		English	
26	Mr. M. Nadeem	MA (ENG)	NUML, Islamabad	English	2013

### 6.3 Faculty Development

To accomplish its cherished mission, the department places equal weight-age on the dissemination of knowledge (teaching), the creation of knowledge (research) and the application of knowledge (service). This culture is instrumental in giving the students a technical versatility and a driving intellectual curiosity with which to carry out applied research leading to the development of science and technology.

#### 6.3.1 Faculty Professional Development

The faculty is encouraged to develop its professional skill set and remain current in areas of specialization and technology. In this regard, faculty is provided utmost support from institution for attending conferences, workshops and training opportunities. At department level, a yearly review identifies the faculty members who can benefit from further training, and opportunities are identified which can aid in this effort. Along with the training opportunities, faculty promotion is based on the following criteria:

6.3.1.1 Publications by the faculty members;

6.3.1.2 Conferences arranged, attended and organized by the faculty member;

6.3.1.3 Evaluation of faculty by the students;

6.3.1.4 Affiliations of the faculty with the institute and university.

#### 6.3.2 Faculty Motivation and Job Satisfaction

University offers a competitive pay package as well as learning resources like state of the art software packages, transportation allowance, IT allowance, medical and living allowance to maximize the job satisfaction and to enhance the quality of work. Often tea / coffee and dinners are arranged in order to strengthen the open communication environment. Faculty is also encouraged to attend the conferences and seminars around the globe and these trips are fully funded by the affiliates. Ratio

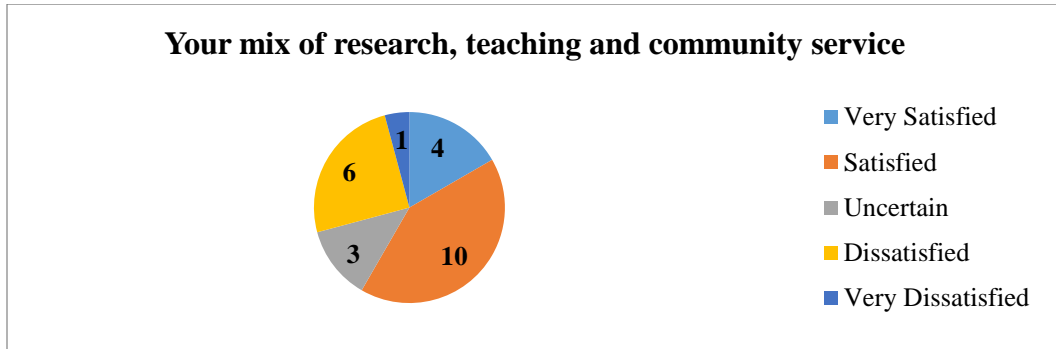
A total of 26 permanent faculty members are in the department. The total strength of the department is 975 students. The faculty student ratio is 1:37

### 6.4 Faculty Survey

A total of 24 faculty members participated in the survey. The survey included questions regarding job, environment and their activities.

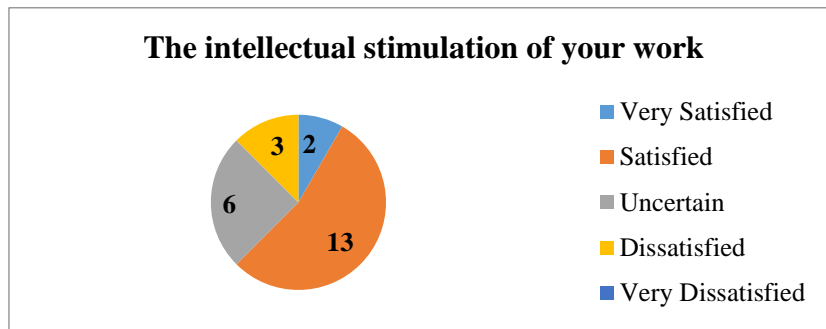
#### 6.4.1 Question No. 1: Mix of Research, Teaching and Community Service

58% faculty members are satisfied while 29% are not satisfied



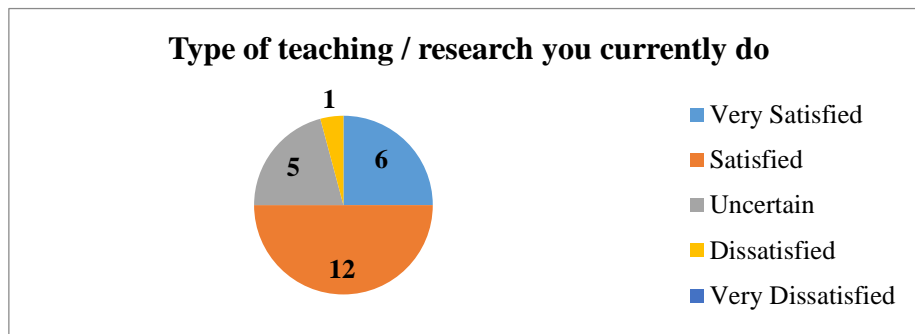
#### 6.4.2 Question No. 2: Intellectual Stimulation

63% faculty members are satisfied with while 13% are not satisfied.



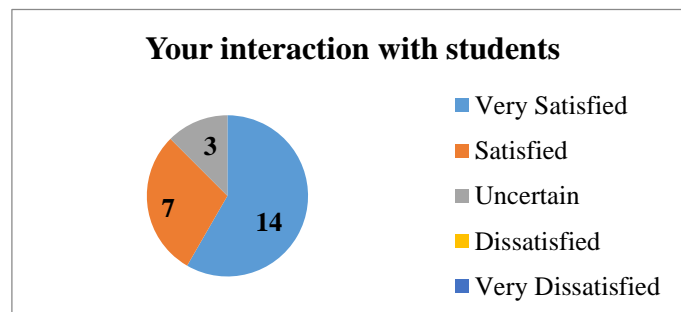
#### 6.4.3 Question No. 3: Teaching and Research Activities

75% faculty members are satisfied while 4% are not satisfied.



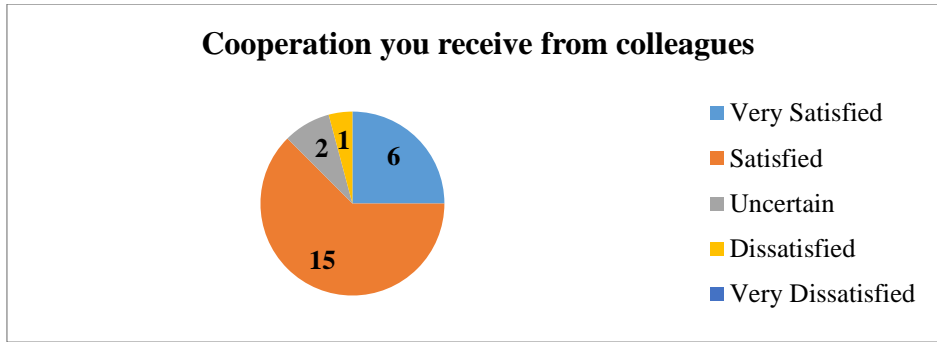
#### 6.4.4 Question No. 4: Student Teacher Interaction

88% faculty members are satisfied.



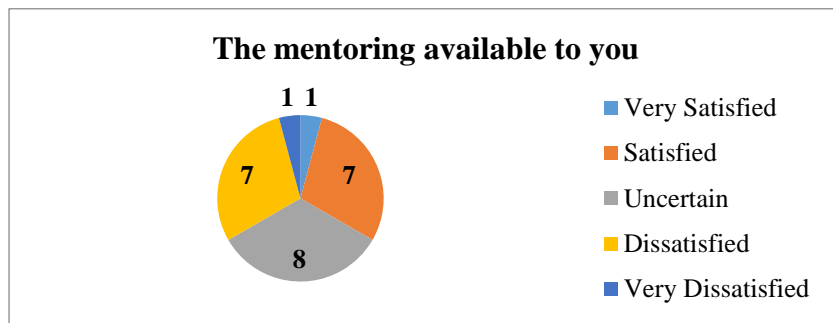
#### 6.4.5 Question No. 5: Colleague Cooperation

88% faculty members are satisfied while 4% are not satisfied.



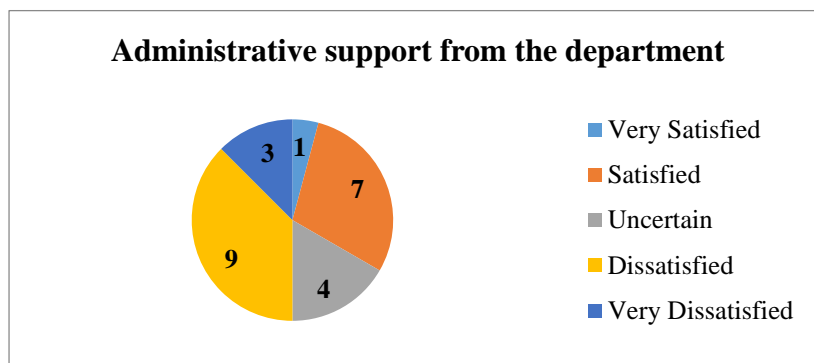
#### 6.4.6 Question No. 6: Mentoring

33% faculty members are satisfied while 33% are not satisfied.



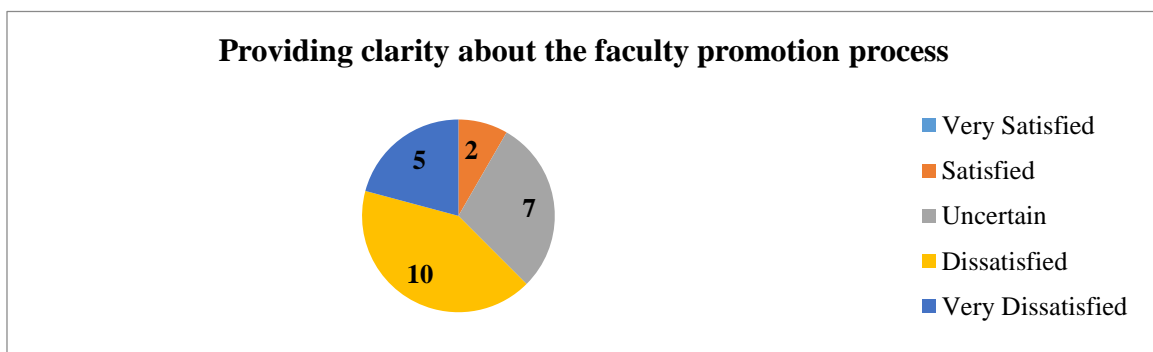
#### 6.4.7 Question No. 7: Admin Support

33% faculty members are satisfied while 50% are not satisfied.



#### 6.4.8 Question No. 8: Faculty Promotion

8% faculty members are satisfied while 62% are not satisfied.



#### 6.4.9 Question No. 9: Prospects of Advancement

25% faculty members are satisfied while 33% are not satisfied.

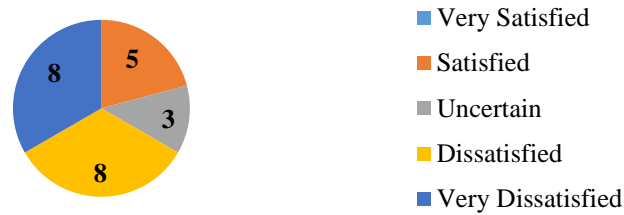
### Your prospects for advancement and progress through ranks



#### 6.4.10 Question No. 10: Salary

21% faculty members are satisfied while 67% are not satisfied.

### Salary and compensation package



#### 6.4.11 Question No. 11: Job Security

29% faculty members are satisfied with while 33% are not satisfied.

### Job security and stability at the department



#### 6.4.12 Question No. 12: Amount of Time for Self and Family

42% faculty members are satisfied while 29% are not satisfied.

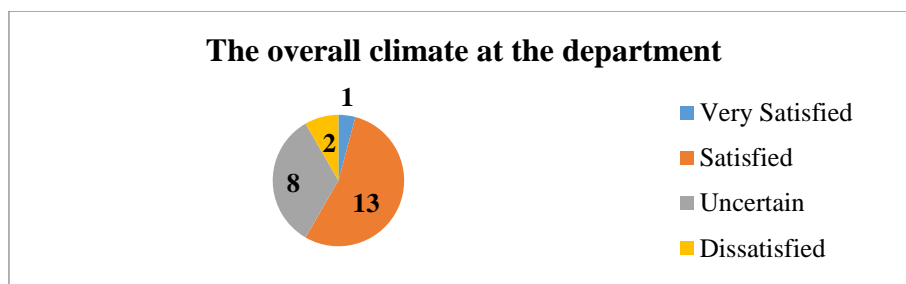
### Amount of time you have for yourself and family



#### 6.4.13 Question No. 13: Overall Climate

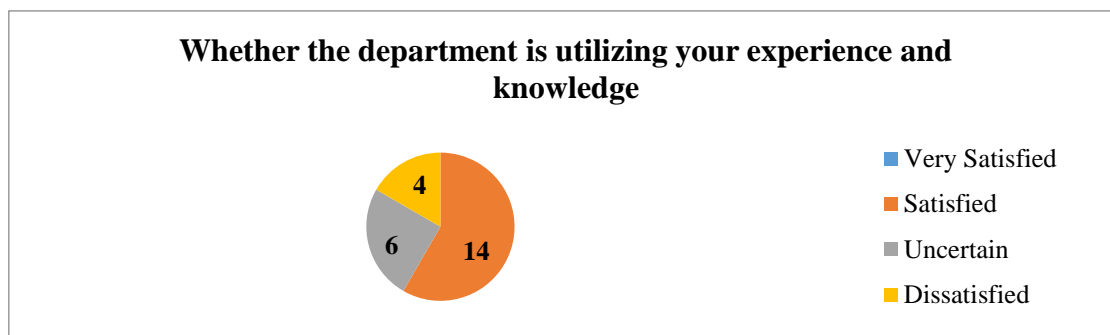
58% faculty members are satisfied while 8% are not satisfied.





#### 6.4.14 Question No. 2: Knowledge and Experience Utilization

58% faculty members are satisfied while 17% are not satisfied.



## 6.5 Faculty Feedback Score

The aggregate percentage of faculty feedback is shown in the following table. This feedback shows the effectiveness of the faculty in performing pedagogical tasks. Feedback for each faculty member is given by the students at the end of each semester. The feedback is for each course and marks are calculated based on the feedback results. The marks are added and percentage calculated for all subjects taught by the faculty member.

Teacher name	Scored	Out of	%
Lec Aamina Akbar	20.52	25	83
Lec Ameer Sultan	27.08	35	78
AP Aqeel Iqbal	11.16	15	75
AP Dr Arif Jamal	20.2	25	81
AP Dr Asma Azim	16.59	20	83
Lec Ayyaz Mehmood	16.86	20	85
AP Ejaz Gul	16.06	20	81
AP Ishtiaq	21.49	25	86
Lec M. Nadeem	20.69	25	83
Lec M. Shoaib	14.25	20	72
Lec Raja Imran Ali	19.86	25	80
AP Dr Shariq	16.18	20	81
AP Sheeraz	15.86	20	80
AP Tehmina	16.15	20	81
Lec Usman	24.58	30	82

## **VII. INSTITUTIONAL FACILITIES**

### **7.1 Introduction**

This section identifies the institutional and infrastructural facilities in DSE.

### **7.2 e-Learning**

The university maintains a CMS that allows the faculty members to share information, lectures, notes and announcements with the students. The CMS is accessible worldwide. The university also provides access to digital library through library and labs.

### **7.3 Library Support**

The library maintains an up to date repository of course books with multiple copies. A number of original and low price editions are also available in the library. The library is staffed with effective members who help in acquiring books relevant to the courses. Every semester the library acquires more and new books as demanded by the faculty members.

### **7.4 Adequate Classrooms and Faculty Offices**

Enough class rooms are available to accommodate the students. The class rooms are equipped with multimedia to support visual learning. The faculty members are given offices and cabins where the students can interact with them.

## **VIII. INSTITUTIONAL SUPPORT**

### **8.1 Introduction**

This section identifies the institutional support to faculty members.

### **8.2 Financial Resources to Retain Quality Faculty Members**

The university is in a constant lookout for high quality faculty members. The faculty members are retained by giving them good remunerations.

### **8.3 PhD Faculty Members**

The department has currently 6 PhD faculty members while the rest are undergoing PhD studies in different local universities. The ratio of PhD faculty members to students in department is 1:162.

### **8.4 Financial Resources for Library, Laboratories and Computing Facilities**

Library at FURC is adequate and has a large number of books. The library regularly receives journals magazines and news papers. The computing labs are well equipped with i5 systems and a large number of soft wares.

## **IX. CONCLUSION**

### **9.1 Introduction**

This section identifies the strengths and weaknesses of the BCSE program at DSE. The surveys conducted and presented in earlier chapters have provided the means to present the strengths and weaknesses. The management is striving hard to improve the infrastructure. The faculty is imparting quality education focusing on theoretical as well as practical work and the character building of potential software engineers.

### **9.2 Strengths**

The strengths are as follows: -

- 9.2.1 Well founded and measurable program objectives.
- 9.2.2 Pre requisites are fully observed.
- 9.2.3 Academic schedules as well as examination schedules are given well before time and strictly followed.
- 9.2.4 Steps taken in examination to curb use of unfair means.
- 9.2.5 Planning of semester courses and electives.
- 9.2.6 Excellent library services.
- 9.2.7 HEC curriculum is strictly followed.
- 9.2.8 Course load and work is according to NCEAC.

### **9.3 Weaknesses**

The weaknesses are as follows: -

- 9.3.1 Improvement in class room furniture are required.
- 9.3.2 Multimedia projectors in some class rooms is required.
- 9.3.3 Provision of licensed software in laboratories.
- 9.3.4 Improvement in faculty student ratio is required.
- 9.3.5 Industrial and educational trips need to be organized.
- 9.3.6 Provision of TA/RA in the department.
- 9.3.7 Mentoring of young and junior faculty members.
- 9.3.8 Improvement in Faculty development plans for higher studies in international universities.
- 9.3.9 Enhancement of practical skills of faculty members.
- 9.3.10 Balance of teaching and research activities.
- 9.3.11 Improvements in faculty monetary satisfaction are required.