DEPARTMENT OF COMPUTER SCIENCE
LAHORE COLLEGE FOR WOMEN UNIVERSITY, LAHORE

SELF-ASSESSMENT REPORT

B.S (CS)

Submitted to

Quality Enhancement Cell,
Lahore College for Women University, Lahore
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T A B L E O F C O N T E N T S

CRITERION 1: PROGRAM MISSION, OBJECTIVES AND OUTCOMES

The history of the Department of Computer Science dates back to 1996 when it started as a computer center by the grant provided by Ministry of social work and Women Development. The Department started ICS classes in 1997 in addition to offering Short Courses and Diploma. The lab facilities were extended with the grant from Punjab Information Technology Board and started BCS classes in 1999. The Department started 4 year BSCS degree program in 2000 and expanded its facilities in 2001 with the funding provided by Higher Education Commission. MSCS degree program was introduced in 2002. The Department was shifted in its new building in 2005. The Department started PhD degree program in 2011. Moreover, a new ICT center has been constructed with the help of ICT R&D fund, inaugurated on October 26, 2015 to offer students a nurturing environment to innovate in the ICT domain.

Currently the Department is equipped with high speed Internet of 400 MB bandwidth supported by fiber backbone, and video conferencing facility. There are total 7 labs: with 40 computers in three, 35 computers in two and 30 in two labs. Departmental library has more than 15000 books. Moreover, the Department has access to international journals and scholarly publications through HEC Digital Library.

Standard 1.1: The program must have documented measurable objectives that support college and institution mission statements.

Mission of the Department

The Department strives to produce highly skilled professionals who apply specialist skills and knowledge to everyday workplace situations. Besides having highly developed technical abilities they are expected to carry out research and to keep their knowledge continually up-to-date. Most importantly, they are required to have excellent communication skills. To set pace in the field of study, the Department has designed several degree courses that provide balanced coverage of the various aspects of Computer Science.

Our aims and objectives are:

- Depth and breadth of knowledge in computer science coupled with the capacity to produce feasible and responsible solutions to complex computing problems.
- Literacy in writing, reading, speaking, and listening.

- Critical thinking in interpretation, analysis and evaluation.
- Values by the ability to make reasoned and ethical choices and to accept responsibility for them.
- Interpersonal skills with leadership ability, appreciation for diversity, and the capacity to work effectively with others.
- Life-long learning skills as evidenced by the ability to adapt to innovation and change.
- To teach different methods of exploration, investigation, organization of data and its utilization in practical life.
- To develop the scientific attitude and demonstrate professional skills in teaching, research and managerial positions in wide range of professions in national and international organizations.

Name of Programs	**Duration**	**No. Of Modules**	**Total Credit Hrs**
B.S. Computer Science	4 years degree program	8 semesters (Course work + Final year Project)	132

PROGRAM'S OBJECTIVES

BS Computer Science (4 years degree Program)

Curriculum for the degree consists of HEC approved courses. In year 1 and 2 the students learn the basic, foundation and compulsory courses according to the weightage given by the HEC. These courses include i) Compulsory Courses, ii) Core Courses from Computer Science, iii) Supporting Minor Courses from Mathematics, Management and Electronics e.g., Statistics, Psychology, DLD, Calculus, Project Management etc. In the final years the students study the advanced courses and work on Professional projects.

B.S. Computer Science Program Objectives:

1. Depth and breadth of knowledge in computer science coupled with the capacity to produce feasible and responsible solutions to complex computing problems.
2. To develop strong critical, analytical and logical thinking in the graduates.
3. Interpersonal skills with leadership ability, appreciation for diversity, and the capacity to work effectively with others.

4. Life-long learning skills as evidenced by the ability to adapt to innovation and change and to teach different methods of exploration, investigation, organization of data and its utilization in practical life.

Strategies are based on:

i) Designing the program as per requirements of the students.
ii) Develop curriculum according to the need of the program.
iii) Regular revision of curriculum to keep them abreast with the national and international developments.
iv) Providing all resources including classroom facilities, multimedia, computers, and properly equipped labs.
v) Updating the knowledge of teachers through workshops and training programs.
vi) Encouraging the establishment of linkages at national and international level.
vii) Establish cooperation with the potential employers and provide economical consultancy services.
viii) Develop moral basis of the students to impart concept of teams, honesty and discipline through ethical attitudes.

Assessment of Educational Objectives:

Degrees are assessed by the completion of an advanced practical project. Taught courses are assessed through a combination of coursework and projects related to the study. The educational objectives of each program are regularly assessed as indicated in the Table 1. below:

Table 1. Program Objectives Assessment

OBJECTIVES (1)	**HOW MEASURE (2)**	**WHEN MEASURED (FREQUENCY) (3)**	**IMPROVEMENT IDENTIFIED (4)**	**IMPROVEMENT MADE (CORRECTIVE & PREVENTIVE ACTION) (5)**
As given in *Para 1*	1. Regular assessment of student knowledge and ability to exhibit the skill by the teacher:	Regular	1) Regularity of attendees required 2) Work based teaching 3) Improving writing skills. 4) Course / curriculum revision to enhance	1) Attendance rules applied more strictly 2) Teachers training and development 3) Student encouraged to enhance their writing skills. 4) Student encouraged to join language courses. 5) Course / curriculum
	i) Class exercises as	1 pre mid-term		

	Assignment		outcomes and make it more work based 5) Enhancing communication skills 6) Guidance to student	revised. 6) Students encouraged to attend the National and International workshops /Seminars /Conference
	ii) Presentation of relevant topic	As per course requirement		
	iii) Quizzes	1 pre mid-term		
	2. Class Tests	2 pre mid term		
	3. Written examination	Once a semester		
	4. Practical assignment in each modules	As per course requirement		
	5. Final year project pertaining to practical problem	In last year		
	6.Teaching/ Learning Process Survey (teachers' evaluation by the student)	Once in a semester	Shortcomings as per survey identified	Teachers are intimated the survey report who make effort to improve which is monitored in next survey
	7. Faculty Survey Form	Once in a year	1) More time to be spent on the following during teaching: a) Case studies b) Presentation by students 2) Revision of program a) Personal development topic like ethic, moral & code of conduct b) Improvement in quality of Administrative support	All the improvements identified have been implemented

	8. Suggestion received from students	As and when received	1) Administrative and personal problems of students 2) Computer labs	Complaints are addressed immediately

Standard 1.2: The program must have documented outcomes for graduating students. It must be demonstrated that the outcomes support the program objectives and that graduating students are capable of performing these outcomes.

1.2.1 BS Computer Science Program's Outcomes:

Following are expected outcomes:

1. Use of the logical methods and analytical designs for problem solving.
2. The program will prepare such professional as to fulfill the need of software development.
3. The program will establish foundations for further learning and education.
4. The program will produce graduates with convincing capabilities.

In Table 2. show the outcomes that are aligned with each objective.

Table 2: Outcomes versus Objectives

Program Objectives	Program Outcomes			
	1	**2**	**3**	**4**
1	X	X	X	X
2	X	X	X	X
3	X	X	X	X
4	X	X	X	X

Below table is showing means for assessing the extent to which graduates are performing the stated program outcomes/learning objectives.

Table 3: Measure Learning Objectives and Improvements

LEARNING OBJECTIVES	HOW MEASURE	WHEN MEASURED (FREQUENCY)	IMPROVEMENT IDENTIFIED	IMPROVEMENT MADE (CORRECTIVE & PREVENTIVE ACTION)

1	Survey of Graduating Seniors	Every Semester	-	-
2	Alumni Survey	Once a year	Regular Assistance from the concerned organizations.	Support and the cooperation from other organizations as per requirement of the project.
3	Survey of Employers	Once a year	Qualification. Training.	Sent for higher studies. Internal and external training arranged.
4	Senior Project Presentations	Twice in Final year. Monthly progress reports in final year	Learning. Knowledge Enhancement. Understanding of diverse Fields.	Support and the cooperation from other Teachers by giving them right directions/questions.
5	Outcome Examinations	As per policy	-	-

Table 4: Outcomes versus Objectives

Program Objectives	**Program Outcomes**			
	1	**2**	**3**	**4**
1	*	*	*	◊
2	*	*	*	*
3	*	*	*	*
4	*	*	*	*

Legend: *****Denotes **Substantial** Contribution to the objectives

◊ Denotes **Moderate** Contribution to the objectives

_ Denotes **No** Contribution to the objectives

Standard 1.3: The results of program's assessment and the extent to which they are used to improve the program must be documented.

1.3.1. A. Actions taken on the basis of assessment:

1. Syllabus revision
2. Teachers training
3. Labs development
4. Faculty development

1.3.1.B. Strengths of Department:

1. Teamwork
2. Infrastructure
3. Work Environment
4. Computer Labs, Digital Library, Video Conferencing and Internet Facilities

1.3.1. C. Weaknesses of Department:

1. Digital library limited access
2. Trained Lab Supervisor
3. Strengthening of existing Lab facilities
4. Lack of classrooms

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

1.4.1 Performance Measures:

Computer department assesses the overall performance using quantifiable measures e.g. statistical method.

i) Student's Enrollment
ii) Student-Faculty Ratio
iii) Student Passed Out
iv) Percentage of Honor Students & Attrition Rate
v) Faculty Training, Seminars and Workshops
vi) Number of Publications
vii) Books in Library

i) Table 5: No. of Students Enrolled

Program	Session	No. of Students
BSCS (4 year Program)	2015-2019	51
	2016-2020	54
	2017-2021	54
	2018-2022	53

ii) Table 6: Student-Faculty Ratio

Year	No. of Students	No. of Faculty Members	Student-Faculty ratio
2016	216	21	10:1
2017	217	21	10:1
2018	212	19	11:1

iii) Table 7: No. of Students Passed Out

Program	Passing out Year	No. of Students
BSCS (4 years program)	2018	58
	2017	50
	2016	74

iv) Table 8: Percentage of Honor Students & Attrition Rate

Year	%age of Honor Students **Criteria:** CGPA 3.75 and above	Attrition Rate $\frac{(\text{Admitted} - \text{pass out})}{\text{Admitted}} * 100$
2018	02	3.33
2017	05	5.66
2016	11	2.63

v) Table 9: Faculty Training, Seminars and workshops (Appendix A)

Year	No. Of Trainings, Seminars and workshops
2017	4
2016	3

vi) Papers Published at National & International Level

Table 10: Number of Publications (Appendix B)

Year	Papers published
2017	16
2016	16

vii) Books in Library

Table 11: Number of Books in library

Year	Total Books
2018	8000

Research Areas

The Faculty is involved in research in General Computing for Graduation Programs.

Collaborations

Table 12: Linkages with other institutes and industry

Linkage	Mevlana Exchange Program
No. of linkages	01

Departmental Achievements (others)

- International Research Publications by faculty and students
- Completion of IT Block

Honors and Awards

Year	Awards & Honors
2018	10
2017	04
2016	01

CRITERION 2: CURRICULUM DESIGN AND ORGANIZATION

Curriculum of Computer science for each program is developed on the basis of detailed guidelines given by the HEC.

PROGRAM BS. Computer Science
A). Scheme of Study for BSCS 2016-2020 and onward (132 Credit Hours)
Previous sessions Road Maps remain same

Semester I (18)	Semester II (18)	Semester III (18)	Semester IV (18)	Semester V (15)	Semester VI (15)	Semester VII (15)	Semester VIII (15)
CS-101 4 (3-1)	CS-104 4 (3-1)	CS-206 4 (3-1)	CS-209 3 (3-0)	CS-313 3 (2-1)	CS-317 3 (3-0)	CS-422 3 (2-1)	MG-402 3 (3-0)
Programming Fundamentals	Object Oriented Programming	Data Structure and Algorithms	Design and Analysis of Algorithms	Artificial Intelligence	Theory of Automata	Compiler Construction	Human Resource Management
CS-103 3 (2-1)	CS-105 3 (2-1)	CS-207 4 (3-1)	CS-210 3 (3-0)	CS-314 3 (2-1)	CS-318 3 (2-1)	SS-402 3 (3-0)	CS-424 3 (2-1)
Introduction to Information and Communication Technologies	Digital Logic Design	Microprocessor and Assembly Language	Computer Architecture and Organization	Operating Systems	Wireless Networks	Psychology	Human Computer Interaction
CC/SS-101 2 (2-0)	CC/SS-102 2 (2-0)	CC/ENG-203 3 (3-0)	MG-201 3 (3-0)	CS-315 3 (2-1)	CS-319 3 (2-1)	CS-423 3 (3-0)	SS-404 3 (3-0)
Islamic Studies / Ethics	Pakistan Studies	Communication Skills	Financial Accounting	Data Communications and Computer Networks	Visual Programming	Digital Image Processing	Professional Practices
CC/ENG-101 3 (3-0)	CC/ENG-102 3 (3-0)	MT-203 3 (3-0)	CS-211 3 (2-1)	CS-316 3 (3-0)	CS-320 3 (3-0)	SS-403 3 (3-0)	CS-425 3 (3-0)
Composition and Comprehension	Technical and Business Writing	Linear Algebra	Web Design and Development	Software Engineering	Object Oriented Analysis and Design	Foreign Languages	Information Security
CS-102 3 (3-0)	MT-101 3 (3-0)	CS-208 4 (3-1)	ST-201 3 (3-0)	ST-302 3 (3-0)	CS-321 3 (3-0)	CS-426 3 (0-3)	3 (0-3)
Discrete Structures	Calculus and Analytical Geometry	Database Systems	Multivariate Calculus	Differential Equations	Numerical Computing	Final Project (Part I)	Final Project (Part II)
EL-101 3 (2-1)	MT-102 3 (3-0)		CS-212 3 (3-0)				
Basic Electronics	Probability and Statistics		Distributed Database Systems				

B). Definition of credit hours: 1 credit hour is equivalent to 15-16 teaching hours/semester

Curriculum Breakup	**Credit Hours**
HUMANITIES AND SOCIAL SCIENCES • Islamic and Pakistan Studies • English-I (Composition and Comprehension) • English-II (Technical and Report Writing) • English-III (Communication Skills) • Psychology • Pakistan Studies • Foreign Languages • Professional Practices	22
STATISTICS AND MATHEMATICS • Calculus and Analytical Geometry • Probability and Statistics • Linear Algebra • Multivariable Calculus • Differential Equations	15
MANAGEMENT SCIENCE AND ELECTRONICS • Basic Electronics • Financial Accounting • Human Resource Management	9

CORE COURSES • Programming Fundamentals • Discrete Structures • Introduction to Information and Communication Technologies • Object Oriented Programming • Digital Logic Design • Data Structures and Algorithms • Microprocessor and Assembly Language • Database Systems • Design and Analysis of Algorithms • Computer Architecture and Organization • Web Design and Development • Distributed Database Systems • Visual Programming • Operating Systems • Computer Communication and Networks • Software Engineering • Theory of Automata and Formal Languages • Wireless Networks • Object Oriented Analysis and Design • Computer Graphics • Numerical Computing • Compiler Construction • Information Security • Artificial Intelligence • Human Computer Interaction	80
FINAL PROJECT • Final Project I • Final Project II	06
Total Credit Hours	**132**

C) Degree Plan chart showing the prerequisites of core and elective courses.

Sr. No.	Course No.	Prerequisite Course No.
1	Object Oriented Programming (CS-104)	Programming Fundamentals (CS-101)
2	Digital Logic Design (CS-105)	Introduction to Information and Communication Technologies (CS-103)
3	Data Structures and Algorithms (CS-206)	Programming Fundamentals (CS-101) Discrete Structures (CS-102) Object Oriented Programming (CS-104)
4	Microprocessor and Assembly Language (CS-207)	Digital Logic Design (CS-105)
5	Design and Analysis of Algorithms (CS-209)	Discrete Structures (CS-102) Data Structures and Algorithms (CS-206)
6	Computer Architecture and Organization (CS-210)	Digital Logic Design (CS-105)
7	Multivariate Calculus (MT-204)	Calculus and Analytical Geometry (MT-101)
8	Distributed Database Systems (CS-212)	Database Systems (CS-102)
9	Artificial Intelligence (CS-313)	Discrete Structures (CS-102)
10	Software Engineering (CS-316)	Object Oriented Programming (CS-104)
11	Differential Equations (MT-305)	Calculus and Analytical Geometry (MT-101)
12	Theory of Automata (CS-317)	Discrete Structures (CS-102)
13	Wireless Networks (CS-318)	Data Communications and Networking course (CS-315)
14	Object Oriented Analysis and Design (CS-320)	Software Engineering (CS-316)
15	Numerical Computing (CS-321)	Calculus and Analytical Geometry (MT-101)
16	Compiler Construction (CS-422)	Theory of Automata and Formal Languages (CS-317)
17	Human Computer Interaction (CS424)	Data Structures and Algorithms (CS-206)
18	Information Security (CS-425)	Data Communications and Networking course (CS-315)

D) Curriculum breakdown in terms of Stats and Mathematic, Management Sciences and Electronics, Core Courses, Humanities and Social Sciences and other requirements are showing in Table 13.

Table 13. Curriculum course requirements

Semester	Course Number	Stats and Mathematics	Management Science and Electronics	Core Courses	Final Project	Humanities and Social Sciences
1	CS-101 EL-101 SS-101 ENG-101 CS-102 CS-103	--	EL-101 (3 credit)	CS-101 CS-102 CS-103 (10 credit)	--	SS-101 ENG-101 (5 credit)
2	CS-104 CS-105 SS-102 ENG-102 MT-101 MT-102	MT-101 MT-102 (6 Credit)	--	CS-104 CS-105 (7 Credit)	--	SS-102 ENG-102 (5 credit)
3	CS-206 CS-207 ENG-203 MT-203 CS-208	MT-203 (3 Credit)	--	CS-206 CS-207 CS-208 (12-Credit)	--	ENG-203 (3 Credit)
4	CS-209 CS-210 MG-201 CS-211 ST-201 CS-212	ST-201 (3 Credit)	MG-201 (3 Credit)	CS-209 CS-210 CS-211 CS-212 (12 Credit)	--	--
5	CS-313 CS-314 ST-302 CS-315 CS-316	ST-305 (3 Credit)	--	CS-313 CS-314 CS-315 CS-316 (12 Credit)	--	--
6	CS-317 CS-318 CS-319 CS-320 CS-321	--	--	CS-317 CS-318 CS-319 CS-320 CS-321 (15 Credit)	--	--
7	CS-422 SS-402 CS-423 SS-403 CS-426	--	--	CS-422 CS-423 (6 Credit)	CS-426 (3 Credit)	SS-402 SS-403 (6 Credit)
8	MG-402 CS-424 SS-404 CS-425	--	MG-402 (3 Credit)	CS-424 CS-425 (6 Credit)	CS-426 (3 Credit)	SS-404 (3 Credit)

	CS-426					
Total (132)		**15**	**9**	**80**	**6**	**22**
Minimum Requirement (132)		**15**	**9**	**80**	**6**	**22**

E) Course title, objectives, outcomes, description, text books and reference books, computer and Laboratory Usage for each course in the program that can be counted for credit is showing below.

CS-101 Programming Fundamentals

Credit Hours 4(3-1)

Course Description To develop programming logic and to familiarize the students with the structured programming approach in C++.	
Course Objectives The course is designed to familiarize students with the basic structured programming skills. It emphasizes upon problem analysis, algorithm designing, and programme development and testing.	
Learning Outcomes Students will be able to analyze problems written in plain text and to develop programs in C++ using structures approach.	
Textbooks C++ How to Program, 5/E (Harvey & Paul) Deitel & Deitel, ISBN-10: 0132404168 ISBN-13: 9780132404167 Publisher: Prentice Hall Copyright: 2007	
Reference Books / Material Problem Solving and Program Design in C / 6E Hanly & Koffman Addison-Wesley Published: 02/06/2009 ISBN-10: 0321535421 ISBN-13: 9780321535429	
Course Distribution	Theory: 50% Problem Analysis: 10% Solution Design: 30% Social and Ethical Issues: 10%

Lab Objectives Labs sessions are planned to familiarize students with the basic structured programming skills. Emphasize is upon implementing problem analysis, algorithm designing, and programme development and testing
Lab Outcomes Students will be able to develop programs in C++ using structures approach
Textbooks / Lab Manual C++ How to Program, 5/E (Harvey & Paul) Deitel & Deitel, ISBN-10: 0132404168 ISBN-13: 9780132404167 Publisher: Prentice Hall Copyright: 2007
Reference Books / Material Problem Solving and Program Design in C / 6E Hanly & Koffman Addison-Wesley Published: 02/06/2009 ISBN-10: 0321535421 ISBN-13: 9780321535429
Technology Involved (Multimedia, Overhead Projector, Web, etc.)
Practiced Techniques (Lab Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)

EL-101Basic Electronics

Credit Hours 3 (2-1)

Course Description

The goal of this course is to teach the design of electronic systems using discrete electronic devices and components.

Course Objectives

- Describe the operation of simple semiconductor devices: junction diode, bipolar transistor
- Analyse the operation of a range of basic analogue electronic circuits involving transistors
- Perform design calculations for such circuits
- Measure circuit performance

Learning Outcomes

- Describe the operation of simple semiconductor devices: junction diode, bipolar transistor
- Analyse the operation of a range of basic analogue electronic circuits involving transistors
- Perform design calculations for such circuits;
- Measure circuit performance.

Textbooks

- Freedman and Young, University Physics, (10^{th} and higher editions).
- Resnick, Hallidayand Krane, College Physics (6^{th} and higher edition).

Reference Books / Material

- Thomas Floyd. Electronic Devices , Sixth Edition
- Theodre. F.Bogart. Electronic Devices and circuits
- Grob. Basic Electronics
- Robert Paynter, "Introductory Electronic Devices and Circuits Electron Flow Version," Seventh Edition

Course Distribution	Theory: 60% Problem Analysis: 20% Solution Design: 15% Social and Ethical Issues: 5%

Lab Objectives: The goal of Lab is to teach the design of electronic systems using discrete electronic devices and components.

Lab Outcomes: The goal of Lab is to teach the design of electronic systems using discrete electronic devices and components.

Textbooks/Lab Manual

- Freedman and Young, University Physics, (10^{th} and higher editions).
- Resnick, Hallidayand Krane, College Physics (6^{th} and higher edition).

Reference Books / Material

- Thomas Floyd. Electronic Devices , Sixth Edition
- Theodre. F.Bogart. Electronic Devices and circuits
- Grob. Basic Electronics
- Robert Paynter, "Introductory Electronic Devices and Circuits Electron Flow Version," Seventh Edition

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Lab Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)

CC/SS-101Islamic Studies/ Ethics (for Non-Muslims)

Credit Hours 2 (2-0)

Course Description

Islamic Studies presents Islam as a rational code of life with emphasis on Islamic perspectives on fundamental human rights, rule of law, brotherhood and equality of mankind, empirical and rational basis of knowledge, and harmony between the religious and the scientific domains of experience.

Pakistan Studies develops a sense of understanding among the Students about the various stage of freedom movement of Pakistan before partition and its Political and constitutional development after the independence. The course is designed in such a way to cultivate those issues which have retarded our social and economic progress.

Course Objectives

- To provide basic information about Islamic studies.
- To enhance understanding of the students regarding Islamic Civilization
- To improve Student's skill to perform prayers and other worships
- To enhance the skill of the students for understanding of issues related to faith and religious life
- 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.

Learning Outcomes

- To provide basic information about Islamic studies.
- To enhance understanding of the students regarding Islamic Civilization
- To improve Student's skill to perform prayers and other worships
- To enhance the skill of the students for understanding of issues related to faith and religious life
- Students will be able to revise the History of Pakistan and analyze the problems present in the Pakistan and the Position of Pakistan in the World Politics

Text books

- Islamic Education Compulsory
- Kazmi, M.R. Concise History of Pakistan. Oxford 2010
- Rabbani, M. Ikram, Pakistan Studies for GCU Students. Carvan Book House-Lahore.

Reference Books/Material

- Hameedullah Muhammad "Emergence of Islam". IRI, Islamabad
- Hameedullah Muhammad "Muslim conduct of state"
- Hameedullah Muhammad "Introduction to Islam"
- Hussain Hamid Husssan, "An Introduction to the Study of Islamic Law" leaf Publication Islamabad, Pakistan.
- Ahmad Hasan, "Principles of Islamic Jurisprudence" Islamic Research Institute. International Islamic University Islamabad, Pakistan (1993).
- Mir Waliullah, "Muslim Jurisprudence and the Quranic Law of Crimes". Islamic Book Service: (1989)
- Dr.Muhammmad Zia-ul-Haq. "Introduction to Al Sharia Al Islamia" AllamaIqbal Open University Islamabad (2001)
- Burki, ShahidJaved. State & Society in Pakistan, The Macmillan Press Ltd 1980.

• Akbar, S. Zaidi. Issue in Pakistan's Economy. Karachi: OxfordUniversity Press, 2000. • S.M. Burke and LawrenceZiring. Pakistan's Foreign policy: An Historical analysis. Karachi: OxfordUniversity Press, 1993. • Mehmood, Safdar. Pakistan Political Roots & Development. Lahore, 1994.	
Course Distribution	Theory: 60% Problem Analysis:5% Solution Design: 5% Social and Ethical Issues: 30%
Technology Involved (Multimedia, Overhead Projector, Web, etc.)	
Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, survey etc.)	

Ethics(for Non-Muslims)

Course Description **Ethics for Non-Muslims** presents religion as a rational code of life with emphasis on fundamental human rights, rule of law, brotherhood and equality of mankind, empirical and rational basis of knowledge, and harmony between the religious and the scientific domains of experience.	
Course Objectives • To provide basic information about religious studies • To enhance understanding of the students regarding religious Civilization • To improve Student's skill to perform prayers and other worships in their respective religion • To enhance the skill of the students for understanding of issues related to faith and religious life	
Learning Outcomes The course will be able to enhance the skills of the students for understanding of issues related to faith and religious life	
Reference Books/Material • William Lille. **An Introduction to Ethics** London Methuen & Co. latest edition. • Titus, H.H. **Ethics for Today**. New York: American Book, latest edition. • Hill, Thomas. **Ethics in Theory and Practice** N.Y. Thomas Y. Crowel, latest edition • Sayeed, S.M.A.(Tr.) **Ta'aruf-e-Akhlaqiat.** Karachi: BCC&T, Karachi	
Course Distribution	Theory: 60% Problem Analysis: 5% Solution Design: 5% Social and Ethical Issues: 30%
Technology Involved (Multimedia, Overhead Projector, Web, etc.)	
Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, survey etc.)	

CC/ENG-101 English Composition and Comprehension

Credit Hours 3 (3-0)

Course Description
The course aims to develop language skills of students to help them in other subjects.

Course Objectives
- To use parts of speech correctly
- To write simple and compound sentences
- To practice comprehension skills
- To practice paragraph writing
- To develop translation skill

Learning Outcomes
- To use parts of speech correctly
- To write simple and compound sentences
- To practice comprehension skills
- To practice paragraph writing
- To develop translation skill

Textbooks
- Warriner's English Grammar and Composition by John E. Warriner
- Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.
- Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. OxfordUniversity Press. 1997. ISBN 0194313506

Reference Books / Material
Authentic materials like newspapers, magazines, pictures, movie-clips etc.
- OxfordUniversity Press. 1997. ISBN 0194313492
- Reading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.

Course Distribution	Theory: 50% Problem Analysis:15% Solution Design:15% Social and Ethical Issues: 20%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, etc.)

CS-102 Discrete Structures

Credit Hours 3 (3-0)

Course Description

This course covers mathematical foundations of computer science. An introduction to logic, sets, functions and relations is made. Notion of complexity (time and space) is introduced and its use in the analysis of algorithms is discussed. An introduction is made to the basic Graph and Tree algorithms. Problems are formed mathematically and solved using available tools and techniques.

Course Objectives

The aim is for students to be able to engage in mathematical brainstorming and discussions by asking questions, making conjectures, and suggesting strategies for solving problems.

Learning Outcomes

- View mathematics as an integrated whole rather than as a series of disconnected topics
- Relate mathematics procedures to their underlying concepts.
- Use models, calculators, and other mathematical tools to demonstrate the connections among various equivalent graphical, concrete, and verbal representations
- Explore problems and describe and confirm results using various representations.

Textbooks

- Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6TH edition, 2006, Mcgraw Hill Book Co.
- Richard Johnsonbaugh, Discrete Mathematics, 7TH edition, 2008, Prentice Hall Publishers.

Reference Books

- Kolman, Busby & Ross, Discrete Mathematical Structures, 4th edition, 2000, Prentice-Hall Publishers.
- Discrete Mathematics Schaum Series
- Ralph P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, Addison-Wesley Pub. Co., 1985.

Course Distribution	Theory: 75% Problem Analysis: 10% Solution Design: 10% Social and Ethical Issues: 5%:

Technology Involved: Board

Practiced Techniques: Class Room Lecture, Presentations, Viva Voce

CS 103 Introduction to Information and Communication Technologies

Credit Hours 3(2-1)

Course Description
This is an introductory course on Information and Communication Technologies. Topics include ICT terminologies, hardware and software components, the internet and world wide web, and ICT based applications.

Course Distribution
Theory: 70%
Problem Analysis: 15%
Solution Design: 10%
Social and Ethical Issues: 5%

Course Objectives
After completing this course, a student will be able to:

- Understand different terms associated with ICT
- Identify various components of a computer system
- Identify the various categories of software and their usage
- Define the basic terms associated with communications and networking
- Understand different terms associated with the Internet and World Wide Web.
- Use various web tools including Web Browsers, E-mail clients and search utilities.
- Use text processing, spread sheets and presentation tools
- Understand the enabling/pervasive features of ICT

Technology Involved (Multimedia, Web)

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)
Class Room Lecture, Group Discussions

Learning Outcomes
After completing this course, a student will be able to:

- Understand different terms associated with ICT
- Identify various components of a computer system
- Identify the various categories of software and their usage
- Define the basic terms associated with communications and networking
- Understand different terms associated with the Internet and World Wide Web.
- Use various web tools including Web Browsers, E-mail clients and search utilities.
- Use text processing, spread sheets and presentation tools
- Understand the enabling/pervasive features of ICT

Textbooks

1. Introduction to Computers by Peter Norton, 6th International Edition (McGraw HILL)
2. Using Information Technology: A Practical Introduction to Computer & Communications by Williams Sawyer, 6th Edition (McGraw HILL)
3. Computers, Communications & information: A user's introduction by Sarah E. Hutchinson, Stacey C. Sawyer
4. Fundamentals of Information Technology by Alexis Leon, Mathewsleon Leon press

Reference Books / Material

- Computers: Information Technology in Perspective, 9/e by Larry Long and Nancy Long, Prentice Hall, 2002/ISBN: 0130929891.
- An Invitation to Computer Science, Schneider and Gersting, Brooks/Cole Thomson Learning, 2000.
- Information System Today by Leonard Jessup, Joseph Valacich.
- Computers Today by Suresh K. Basandra.
- Computer Science: An overview of Computer Science, Sherer

Lab Objectives This is an Elementary course of computer science to give introduction of computer fundamentals and commonly used Application Softwares such as Microsoft Word, Microsoft Excel, Microsoft Power Point.
Lab Outcomes After completion of this course the student should be able to have a complete knowledge of Information Technology Softwares that are used on daily basis
Technology Involved (Multimedia, Overhead Projector, Web, etc.) Multimedia, Web, Headphones/Mircrophones
Practiced Techniques (Lab Lecture, Presentation, Workshop, Group Discussion, Survey, etc.) Lab Lecture, Presentation

CS-104 Object Oriented Programming

Credit Hours 4(3-1)

Course Description

The course is designed to teach the concepts of Object Oriented paradigm. Object Oriented Design is concerned with developing an object-oriented model of a software system to implement the identified requirements Object Oriented Design. It offers a powerful way to cope with program complexity. Object-oriented programming languages (OOPLs) are the natural choice for implementation of an Object-Oriented Design because they directly support the object notions of classes, inheritance, information hiding, and dynamic binding. Because they support these object notions, Object Oriented Programming Languages make an object-oriented design easier to implement.

Course Objectives

The basic goal is to develop such programs that are clear, reliable and easily maintainable. The course includes concepts like Data Encapsulation, Classes, Objects, Constructors & Destructors, Operator and Function overloading, Virtual functions & Polymorphism, Inheritance, I/O & File handling, Templates & Exception handling.

Learning Outcomes

Upon completion of this course the student should be able to:

- Explain object-oriented programming concepts like- classes, instance variables, instance methods, constructors
- Explain advanced object-oriented programming concepts - inheritance, polymorphism
- Demonstrate creativity and problem-solving skills.
- Demonstrate proper use of the object-oriented principle of inheritance.
- Given a problem description, the student should be able to decide on appropriate classes in a class hierarchy tree.
- Demonstrate proper use of the object-oriented principle of composition.
- Given a description that involves two classes, the student should be able to decide on whether composition or inheritance is more appropriate.

Textbooks

How to Programe C++ by Deitel & Deitel 5/e, Pearson

Reference Books / Material

- *An Introduction to Object-Oriented Programming with Java*, C. Thomas Wu (2010). 5th Edition. McGraw-Hill. ISBN: 9780073523309
- *Java: How to Programme*, 5/e, Deitel and Deitel, Prentice Hall, 0131016210/ 0131202367 International Edition
- *Ivor Horton's Beginning Java*, 7/e, Ivor Horton
- *C++: How to Programme*, Deitel and Deitel, 5/e, Pearson
- *Object Oriented Programming in C++*, 3rd Edition, Robert Lafore

Course Distribution	Theory: 45% Problem Analysis: 20% Solution Design: 30%

	Social and Ethical Issues: 5%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)
Multimedia, Web

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)
Class Room Lecture, Presentation, Group Discussion.

Lab Objectives
The basic goal is to develop such programs that are clear, reliable and easily maintainable. The students should be able to implement concepts like Data Encapsulation, Classes, Objects, Constructors & Destructors, Operator and Function overloading, Virtual functions & Polymorphism, Inheritance, I/O & File handling, Templates & Exception handling.

Lab Outcomes
Upon completion of the practical work the student should be able to implement object-oriented programming concepts like- classes, instance variables, instance methods, constructors, advanced object-oriented programming concepts - inheritance, polymorphism, principle of composition.

Textbooks / Lab Manual
- How to Program C++ by Deitel&Deitel

Reference Books / Material
- How to Program C++ by Deitel&Deitel
- Object Oriented by Robert Lafore
- C++ Programming by Satish Jain
- Object Oriented Programming with C++ David Parsons

Technology Involved (Multimedia, Overhead Projector, Web, etc.)
Multimedia, Web

Practiced Techniques (Lab Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)
Lab Lecture, Presentation, Programming Assignments, Group Discussion.

CS-105 Digital Logic Design

Credit Hours 3 (2-1)

Course Description

This course has the objective to make students understand number representations used in today's digital systems and their arithmetic properties. This course has the objective to make the students learn the combinational logic and combinational circuits (multiplexers, decoders, and encoder). And sequential logic and sequential circuits.

Course Objectives

- Students will learn the number system and conversion of one system to the other system.
- Students will learn to analyze and synthesize networks of combinational, digital logic elements.
- Students will learn to analyze and design digital, clocked sequential circuits. e.g flip flops, counters registers etc.

Learning Outcomes

- Students will learn the number system and conversion of one system to the other system.
- Students will learn to analyze and synthesize networks of combinational, digital logic elements.
- Students will learn to analyze and design digital, clocked sequential circuits e.g flip flops, counters registers etc.

Textbooks

- Morris Mano " Digital Logic And Computer Design"
- Morris Mano and Charles R. Kime, "Logic and Computer Design Fundamentals," Third Edition.
- Digital Fundamentals / 9E By Thomas L. Floyd Published by Floyd Publisher, 2007

Reference Books / Material

- "Digital Design & XILINX 6.3 XSE PKG," M. Morris Mano First Edition
- "Digital Electronics: Principles and Applications," Roger L Tokheim, Student Text with MultiSIM CD-ROM, Sixth Edition

Extra Material/ Handouts will be provided in class

Course Distribution	Theory: 55% Problem Analysis:20% Solution Design:20% Social and Ethical Issues: 5%

Lab Objectives:
Learn the use of logic trainer and implement various logic gates and combinational circuits

Lab Outcomes:
The students will be able to

- Learn the logic trainer
- Implement and practice the working of various gates
- Implement and practice the working of combinational circuits

Textbooks / Lab Manual:

- Laboratory Work Book

Reference Books / Material: Nil

Technology Involved: Logic Trainer, Web

Practiced Techniques: Lab Lecture, Presentation

CC/SS-102 Pakistan Studies

Credit Hours 2 (2-0)

Course Description:
Develops a sense of understanding among the Students about the various stage of freedom movement of Pakistan before partition and its Political and constitutional development after the independence. The course is designed in such a way to cultivate those issues which have retarded our social and economic progress.

Course objectives:
- 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.

Learning Outcomes
- Students will be able to revise the History of Pakistan and analyze the problems present in the Pakistan and the Position of Pakistan in the World Politics

Reference Books/Material
- Burki, ShahidJaved. State & Society in Pakistan, The Macmillan Press Ltd 1980.
- Akbar, S. Zaidi. Issue in Pakistan's Economy. Karachi: OxfordUniversity Press, 2000.
- S.M. Burke and LawrenceZiring. Pakistan's Foreign policy: An Historical analysis. Karachi: OxfordUniversity Press, 1993.
- Mehmood, Safdar. Pakistan Political Roots & Development. Lahore, 1994.

Text books
- Kazmi, M.R. Concise History of Pakistan. Oxford 2010
- Rabbani, M. Ikram, Pakistan Studies for GCU Students. Carvan Book House-Lahore.

Course Distribution	Theory: 60% Problem Analysis:5% Solution Design: 5% Social and Ethical Issues: 30%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, survey etc.)

CC/ENG-102 Technical and Business Writing
Credit Hours 3 (3-0)

Course Description: The course aims to develop business communicative i.e. writing and speaking skills of students.

Course Objectives: To define & explain the components of communication

- To write messages
- To practice letter writing
- To develop study skills like letter writing etc.
- To practice memo& report-writing
- To develop précis writing skill

Learning Outcomes

- To define & explain the components of communication
- To write messages
- To practice letter writing
- To develop study skills like letter writing etc.
- To practice memo& report-writing
- To develop précis writing skill

Textbooks: Effective Business Communication by Herta A. Murphy

Reference Books / Material: Authentic materials like newspapers, magazines, pictures, movie-clips etc.

- Writing. Advanced by Ron White. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 435407 3 (particularly suitable for discursive, descriptive, argumentative and report writing).
- College Writing Skills by John Langan. McGraw-Hill Higher Education. 2004.
- Patterns of College Writing (4th edition) by Laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press. Presentation Skills, Reading
- The Mercury Reader. A Custom Publication. Compiled by NortherIllinois University. 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).

Course Distribution	Theory:50% Problem Analysis: 15% Solution Design:15% Social and Ethical Issues:20%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion etc.)

MT-101Calculus and Analytical Geometry

Credit Hours 3 (3-0)

Course Description: Implementation and study of different functions, their limits, continuity derivatives, Anti derivatives, integrals and also the study of the behavior of functions

Course objectives: Students should be able to work with functions represented in a variety of Ways: graphical, numerical, analytical, or verbal. They should understand the Connections among these representations. Students should understand the meaning of the derivative in terms of a rate of change and local linear approximation and should be able to use derivatives to solve a variety of problems. Students should understand the meaning of the definite integral both as a limit of Riemann sums and as the net accumulation of a rate of change and should be able to use integrals to solve a variety of problems.

Learning Outcomes

After completion of this course students will be able to:

- Discuss properties of real numbers.
- Calculate the derivatives and integrals of functions using different techniques
- Apply different theorems i.e M.V.T. , Roll s theorem, G.M.V.T.
- See the behavior of surfaces as well as students must be able to identify the different equations ellipse, parabola, and hyperbola.

Textbooks

1. E. Kreyszig, Advanced Engineering Mathematics, 7th edition (John Wiley 1994)
2. C. F. Gerald, Applied Numerical Analysis, 2nd Edition (Addison-Wesley 1978)
3. G. Arfken, Mathematical Method for Physicists, 2nd edition, (Academic Press 197

Reference Books

- Calculus & Analytic Geometry By M.Amin and S.M Yousaf
- Calculus & Analytic Geometry By Thomas and finny
- Swokowski, Olinick and Pence, Calculus and Analytical Geometry, 6th edition, 1994, Brooks/Cole Publishers
- Howard Anton, Calculus, 7th edition. 2002, John Wiley and Sons (WIE).
- William E. Boyce Richard C. Diprima, Calculus, John Wiley & Sons, ISBN: 0471093335.
- Erwin Kreyzig, Advanced Engineering Mathematics, 7th edition, 1993, John Wiley & Sons Inc.

Course Distribution	Theory: 75% Problem Analysis: 10% Solution Design: 10% Social and Ethical Issues: 5%:

Technology Involved: Board

Practiced Techniques: Class Room Lecture, Presentations, Viva Voce

MT-102Probability and Statistics

Credit Hours 3(3-0)

Course Description Representation of data. Elementary statistical packages for explanatory data. Data analysis.	
Course Objectives Concept of statistics. Sampling probability techniques to work with random variables.	
Learning Outcomes Model building, sampling techniques, data collection, presentation and analysis.	
Textbooks Probability and Statistics for Engineers & Scientists by Walepole, Myers, Myers, Ye	
Reference Books / Material Introduction to statistics by Sher Muhammad Chaudary Ronald Walpole, Myers, Myers, Ye, "Probability & Statistics for Engineers & Scientists", 8th edition, 2008, Prentice Hall Publisher. Lay L. Devore, Probability and Statistics for Engineering and the Sciences, 2003, Duxbury Publishers. G. Cowan, Statistical Data Analysis, 1998, Clarendon, Oxford.	
Course Distribution	Theory: 30% Problem Analysis: 20% Solution Design: 45% Social and Ethical Issues: 5%
Technology Involved Board, Multimedia	
Practiced Techniques Class Room Lecture, Presentations, Viva Voce	

CS-206 Data Structures and Algorithms
Credit Hours 4 (3-1)

Course Description
The course covers: Introduction to data structures; arrays, stacks, queues, priority queues, linked lists, trees, hashing, graphs, sorting and searching algorithms. Storage and retrieval properties and techniques for the various data structures. Algorithm complexity and classes of efficient algorithms.

Course Objectives:
The course is designed to teach students structures and schemes, which allow them to write programs to efficiently manipulate, store, and retrieve data. Students are exposed to the concepts of time and space complexity of computer programs.

Learning Outcomes: Students will be able to:

- Design and implement appropriate data structures such as stacks, queues, trees, linked lists, hash table and graphs.
- Apply object-oriented principles of polymorphism, inheritance, and generic programming when implementing data structures through their ADTs
- To create problem specific representations of ADTs
- Implement various sorting and searching algorithms
- Determine time and space complexity of various data structures

Textbooks

- Fundamentals of Data Structures in C++ by Ellis Horowitz, Sartaj Sahni, Dinesh Mehta
- ADTs, Data Structures, and Problem Solving with C++ by Larry R. Nayhoff ISBN: 0131409093

Reference Books / Material

- *Sams Teach Yourself Data Structures and Algorithms in 24*, Hours by Robert Lafore ISBN: 9780672316333
- *Data Structures and Algorithm Analysis*, Mark Allen Weiss, Florida International University, Addison-Wesley (latest Edition)
- *Algorithms*, Robert Sedgewick, Princeton University Publisher: Addison Wesley Professional (latest edition)
- *Data Structures: Abstraction and Design Using Java*, Koffman and Wolfgang, Wiley; 2nd Edition (or latest edition), 2010
- *Data Structures and Algorithms in C++*, Adam Drozdek, Course Technology; 4th Edition, 2012

Course Distribution	Theory: 30% Problem Analysis: 20% Solution Design: 45% Social and Ethical Issues: 5%

Lab Objectives
Labs sessions are planned to familiarize students with the basic data structures and their implementations. Emphasize is upon designing and implementing algorithms.

Lab Outcomes
Students will be able to develop and analyse different algorithms

Textbooks

- Fundamentals of Data Structures in C++ by Ellis Horowitz, Sartaj Sahni, Dinesh Mehta
- ADTs, Data Structures, and Problem Solving with C++ by Larry R. Nayhoff ISBN: 0131409093

Reference Books / Material

- *Teach Yourself Data Structures and Algorithms in 24 Hours*, by Robert Lafore ISBN: 9780672316333
- *Data Structures and Algorithm Analysis*, Mark Allen Weiss, Florida International University, Addison-Wesley (latest Edition)
- *Algorithms*, Robert Sedgewick, Princeton University Publisher: Addison Wesley Professional (latest edition)
- *Data Structures: Abstraction and Design Using Java*, Koffman and Wolfgang, Wiley; 2nd Edition (or latest edition), 2010
- *Data Structures and Algorithms in C++*, Adam Drozdek, Course Technology; 4th Edition, 2012

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Lab Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)

CS-207 Microprocessor and Assembly Language

Credit Hours 4 (3-1)

Course Description

The main objective of this course is to introduce the organization of computer systems and usage of assembly language for optimization and control. Emphasis is to expose the low-level logic employed for problem solving while using assembly language as a tool.

Course Objectives

This course focuses on the low-level aspects of programming, including organization of the computer itself, how an instruction set architecture is implemented. From an understanding of these items, the student will have a much better grasp of the inner workings of a typical computer, enabling her/him to become more effective when designing problem solutions at a higher level.

Learning Outcomes

- The students will be able to develop moderately complex programs in Assembly language
- The student will be familiar with 80x86 based machines architecture and specific device types Interrupts and file manipulation and screen graphics.

Textbooks

- Assembly Language Programming and Organization of the IBM PC by Ytha YU and Charles Marut ISBN: 0-07-072692-2

Reference Books

- Assembly Language for Intel Based Computers by Kip R. Irvine 3rd edition ISBN: 0136603904
- Stallings, "Computer Organization & Architecture", 7th ed, Prentice HALL, 2006.
- Irvine, Assembly Language for Intel-based Computers, 5thed, Prentice Hall, 2007.
- Computer Organization and Design, The Hardware/Software Interface, 4th ed, by David A. Patterson and John L. Hennessy, 2008. Elsevier Publishers.
- The Intel Microprocessor 8th ed, Barry B Brey.

Course Distribution	Theory: 30% Problem Analysis: 20% Solution Design: 45% Social and Ethical Issues: 5%

Lab Objectives Lab sessions are planned to familiarize students with Assembly language syntax, and to develop programs to have proper understanding of the language
Lab Outcomes Students will be able to develop programs and solve certain problems
Textbooks/ Lab Manual Assembly Language Programming and Organization of the IBM PC by Ytha YU and Charles Marut ISBN: 0-07-072692-2
Reference Books Assembly Language for Intel Based Computers by Kip R. Irvine 3rd edition ISBN: 0136603904
Technology Involved (Multimedia, Overhead Projector, Web, etc.)
Practiced Techniques (Lab Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)

CC/ENG-203 Communication Skills
Credit Hours 3 (3-0)

Course Description
The course aims to develop communicative i.e. writing and speaking skills of students.

Course Objectives: The course aims to enable students:

- To write paragraph following all steps of formal writing process
- To write essay following all steps of formal writing process
- To develop précis writing skill
- To develop presentation skills
- To develop business communication skills (Memo, Minutes of Meeting, Messages, Letter)
- To revise Grammar and Punctuation

Learning Outcomes: The students will be able:

- To write paragraph following all steps of formal writing process
- To write essay following all steps of formal writing process
- To develop précis writing skill
- To make presentations
- To develop business communication skills (Memo, Minutes of Meeting, Messages, Letter)
- To revise Grammar and Punctuation

Textbooks

- Intermediate by Marie-Chrisitine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).
- Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. OxfordUniversity Press 1986. ISBN 0 19 431350 6.

Reference Books / Material

- Authentic materials like newspapers, magazines, pictures, movie-clips etc
- Practical Business English, Collen Vawdrey, 1993, ISBN = 0256192740
- 2. Effective Communication Skills: The Foundations for Change, John Nielsen, 2008, ISBN = 1453506748
- Writing. 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).
- Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.
- Reading and Study Skills by John Langan
- Study Skills by Riachard Yorky.

Course Distribution	Theory:50% Problem Analysis:15% Solution Design:15% Social and Ethical Issues:20%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, etc.)

MT-203 Linear Algebra
Credit Hours 3 (3-0)

Course Description The course deals with elementary linear algebra and its applications. This includes: systems of linear equations and matrices, determinants, vector spaces, inner-product spaces, eigenvalues, eigenvectors, diagonalization, linear transformations, and applications.

Course Objectives
The following are the primary objectives for this course:

- To learn the fundamental concepts of linear algebra in the concrete setting of Rn
- To learn to use linear algebra to solve problems from engineering and other fields
- To learn to use computer software to apply the techniques of linear algebra
- To communicate, both orally and in writing, the theoretical concepts and scientific applications

Learning Outcomes
Students will be able to :

- Effectively express concepts of linear algebra in written form;
- Demonstrate ability to think critically about vector spaces and linear transformations; Locate and use information to solve problems of linear transformations and vector spaces;

Textbooks
Linear Algebra& Its Applications by Bernard Kolman

Reference Books / Material

- Linear Algebra by Lipschutz& Marc
- Linear Algebra by Hoffman & Kunge
- Gilbert Strang, Strang, Brett Coonley, Andy Bulman-Fleming, Andrew Bulman-Fleming, Strang's Linear Algebra And Its Applications, 4th edition, Brooks/Cole, 2005
- Howard Anton, Chris Rorres, Elementary Linear Algebra: Applications Version, 9th edition, Wiley, 2005.
- David C. Lay, Linear Algebra and Its Applications, 2nd edition, Addison-Wesley, 2000.

Course Distribution	Theory: 30% Problem Analysis: 20% Solution Design: 45% Social and Ethical Issues: 5%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)

CS-208 Database Systems
Credit Hours 4 (3-1)

Course Description
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.

Course Objectives
The course will deal with entity relationship model, concepts behind normalization and the main language for relational database systems i.e. SQL.

Learning Outcomes
Upon successful completion of this course, students will have the skills to analyze business requirements and produce a viable model and implementation of a database to meet such requirements.

Textbooks
- Modern Database Management. By Fred, R. McFadden Jeffrey, A Hoffer, Mary, B. Prescott. 2005.
- Introduction to Oracle: SQL and PL/SQL

Reference Books
- Database Systems: A Practical Approach to Design, Implementation & Management by Thomas Connnolly, Carolyn Begg
- Fundamentals of Database Systems, 5/E, Elmasri and Navathe, Addison-Wesley, ISBN: 0-201-74153-9.

Course Distribution	Theory: 30% Problem Analysis: 20% Solution Design: 45% Social and Ethical Issues: 5%

Technology Involved
Board, Multimedia

Practiced Techniques
Class Room Lecture, Presentations, Viva Voce

Lab Objectives
Lab sessions cover the practical implementation of the course. To create and analyze a database, to and produce a viable model and implementation of a database to meet requirements

Lab Outcomes
Upon successful completion of this course, students will have the skills to analyze business requirements and produce a viable model and implementation of a database to meet requirements.

Textbooks

- Modern Database Management. By Fred, R. McFadden Jeffrey, A Hoffer, Mary, B. Prescott. 2005.
- Introduction to Oracle: SQL and PL/SQL

Reference Books

- Database Systems: A Practical Approach to Design, Implementation & Management by Thomas Connnolly, Carolyn Begg

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Lab Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)

CS-209Design and Analysis of Algorithms
Credit Hours3 (3-0)

Course Description
This course focuses on the complexity and correctness of algorithms: big oh, big omega, and big theta notations, recurrence relations and their solutions, and worst, average and amortized analysis of algorithms with examples. Basic and advanced data structures for searching, sorting, and compression and graph algorithms.

Course Objectives
This course places emphasis on complexity analysis, sorting, graph theory and problem-solving strategies. Comparison of various sorting and graph algorithms, with focus on complexity and space versus time trade-offs is made. A special effort is made to formulate and design algorithms and use of approximate algorithms where the problem cannot be solved by an exact algorithm.

Learning Outcomes
On successful completion of this course unit students will:

- Understand the general notion of complexity classes, P and NP, completeness and hardness, and the relationships between classes by reduction. You will also have seen how to show tasks are NP-complete
- Be able to develop, and reason about the correctness and performance, of algorithms for string searching and for calculating over graphs
- Have studied a range of distributed and probabilistic algorithms, understand the key issues involved, and be able to use distributed and probabilistic techniques to develop algorithms.

Textbooks
Introduction to algorithms by Thomas H.Cormen, Charles E.Leisorson, Ronald L.Rivest, Clifford Stein

Reference Books
Algorithms and Complexity by HerbertS.WilfUniversity of PennsylvaniaPhiladelphia, PA
Algorithms in C++; Robert Sedgewick

Course Distribution	Theory: 45% Problem Analysis: 20% Solution Design: 30% Social and Ethical Issues: 5%

Technology Involved
Multimedia

Practiced Techniques
Class Room Lecture, Presentations

CS-210 Computer Architecture and Organization
Credit Hours 3 (3-0)

Course Description

This course is a study of the evolution of computer architecture and the factors influencing the design of hardware and software elements of computer systems. Topics may include: instruction set design; processor micro-architecture and pipelining, concepts of associative, cache and virtual memory organizations and the basic schemes involved in IO and memory management.

Course Objectives

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.

Learning Outcomes

Upon successful completion of this course, students should be able to:

- Describe the fundamentals of computer design
- Explain the basic concepts of modern computer architectures, including instruction set, pipelining, memory hierarchy and storage system
- Identify advanced techniques such as multiprocessor architecture
- Criticize computer designs and improve the designs
- Gain an appreciation of the beauty of computer designs and fundamentals

Textbooks

- Computer Architecture: A Quantitative Approach by Hennessy & Patterson, Morgan & Kauffman Series (2006) Fourth Edition.

Reference Books / Material

- Computer Organization & Design: The Hardware/Software Interface By Patterson &Hennessy, Morgan & Kauffman Series (2008) Fourth Edition.

Course Distribution	Theory: 65% Problem Analysis: 20% Solution Design: 10% Social and Ethical Issues: 5%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)
Multimedia, Web

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)
Class room lectures, Presentation

MG-201 Financial Accounting
Credit Hours 3 (3-0)

Course Description
Introduce the students to accounting fundamentals with a view to understand the technicalities of the accounting cycle.

Course Objectives
The central focus of accounting is to explain how financial information is accumulated and reported in periodic financial statements and use of accounting information effectively.

Learning Outcomes
- Prepare a trading, profit and loss account, balance sheet and cash flow report for sole traders and partnerships after taking into account a normal range of adjustments to the trial balance necessary for such preparation.
- Recognize and apply appropriate accounting conventions to a range of transactions within the context of the accounting regulatory requirements.
- Understand and describe the appropriate books of account for different types of accounting transactions and be able to prepare a trial balance from these books of account. To prepare journal entries and deal with the treatment of work sheet items.

Textbooks
- Accounting the Basis for Business Decisions by Meigs, Williams Haka & Bettner 11th edition
- Accounting an intuitive approach by M. Arif&SohailAfzal

Reference Books / Material
Principles of Accounting By M.A Ghani

Course Distribution	Theory: 75% Problem Analysis: 15% Solution Design: 5%: Social and Ethical Issues: 5%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)
Lectures and Presentations, Group Discussion

CS-211 Computer Graphics
Credit Hours 3 (2-1)

Course Description
The course covers: Graphics hardware and Fundamental graphics algorithms. Two and three dimensional imaging geometry and transformations. Curve and surface design, rendering, shading, colour, and animation.

Course Objectives
The objective of the course is to

- Learn basic and fundamental computer graphics algorithms and techniques;
- Learn 2-D and 3-D geometric transformations;
- Examine applications of modelling, rendering, design, visualization and animation

Learning Outcomes
Students will be able to:
Write and implement different algorithms for:

- Different shapes, image transformations, lines and curves, panning and zooming, Curve and surface design, rendering, shading, colour, and animation

Textbooks

- Computer Graphics Donald Hearn, M. Pauline Baker, Prentice Hall
- Computer Graphics Using Open GL, 2/E, Francis S. Hill, Jr., Prentice Hall, 2001

Reference Books / Material

- Fundamentals of Computer Graphics: 2nd Edition by Peter Shirley A.K. Peters, 2005
- 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
- Computer Graphics, F. S. Hill, Maxwell MacMillan ISBN: 0-02-354860-6.

Course Distribution	Theory: 30% Problem Analysis: 20% Solution Design: 45% Social and Ethical Issues: 5%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)

Lab Objectives

Labs sessions are planned for implementation of different algorithms to generate shapes, image transformations, lines and curves, panning and zooming, Curve and surface design, rendering, shading, colour, and animation

Lab Outcomes

Students will be able to work with algorithms to generate shapes, image transformations, lines and curves, panning and zooming, Curve and surface design, rendering, shading, colour, and animation

Textbooks

- Computer Graphics Donald Hearn, M. Pauline Baker, Prentice Hall
- Computer Graphics Using Open GL, 2/E, Francis S. Hill, Jr., Prentice Hall, 2001

Reference Books / Material

- Fundamentals of Computer Graphics: 2nd Edition by Peter Shirley A.K. Peters, 2005
- 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

MT-204 Multivariate Calculus
Credit Hours 3 (3-0)

Course Description

The goal of the Mathematics requirement is to expand students' understanding of mathematics beyond the entry-level requirements for college and to extend their knowledge of mathematics through relevant mathematical modelling with applications, problem solving, critical thinking skills, and the use of appropriate technologies.

Course Objectives

- Make meaningful connections between mathematics and other disciplines

Learning Outcomes

At the end of this course students will be able to:

- Use advance mathematics to solve problems and determine if the solutions are reasonable;
- Use mathematics to model real world behaviors and apply mathematical concepts to the solution of real-life problems;
- Make meaningful connections between mathematics and other disciplines;
- Use technology for mathematical reasoning and problem solving;
- Apply mathematical and/or basic statistical reasoning to analyze data and graphs.

Textbooks

- Calculus and Analytical Geometry by Thomas Finney
- Advanced Engineering Mathematics by Erwin Kreyszig

Reference Books

- Calculus & Analytical Geometry by Anton Howard
- Calculus with Analytical Geometry by Swokowski, Olinick and Pence Finny
- Calculus by H. Anton, John Wiley and Sons
- James Stewart, Multivariable Calculus, 6th edition, 2007, Cengage Learning publishers.
- Swokowski, Olinick and Pence, Calculus and Analytical Geometry, 6th edition, 1994, Thomson Learning EMEA, Ltd.
- Bernard Kolman, William F. Trench, Elementary Multivariable Calculus, 1971, Academic Press.
- Howard Anton, Albert Herr, Multivariable Calculus, 5th edition, 1995, John Wiley.

Course Distribution	Theory: 45% Problem Analysis: 25% Solution Design: 25% Social and Ethical Issues: 5%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Class Room Lecture, Group Discussion)

CS-212 Distributed Database Systems

Credit Hours 3 (3-0)

Course Description
This course is an advanced and specialized course based on the knowledge learned in database system course. The database management systems (DBMS) can be classified into centralized or distributed approach, and specifically the focus of the course would be toward distributed approach toward database development.

Course Objectives
To clearly describe the difference of Centralized database and Distributed database and enable the students to design/model a distributed database.

Learning Outcomes
After studying this course, the students would be able to distinguish clearly between centralized and distributed approaches to database management system (DBMS). The students can analyze the DMBS requirement distinct to every application type and business domain, and can work on distributed DBMS systems.

Textbooks
- Principals of Distributed Database Systems by Ozsu Tamer.

Reference Books / Material
- Database Systems by Thomas Connolly.

Course Distribution	Theory: 75% Problem Analysis: 10% Solution Design: 10% Social and Ethical Issues: 5%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)

CS-313 Artificial Intelligence
Credit Hours 3 (2-1)

Course Description
This course gives basic knowledge about intelligence in computers. The knowledge representation techniques and systems (e.g., expert systems. ANN, Fuzzy Logic, Semantics etc.) are discuss in detail.

Course Objectives
This course places emphasis on making machines think and learn like humans. The main objective of this course is to make intelligent programs to deal with real time problems.

Learning Outcomes
On successful completion of this course students will:

- Understand the logic and calculus behind artificial intelligence.
- Be able to develop reasoning and logic to solve some real time problems.
- Be able to built expert systems and other related programs using Prolog (AI Programming Language).

Textbooks

- Artificial Intelligence by Luger, 4th edition Pearson Education.
- Russell and Norvig, Artificial Intelligence: A Modern Approach, 2nded, Pearson Education.

Reference Books
Lecture Notes

Course Distribution	Theory : 30% Problem Analysis : 35% Solution Design : 20% Social and Ethical Issues : 5%

Technology Involved: Multimedia

Practiced Techniques: Class Room Lecture, Presentations

Lab Objectives
To practice by doing hands on exercises on components development and gain proficiency in various aspects of professional application development.

Lab Outcomes
Becoming proficient in application development

Textbooks / Lab Manual
- Artificial Intelligence by Luger, 4th edition Pearson Education.
- Russell and Norvig, Artificial Intelligence: A Modern Approach, 2nded, Pearson Education.

Reference Books / Material

Technology Involved (Multimedia, Overhead Projector, Web, etc.)
Multimedia, Web

Practiced Techniques (Lab Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)
Lab Lectures, Presentation, Individual and Group programming assignments

CS-314 Operating Systems

Credit Hours 3 (2-1)

Course Description

Operating systems are essential to most modern computer systems, from very small computing devices such as embedded systems for cell phones, personal digital assistants (PDAs), and mp3 players to larger computers such as personal computers, workstations, clusters, and supercomputers. An operating system has two fundamental tasks: to manage a computer's resources (i.e., CPU cycles, memory, disk, network interface, etc.) and to provide applications with an abstract interface to these resources so that they are (relatively) easy to use. The objective of this course is to give students knowledge of construction and working of Operating systems, to enable them to understand management and sharing of computer resources, communication and concurrency.

Course Objectives:

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

Learning Outcomes

AT the end of this course students should be

- aware of the OS functions and different roles of an Operating System
- aware of the basic concepts (such as processes, memory management) relevant to Operating Systems
- able to take decisions regarding selecting Operating Systems

Textbooks

- Applied Operating Systems Concepts, 7th Edition, Silberschatz A., Peterson, J.L., & Galvin P.C. 2004.
- Modern Operating Systems, 3rd Edition, Tanenmaum A.S., 2008.

Reference Books / Material

- Operating Systems by William Stallings 4th edition

Course Distribution	Theory : 65% Problem Analysis: 20% Solution Design: 10% Social and Ethical Issues: 5%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Multimedia, Web

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)

Class room lectures, Presentation

Lab Objectives To provide an understanding of the design aspects of operating system and to provide a clear description of basic concepts that underlie operating systems.
Lab Outcomes Students will get a deeper understanding of the underlying algorithms of the Operating System.
Textbooks / Lab Manual Applied Operating Systems Concepts, 7th Edition, Silberschatz A., Peterson, J.L., & Galvin P.C. 2004.
Technology Involved (Multimedia, Overhead Projector, Web, etc.) Web
Practiced Techniques (Lab Lecture, Presentation, Workshop, Group Discussion, Survey, etc.) Group discussion

CS-315 Data Communications and Computer Networks
Credit Hours 3(2-1)

Course Description

This course introduces the student to the concepts and terminology of computer communications and networking. It includes topics on communication models, network protocols, standards, LANs, WANS, the Internet, intranet and networking applications. The emphasis will be to develop an understanding of the underlying principles of data communications and networking.

Course Objectives

To expose the students to the basic principles of the technology of data communications and networking. Upon completion of this course, the students should have a good working knowledge of communication technology (network components, transmission links, link control, protocols, network topologies, error detection and correction), network management and security and local area networks.

Learning Outcomes

Upon successful completion of this course, the students will be able to:

- Describe the hardware and software commonly used in data communications and networking.
- Define the functions of the seven layers of the OSI reference model.
- Describe the major WAN and LAN applications.
- Explain the functions of the major components in a network.
- Explain the ways of network interconnections.
- Identify the security requirements of a network.

Textbooks

- Introduction to Computer Networks, A. S. Tanenbaum, Prentice Hall 2003
- Data and Computer Communications By William Stallings Published by Macmillan Pub. Co., 8th Edition 2006

Reference Books / Material

- Computer Networks and Internets, 5/E, 2008 Douglas E. Comer, Purdue University ISBN-10: 0136061273 ISBN-13: 9780136061274 Publisher: Prentice Hall
- Essentials of Data Communications, by David Stamper and the Saratoga Group, The Benjamin/ Cummings Publishing Company Inc., 1997
- Lecture Notes

Course Distribution	Theory: 65% Problem Analysis: 20% Solution Design: 10% Social and Ethical Issues: 5%

Lab Description
An introduction to the basics of computer communication and networking. It includes the hands on experience on cabling and configures the network devices and applies address.

Lab Objectives

Build an understanding of the fundamental concepts of computer networking.
Familiarize the student with the basic taxonomy and terminology of the computer networking area.
Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks

Learning Outcomes

Upon successful completion of this course, students should be able to do practical work related to cabling, understand and building the skills of subnetting and routing mechanisms.
Identify the different types of network topologies and protocols.
Familiarity with the basic protocols of computer networks, and how they can be used
to assist in network design and implementation

Textbooks
- Lecture Notes

Reference Books / Material
- Online references

Technology Involved (Multimedia, Overhead Projector, Web, etc.)
Multimedia

Practiced Techniques (Lab demonstrations, Presentation, Workshop, Group Discussion, practical work etc.)
Lab demonstration, presentations, group discussions and practical work

CS-316 Software Engineering
Credit Hours 3 (3-0)

Course Description

This course offers an introduction to advanced topics of software development. Today Software development is recognizing as a legitimate discipline, one worthy of serious research, conscious study, and tumultuous debate. The topics, which are included in this course like the phases in software development requirement engineering, design engineering, implementation, testing, quality assurance, software project management issues, software metrics, risk management, configuration management and some other advance topics have been adopted successfully across a board spectrum of I.T industry applications. Managers and Practitioners alike recognize the need for a more disciplined approach to software development. The basic goal of this course is to make students be able to meet and understand the I.T market needs.

Course Objectives

The course objective is to enable students to understand software development life cycle, requirement engineering, designing engineering, testing techniques, project management, risk management, quality assurance, software metrics, and configuration management, web engineering etc.

Learning Outcomes

Upon completion of this course, students will:

- Understand concepts and techniques of software development.
- Be able to understand Requirement Engineering, Software Project management, Design principles, Software testing strategies and software quality management issues, Software configuration management. Software metrics etc..

The end project of the course enhances the I.T market vision of students and they will be able to do the documentation of any software project by using the techniques and tools discussed and taught during the course.

Textbooks: Software Engineering a Practitioners approach by roger S. Pressmen 7th edition

Reference Books

- System Analysis and Design by Kenneth E. Kendall and Julie E. Kendall
- A guide to the Project Management Body of Knowledge (PMBO Guide)
- Software Engineering 8E by Sommerville Addison Wesley, 2006

Course Distribution	Theory: 50% Problem Analysis: 25% Solution Design: 24% Social and Ethical Issues: 1%

Technology Involved: Tools, Web, Multimedia, etc.

Practiced Techniques: Lecture, Presentation, Group Discussion, Role playing, workshop and Survey

MT-305 Differential Equations

Credit Hours 3 (3-0)

Course Description

This course deals with mathematical equation for an unknown function of one or several variables that relate the values of the function itself and of its derivatives of various orders. Differential Equations play a prominent role in engineering, physics, economics and other disciplines

Course Objectives

- Develop fundamental skills of solving ordinary differential equations and developing differential equations for real world problems.

Learning Outcomes

At the end of this course students would be able:

- To know how to deal a mathematical models involving various quantities & their rates of change (model involving differentials).
- To know different techniques to solve differential equations which occur in many problems of science & Engineering such as in finding charge in electric circuit, in determining speed of projectile etc.

Textbooks

- "Advanced Engineering Mathematics" by Erwin Kreyzig

Reference Books

- "Advanced Engineering Mathematics" Michael Greenberg
- "Differential Equations with boundary value Problems" by Dennis G Zill,Micheal R Cullen
- "A first Course in differential Equation"Zill, Prindle, Weber and Schimdt
- "Elementary Differential Equations with Applications" C H Edwards, David E Penny

Course Distribution	Theory: 75% Problem Analysis: 10% Solution Design: 10% Social and Ethical Issues: 5%:

Technology Involved

Board

Practiced Techniques

Class Room Lecture, Presentations, Viva Voce

CS-317 Theory of Automata

Credit Hours 3 (3-0)

Course Description

The subject deals with the basic terminologies, notations and techniques of Computer Theory, which are pre-requisites for Computer Design, Artificial Intelligence, the Analysis of Algorithms and so forth. The key objective is to recognize and manipulate context free grammars and to understand the power of recursive interaction of parts of a procedure.

Course Objectives

- Understand mathematical models of computation.
- Be able to reason formally about mathematical models.

Learning Outcomes

- Build a regular expression, deterministic finite automaton and non-deterministic finite automaton for a regular language.
- Build a pushdown automaton or context-free grammar for a context-free language.
- Build a Turing machine.

Textbooks

- Computer Theory by I. A. Cohen

Reference Books / Material

- Introduction to Automata Theory, Languages and Computation by Hop Croft.
- The Language and its Implementations by Darror & D.W
- An Introduction to Formal Languages and Automata, By Peter Linz, 4th edition, Jones & Bartlett Publishers, 2006
- 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.
- John Hopcroft and Jeffrey Ullman, Introduction to Automata Theory, Languages, and Computation, 2nd edition, 2001, Addison-Wesley.
- Introduction to Languages and the Theory of Computation, By John C. Martin 3rd edition, 2002, McGraw-Hill Professional.

Course Distribution	Theory : 30% Problem Analysis: 30% Solution Design: 38% Social and Ethical Issues: 2%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)
Multimedia, Web

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)
Class Room Lecture, Presentation, Group Discussion.

CS-318 Wireless Networks
Credit Hours 3(2-1)

Course Description

Wireless networks have fundamentally different properties than typical wired networks, including higher error rates, lower bandwidths, transmission characteristics, increased susceptibility to interference and eavesdropping, and higher variability of performance. Similarly, mobile nodes (computers) behave differently and have fundamentally different limitations than stationary nodes. This course will examine the area of mobile and wireless networking, looking at the unique network protocol challenges and opportunities presented by wireless communication and node mobility.
This course provides an introduction to various current and next generation wireless networking Technologies, GSM cellular system, Advance and emerging technologies such as 3G.

Course Objectives:
The objective of this course is to give an introduction to the fundamentals of the wireless communications systems, the wireless network architectures, protocols, and applications. Focusing technologies will be digital cellular (GSM/GPRS/EDGE, IS-95, and IMT-2000), wireless broadband communications (wireless local area networks, wireless personal area networks, and fixed/mobile broadband wireless communications). Understand the architecture and applications of current and next generation wireless networks: Cellular, WLANs, networks, mobile ad-hoc networks and intermittently connected mobile networks. This course emphasizes hand on skills to handle networks efficiently & effectively

Learning Outcomes

The students will learn how to design and analyze network layer routing protocols, along with key component mechanisms. Also understand LAN and WAN technologies, wireless communications and digital cellular technologies along with the emerging telecommunication techniques.

Textbooks

- William Stallings, "Wireless Communications and Networks", 2nd Edition, ISBN 81-317-0973-6 Prentice Hall
- Clint Smith , Collins "3 G Wireless Networks" , 2ndEdition, ISBN 0-07-063692-3, McGraw Hill

Reference Books / Material

- Jochen Schiller, "Mobile Communications", 2nd Edition, ISBN-10: 0321123816
- Introduction to Telecommunications Network Engineering, 2nd edition, T. Aattalainen, Artech House 2003, ISBN: 1580535003.
- Fundamentals of Telecommunication Networks, T. Saadawi, Wiley US, ISBN: 0471515825.
- J.P. Castro, "The UMTS Network and Radio Access Technology AirInterface Techniques for Future Mobile Systems", Wiley, 2001
- H. Holma and A. Toskala, "WCDMA for UMTS Radio Access for ThirdGeneration

Mobile Communications", John Wiley & Sons, 2001.	
Course Distribution	Theory: 30% Problem Analysis: 20% Solution Design: 45% Social and Ethical Issues: 5%
Technology Involved Multimedia, Web	

Lab Objectives

To emphasize hand on skills to configure, managing, and troubleshooting elements of the basic network infrastructure.

Learn how to design and analyze network layer routing protocols, along with key component mechanisms.

Lab Outcomes

Demonstrate the ability to configure devices and apply address

Compare and contrast classful and classless IP addressing

Describe the various route types found in the routing table structure

Describe static routes with exit interfaces.

Configure VLANs on the switches in a network topology.

Troubleshoot the common software or hardware configuration problems associated with VLANs on switches in a network topology .

Configure and verify basic wireless LAN access.

Textbooks / Lab Manual

Network Simulator User Manual

Reference Books / Material

Routing & Switching Books

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Lab Lecture, Presentation, Workshop, Group Discussion, Practice work etc.)

CS-319 Web Design and Development

Credit Hours 3(2-1)

Course description

The course is designed to give an exposure of theoretical and practical techniques utilized in the Internet and the development of Web applications. The course provides the understanding of HTML, DHTML, JavaScript, PHP scripting. This course aims at developing professional web and enterprise level applications and tools in Visual Programming Environment.

Course Objectives

This course focuses on basics of web development as well as some advance tools and techniques, which will help the students to understand and grasp the knowledge of what web is and the need for web development. Also it will also help them develop high level, interactive and dynamic web based applications.

Learning Outcomes

- By the end of the course students will have sufficient understanding of browsers and different web technologies HTML, JavaScript, PHP etc.
- Use Microsoft ADO.Net to access and manipulate data in a database
- Create Web applications by using Web Forms
- Use Web Services in applications
- To be able to learn quickly and work in any parallel and upcoming programming tools & technologies

Textbooks

- HTML Complete Reference, 4th EditionISBN: 007222942X
- Advance java script by Shiran and Shiran 10th Edition, ISBN: 1556225520
  Beginning PHP 4 By Wrox, ISBN: 978-0-7645-4364-7
- Professional vb 2005 with .Net by byBill Evjen, Billy Hollis, Tim McCarthy, Kent Sharkey and Bill Sheldon
- Programming Visual Baics.Net by Dave Grundgeiger.
- Professional C# 2005, Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, Allen Jones, ISBN: 978-0-7645-7534-1

Reference Books / Material

- PHP 4 bible by Tim Converse and Joyce Park, 2nd Edition, ISBN-13: 978-0764547164
- A Programmer's Introduction to Visual Basics Net , Craig Utley.
- Professional ADO.NET, Julian Skinner, Bipin Joshi , Donny Mack , ISBN: 978-1861005274
- NET Web Services: Architecture and Implementation, Keith Ballinger, ISBN: 978-0321113597
- Professional ASP.NET 2.0, Bill Evjen, Scott Hanselman, Farhan Muhammad, Srinivasa Sivakumar, Devin Rader, ISBN : 978-0764576102
- MFC from the Ground Up.
- Windows 98 API Programming.
- VC++ A complete References

Course Distribution	Theory: 30% Problem Analysis: 20% Solution Design: 45% Social and Ethical Issues: 5%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)
Multimedia, Web

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)
Class Room Lecture, Lab Lectures, Presentation, Group Discussion, Group assignments

Lab Objectives
To practice by doing hands on exercises on components development and gain proficiency in various aspects of professional application development.

Lab Outcomes
Becoming proficient in web application development

Textbooks / Lab Manual

- HTML Complete Reference, 4th EditionISBN: 007222942X
- Advance java script by Shiran and Shiran 10th Edition, ISBN: 1556225520
  Beginning PHP 4 By Wrox, ISBN: 978-0-7645-4364-7
- Programming Visual Baics.Net by Dave Grundgeiger.
- Professional C# 2005, Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, Allen Jones, ISBN: 978-0-7645-7534-1

Technology Involved (Multimedia, Overhead Projector, Web, etc.)
Multimedia, Web

Practiced Techniques (Lab Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)
Lab Lectures, Presentation, Individual and Group programming assignments

CS-320 Object Oriented Analysis and Design

Credit Hours 3 (3-0)

Course Description

The course is designed to teach the concepts of Object Oriented paradigm. Object Oriented Design is concerned with developing an object-oriented model of a software system to implement the identified requirements Object Oriented Design. It offers a powerful way to cope with program complexity. Object-oriented programming languages (OOPLs) are the natural choice for implementation of an Object-Oriented Design because they directly support the object notions of classes, inheritance, information hiding, and dynamic binding. Because they support these object notions, Object Oriented Programming Languages make an object-oriented design easier to implement.

Course Objectives

- Learn what the object-oriented (OO) approach to software development is, through OO principles and design patterns.
- Learn UML (Unified Modelling Language) that is part of most CASE (Computer Aided Software Engineering) tools and the benefits of visual modelling / diagramming.
- Practice the application of principles of object-oriented software development through the course group project.
- Develop teamwork and communication skills through the course group project.

Learning Outcomes

Upon completion of this course the student should be able to:

- Describe Object Oriented Analysis and Design concepts and apply them to solve problems
- Prepare Object Oriented Analysis and Design documents for a given problem using unified modelling language

Text Book: Applying UML and Patterns - An Introduction to Object-Oriented Analysis and Design and Iterative Development, by Craig Larman, Prentice Hall, 2004, ISBN: 0-13-148906-2.

Reference Books / Material

- Object-Oriented Software Engineering, by Timothy C. Lethbridge and Robert Laganiere, McGraw-Hill, 2001, ISBN: 0-07-709761-0.
- Developing Software with UML, Object-Oriented Analysis and Design in Practice, by Bernd Oestereich, Addison-Wesley, 1999.
- Object-Oriented Analysis and Design with Applications, 2nd ed., by G. Booch, Benjamin/Cummings, Redwood City, CA, 1994.
- Principles of Object-Oriented Software Development, by Anton Eliens, Addison-Wesley, 1995, ISBN: 0-201-62444-3.

Course Distribution	Theory: 50% Problem Analysis: 20% Solution Design: 30%

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)

Class Room Lecture, Presentation, Group Discussion, Workshop

CS-321 Numerical Computing

Credit Hours 3 (3-0)

Course Description: This course is intended to give you a significant experience in solving relatively complicated problems in applied mathematics and some introduction to the approximate solution of mathematical problems using numerical methods. The course will involve a significant component in modeling. The modeling will be used to translate real problems or idealized versions of real problems into mathematical terms. A large number of numerical methods will be introduced throughout the semester. Students will be expected to implement algorithms and analyze the output of your computer code relative to the original problem.

Course Objectives: Upon successful completion of this course, one should be able to:
1. Describe difficulties that can arise because computers usually use finite precision, often non-decimal arithmetic.
2. List sources of error in computation, particularly to be able to identify when catastrophic cancellation may occur in a given computation.

Learning Outcomes Upon successful completion of this course, the student will be able to

- Analyze a practical problem, understand the mathematical basis of the problem,
- Then proceed to develop and implement an algorithm to find a numerical solution of the problem.
- Study the solution and develop a practical interpretation of the numerical results.
- Effectively communicate the solution and its interpretation to others

Textbooks: Gerald/Weatley "Applied Numerical Analysis"

Reference Books

- "Applied Numerical Analysis" by Addison Wesley
- " Numerical Analysis" by Saeed Akhtar Bhatti
- Numerical Methods in Scientific Computing Germund Dahlquist and Åke Björck .
- Numerical Methods for Scientific Computing : J.H. Heinbockel
- Numerical Analysis: I.A. Khubaza
- Numerical Analysis and Programming : Shan S Kuo
- Numerical Analysis by Berden Fairs
- Numerical Analysis by Gerald

Course Distribution	Theory: 30%, Problem Analysis: 20%, Solution Design: 45% Social and Ethical Issues: 5%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)

CS-422 Compiler Construction

Credit Hours 3 (2-1)

Course Description
In this course the emphasis is on solving problems universally, encountered in designing a language translator, regardless of the source or target machine.

Course Objectives
To enable students to understand the design of a compiler as well as to analyse different design issues. To enable students to design some of the phases of a compiler.

Learning Outcomes
The students will be able to apply the ideas and techniques learned in this course to general software design as well as to build some phases of compiler for major programming language.

Textbooks
- Compilers Principles, Techniques & Tools by Aho& A.V. Sethi. R.

Reference Books / Material
- The Theory and Practice of Compiler Writing by Tremblay and J.P.
- High Level Languages and Their Compilers by Des Watson.
- Compilers: Principles, Techniques, and Tools By Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Contributor Jeffrey D. Ullman ,Addison-Wesley Pub. Co., 2nd edition,1987 Original from the University of Michigan
- Modern Compiler Design, By Dick Grune, Henri E. Bal, Ceriel J. H. Jacobs, Koen G. Langendoen, John Wiley, 2000.
- Modern Compiler Implementation in C, By Andrew W. Appel, Maia Ginsburg, Contributor Maia Ginsburg, Cambridge University Press, 2004.
- Modern Compiler Design by Dick Grune, Henri E. Bal, Ceriel J. H. Jacobs, Koen G. Langendoen, 2003, John Wiley & Sons.

Course Distribution	Theory : 30% Problem Analysis: 35% Solution Design : 20% Social and Ethical Issues: 5%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)
Multimedia, Web

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.) Class Room Lecture, Presentation, Group Discussion.

Lab Objectives

To give a hands on experience on solving problems universally, encountered in designing a language translator, regardless of the source or target machine

Lab Outcomes

Students will be able to understand the design and working of a compiler as well as to design some phases of a compiler.

Textbooks / Lab Manual

Compilers Principles, Techniques & Tools by Aho& A.V. Sethi. R.

Reference Books / Material

- The Theory and Practice of Compiler Writing by Tremblay and J.P.
- High Level Languages and Their Compilers by Des Watson.

SS-403 Psychology

Credit Hours 3 (3-0)

Course Description: Introduction to Psychology and its various concepts like Perception, Learning, Motives, Emotions, Memory, and Thinking.	
Course Objectives: Enable the students to gain a better understanding of the field of Psychology. To become familiar with the research methodology commonly used by psychologists. To acquaint students with biological basis of behavior To develop an understanding of psychological processes like perception, learning, emotions, motivation, memory and thinking	
Learning Outcomes: Better understanding of human behavior in social settings.	
Textbooks: 1. Psychological Processes by Prof.Zareen Bukhari. 2. Textbook of Psychology by SheherBano.	
Reference Books / Material • Feldman, R. S. (2010) *Understanding Psychology* (10th ed.). New York:McGraw-Hill. • Myers, D. G. (1992). *Psychology*. (3rd ed.). New York: Wadsworth Publishers.	
Course Distribution	Theory: 85% Problem Analysis:5% Solution Design: 5% Social and Ethical Issues: 5%
Practiced Techniques: Class Room Lecture, Presentation, Group Discussion	

CS-423 Digital Image Processing

Credit Hours 3 (3-0)

Course Description

This is a one semester course covering the image processing methodology. The students are expected to write their programming assignments using MATLAB.

Course Objectives

To introduce underlying concepts involved in processing digital images including Image Enhancement
Image segmentation and different colour models.

Learning Outcomes

Students will be able to learn the fundamental theories and techniques of digital image processing and their MATLAB implementations.

Textbooks

Reference Books / Material

- Digital Image Processing by Gonzalez and Woods, 3rd Edition 2008, Prentice Hall
- Digital Image Processing Using MATLAB, by Gonzalez and Woods, 2nd Edition 2009, Prentice Hall.

Course Distribution	Theory: 50% Problem Analysis: 10% Solution Design: 35% Social and Ethical Issues: 5%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)

SS-404 Foreign Languages (Arabic)

Credit Hours 3 (3-0)

Course Description: This course will help the students in the understanding of Arabic language grammar, vocabulary grammar etc.
Course Objectives To develop the better understanding about Arabic Language
Learning Outcomes Introduction of Arabic numbers, Fundamentals of vocabulary, Grammar, and Literature of Modern Standard Arabic
Reference Books / Material: تدريس اللسان العربي د/ خالق داد ملك
Technology Involved: (Multimedia, Overhead Projector, Web, etc.)
Practiced Techniques: (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.) Class Room Lecture

MG-402 Human Resource Management

Credit Hours 3 (3-0)

Course Description:
This course seeks to develop the necessary skills needed for the student seeking her places in the executive world, so emphasis is placed on the modern day importance of HRM and the new "corporate view" of the functions. Additionally, the student will be exposed to the view of HRM from the perception of both management and subordinate employees. The student will be exposed to practical situations and problem solving regarding areas of employee counselling, discipline and termination. The concept of Equal Employment Opportunity will be discussed in order for the student to understand its need, importance and the legal issues surrounding it. Other critical areas of training and development, staffing and strategy will also be explored. Independent studies courses allow students in good academic standing to pursue learning in areas not covered by the regular curriculum or to extend study in areas presently taught.

Course Objectives:
The course of Human Resource Management id designed to developing knowledge and understanding of HR strategy and practice, skills development assignments are integrated into the course. Student- centered learning activities relating to both human resource and managerial related activities form the basis for the units, which enable the enhancement of a range of people management and HR specific skills. Reflections upon personal competence and competence development further equip students with the ability to make an active contribution to business performance. To that end, the syllabus contents not only concerned with the academic requirements of Human Resource Management but concentrate more on the development of the effective, pragmatic, yet innovative solutions to the issues surrounding the need to maximize people's productivity, efficiency and effectiveness.

Learning Outcomes

- Explain the role and significance of human resources.
- Explore and understand the highly dynamic external and internal factors of competitive environment.
- Identify required skills in recruitment, selection, training and development of human resource
- Categorizes the inputs and processes for compensation planning
- Distinguish key issues regarding career planning and performance appraisal.

Textbooks:
Managing Human Resource By Wany F. Casico
Human Resource Management by Lloyd L. Byars& Leslie W. Rue (10th International Edition)

Reference Books / Material: Understanding Human Resource Management by Ken N. Kamoche.
Other Online resources

Course Distribution	Theory: 60% Problem Analysis: 5% Solution Design: 5% Social and Ethical Issues: 30%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)

Practiced Techniques (Class Room Lecture, Presentation, Group Discussion, Survey, etc.)

CS-424 Human Computer Interaction
Credit Hours 3 (2-1)

Course Description
This course provides an introduction to the fundamental concepts in human-computer interaction. Students will learn how to design and evaluate user interfaces for computer-based systems and devices. Topics include cognition, interaction frameworks, design process, evaluation methods, user research, design principles, prototyping techniques, and interaction paradigms.

Course Objectives
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.

Learning Outcomes
At the end of the course, you should be able to:

- Analyze and adopt usability engineering lifecycle models and methodologies.
- Apply user-centered design approaches and techniques.
- Design software user interfaces through prototyping methods.
- Evaluate user interfaces using heuristics and observation techniques.

Textbooks

- Human Computer Interaction by Alan Dix
- Designing the User Interface: Strategies for Effective Human-Computer Interaction, by Ben Shneiderman, Published by Addison-Wesley
- A number of handouts and few research papers would be given to the students

Reference Books

- Software Engineering a Practitioners approach by roger S. Pressmen

Course Distribution	Theory: 59% Problem Analysis: 20% Solution Design: 20% Social and Ethical Issues: 1%

Technology Involved
Moore Software (compulsory) with other tools, Web, Multimedia, Computers, Research papers/journals etc.

Practiced Techniques
Lecture, Presentation, Group Discussion, and Survey

Lab Objectives

The course include several individual labs in which the students test analytic models, re-design instructions and tutorials, evaluate data input and retrieval devices, critique graphical and textual interfaces, and re-design menu systems as well as other projects. Each of the projects is briefly discussed in class as well as in the Lab session.

Lab Outcomes

The group projects done in the Lab session involves a diverse team of students working together on different issue of HCI. The students select their topics in consultation with course instructor. A group report is presented to the class instructor at the end of course. Finally, at the end of the course each of the students presents her report on an HCI topic of her choice.

Textbooks / Lab Manual

- Human Computer Interaction by Alan Dix
- Designing the User Interface: Strategies for Effective Human-Computer Interaction, by Ben Shneiderman, Published by Addison-Wesley
- A number of handouts and few research papers would be given to the students

Reference Books / Material

- Software Engineering a Practitioners approach by roger S. Pressmen

Technology Involved

Moore Software (compulsory) with other tools, Web, Multimedia, Computers, Research papers/journals etc.

Practiced Techniques Lecture, Presentation, Group Discussion, and Survey

SS-405 Professional Practices

Credit Hours 3(3-0)

Course Description
The course covers: Historical, social, and economic context of computing (software engineering, computer science, information technology, etc.); definitions of computing (software engineering, computer science, information technology, etc.) subject areas and professional activities; professional societies; professional ethics; professional competency and lifelong 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; Technical writing.

Course Objectives
The course aims at developing an understanding of students 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.

Learning Outcomes
Students will be able to:

- Understand the responsibilities of a computing graduate as a professional
- Adopt high valued social, ethical and moral practices

Textbooks

- Professional Issues in Software Engineering 3rd Edition by Frank Bott, Coleman, Eaton & Rowland. ISBN: 978-0-7484-0951-8

Reference Books / Material

- Various web resources

Course Distribution	Theory : 40% Problem Analysis: 5% Solution Design : 5% Social and Ethical Issues : 50%

Technology Involved (Multimedia, Overhead Projector, Web, etc.)
Board, Web

Practiced Techniques (Class Room Lecture, Presentation, Workshop, Group Discussion, Survey, etc.)
Class Room Lecture, Presentations, Viva Voce

CS-425 Information Security

Credit Hours 3 (3-0)

Course Description

Information Security (3 semester hours) is a comprehensive study of the principles and practices of computer system security including operating system security, network security, software security and web security. The objective of this course is to provide a foundation of network related security issues. It builds upon concepts of security such as confidentiality, integrity and authentication and on cryptography. Key topics include security architecture, cryptographic systems, and security management tools. Specifically, will study major security protocols and standards, network attacks and defenses, database security, virus, malware, denial of service, firewalls, intrusion detection, and wireless security.

Course Objectives

This course is designed to understand major cryptographic systems and how they are applied inside a computer network system and how to strategically design, implement, and maintain firewalls based on a network's architecture and associated variables. Identify the different types of access control and site security methods. Understand various attack methods used to target and exploit computer systems and networks

Learning Outcomes

The learning outcome is students shall be able to understand what are the common threats faced today, what are the foundational theory behind information security, what are the basic principles and techniques when designing a secure system, how to think adversarial, how today's attacks and defenses work in practice.
Be able to understand and explain concepts relating to protection of information systems against unauthorized access to or modification of information in its various forms.

Textbooks

- Cryptography and Network Security: Principles and Practice (6th Edition) by William Stallings Security in Computing (4th Edition) by Charles P. Pfleeger, Shari Lawrence Pfleeger

Reference Books / Material

- Computer Security: Art and Science, Matthew Bishop
- Network Security Secrets and Solutions by Stuart McClure, Joel Scambray, George Kurtz. 2003
- Introduction to Network Security, by D. Jacobson, Chapman and Hall, 2009
- *Papers from conferences and journals*

Papers (required reading)

Selected research papers & technical specifications (will be itemized in class)

Course Distribution	Theory: 30% Problem Analysis: 20% Solution Design: 45% Social and Ethical Issues: 5%

Technology Involved Multimedia, Web
Practiced Techniques Class Room Lecture, Presentation, Group Discussion

Standard 2.1: The curriculum must be consistent and supports the program's documented objectives.

BS Computer Science program contents/courses meet the program objectives as shown in the table. Table 14. is showing linking courses to program objectives.

Table 14: Courses versus Program Objectives

Courses/Groups of Courses	**Objectives**			
	1	**2**	**3**	**4**
CS-101	X		X	
EL-101	X		X	
SS-101	X		X	
ENG-101	X	X	X	
CS-102		X	X	X
CS-103	X		X	
CS-104	X		X	
CS-105	X	X	X	X
MG-201	X	X	X	
ENG-102		X	X	X
MT-101	X		X	
MT-102		X	X	X
CS-206	X		X	X
CS-207	X		X	X
MG-402		X	X	X

ENG-203	X		X	
MT-203		X	X	X
CS-208	X	X	X	X
CS-209	X	X	X	X
CS-210		X		X
SS-403	X	X	X	X
CS-211	X	X	X	X
ST-201	X	X	X	X
CS-212	X	X	X	X
CS-313	X	X	X	X
CS-314	X	X	X	X
SS-402	X	X	X	X
CS-315	X	X	X	X
ST-302	X	X	X	X
CS-316	X	X	X	X
CS-317	X	X	X	X
CS-318	X	X	X	X
CS-319	X	X	X	X
CS-320	X	X	X	X
CS-321	X	X	X	X
SS-102	X	X	X	X
CS-426	X	X	X	X
CS-424	X	X	X	X
SS-404	X	X	X	X
CS-425		X	X	X

CS-422	X	X	X	X
CS-423	X	X		X

Standard 2.2: Theoretical background, problems analysis and solution design must be stressed within the program's core material.

Program: BS Computer Science

The modules of all the programs adequately address:

1) Theoretical background
2) Problem solving
3) Solution design
4) Application of the theoretical knowledge

- Some of the modules include the theoretical background and contain problem solving and solution design while others deal with Theoretical background, Problem analysis and Solution design separately.
- Great emphasis of the program is on problem solving strategies and design of solution. The product of the task results in the application of the theoretical knowledge in the applied fields of natural sciences.

Table 13: **Elements of Courses**

Elements	**No of Courses**
Theoretical background	41
Problem solving	33
Solution design	33

Standard 2.3: The curriculum must satisfy the core requirements for the program, as specified by the respective accreditation body.

The curriculum satisfies both the core requirements of credit hours and criteria of admission lay down by Lahore College for Women University and HEC and are in par with the international standards.

Standard 2.4: The curriculum must satisfy the major requirements for the program as specified by the respective accreditation body.

The curriculum satisfies major requirements of the program. No formal accreditation with any professional body. The programs and curriculum has the approval of Board of Studies of Computer Science.

Standard 2.5: The curriculum must satisfy general education, arts, and professional and other discipline requirements for the program, as specified by the respective accreditation body/council.

The curriculum satisfies general education disciplines requirements (for course distribution please refer Table 11). No formal accreditation with any professional body but it fulfills all the necessary/basic requirements of the accreditation body. The programs and curriculum has the approval of Board of Studies of Computer Science and Lahore College for Women University.

Standard 2.6: Information technology component of the curriculum must be integrated throughout the program.

Requirement for the information technology component is fulfilled by all major courses as well as through the presentations made by each student in almost every semester.

Standard 2.7: Oral and written communication skills of the student must be developed and applied in the program.

Oral and written communication skills of the student are developed by the structurally designed courses for English, seminars, question answers, debates and by the class participation of the students.

CRITERION 3: LABORATORIES AND COMPUTING FACILITIES

Indicate for each lab the following:

- Laboratory Title
- Location and area
- Objectives
- Adequacy for Instruction
- Courses taught
- Software available (if applicable)
- Major Apparatus
- Major Equipment
- Safety regulations

Standard 3.1: Manuals/documentation/instructions for experiments must be available and readily accessible to faculty and students.

- The BS program has been provided with adequate lab manuals and related documents. Instructions to the students are available with the Module Leaders and before, they are made accessible to the students.
- Labs are adequately equipped

Standard 3.2: There must be adequate support personnel for instruction and maintaining the laboratories:

- There is lab staff available for routine lab maintenance (networking, trouble shouting and lab equipment). Teachers and lab staff supervise lab activities and provide practical guidance to each student.

Standard 3.3: The University computing infrastructure and facilities must be adequate to support program's objectives:

- The computing infrastructure of the Computer science department is adequate. There are 7 computer labs. The number of computers is constantly under review.

CRITERION 4: STUDENT SUPPORT AND ADVISING

Standard 4.1: Courses must be offered with sufficient frequency and number for students to complete the program in a timely manner:

- The strategy for programs (courses) offering is controlled. The BS courses are offered once a year.

Standard 4.2: Courses in the major area of study must be structured to ensure effective interaction between students, faculty and teaching assistants:

- The effective student/faculty interaction in programs taught by more than one faculty members is streamlined by coordination of these faculty members and the commonality is maintained through any curriculum, which is adopted for the particular module.
- The programs are structured to ensure effective interaction between students, faculty and the Head of Department. The students requiring extra help are provided services through tutorials, questions and answers. The faculty from the students encourages questions. Seminars and tutorials are arranged on weekly bases where the students are free to discuss the topics relating to the courses and projects. Debates are initiated. The students are free to interact with the class in charge and Head of department in case of any deficiencies.

Standard 4.3: Guidance on how to complete the program must be available to all students and access to academic advising must be available to make course decisions and career choices:

- The students are provided guidance regarding the completion of the programs and having access to qualified faculty as well as student counseling. The students are encouraged to bring forward their suggestions and complaints through a complaint box which is maintained in the Institute. The students once in semester carry-out the teacher's evaluation. Furthermore, the weekly work plan and the course outlines are made available to the students in the beginning of the semester.

  The counseling is availed at the Student counseling center of the university which deals with various issues.

CRITERION 5: PROCESS CONTROL

Standard 5.1: The process by which students are admitted to the program must be based on quantitative and qualitative criteria and clearly documented. This process must be periodically evaluated to ensure that it is meeting its objectives:

BS Computer Science [4 Year Degree Program]

This is a 4-year degree program with minimum 132 credit hours. The program is divided in 8 semesters with 2 semesters each year.

Eligibility and Admission Criteria

Female students who have passed Intermediate with ICS/Pre-Engineering, or A Level, or equivalent (equivalence must be from IBCC) securing more than 60% marks can apply for admission. Admission is strictly made on merit.

Standard 5.2: The process by which students are registered in the program and monitoring of students' progress to ensure timely completion of the program must be documented. This process must be periodically evaluated to ensure that it is meeting its objectives:

- Advertisements are made in leading newspapers and on Lahore College for Women University website. The faculty through sessional work and regular written examination system monitors the student academic progress regularly.

Standard 5.3: The process of recruiting and retaining highly qualified faculty members must be in place and clearly documented. Also processes and procedures for faculty evaluation, promotion must be consistent with institution mission statement. These processes must be periodically evaluated to ensure that it is meeting its objectives:

- The standards are clearly indicated in the University act/statues which is followed. Qualifications which are required for each subject are kept in mind. The criteria for recruiting are qualification, experience which is judged through analysis of CVs, written test and personal interviews as stipulated in university's act/statues. The input of the students for maintaining the quality of the teachers is done by evaluating the teachers regularly once in a semester by the students. The results of these studies are sent to the teachers who are asked to improve and in extreme cases, replacements are made.

Standard 5.4: The process and procedures used to ensure that teaching and delivery of course material to the students emphasizes active learning and that course learning outcomes are met. The process must be periodically evaluated to ensure that it is meeting its objectives:

- There are process and procedures to ensure that the teaching and delivery of the program material to the students emphasizes active learning. For instance, exercises, tasks, activities, assignments and projects based on practicality of the knowledge are given to the students and final year project is initiated at the end of the program. Process is monitored and assessed regularly through monthly progress reports.

Standard 5.5: The process that ensures that graduates have completed the requirements of the program must be based on standards, effective and clearly documented procedures. This process must be periodically evaluated to ensure that it is meeting its objectives.

- The semester rules have been adopted by the department according to the rules provided by the examination. Head of Department ensure their compliance.
- This operation is reviewed once a year and is documented.

CRITERION 6: FACULTY

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

- There is adequate full-time faculty which provides sufficient coverage of the program with permanence and stability. The interest and the qualifications of all faculty members are pre-judged and monitored for each course forming a part of the program. The level of competency of the faculty members are evaluated at time of induction and monitored during teaching.

Table 15: Faculty Distribution by Program Areas

Program Area of Specialization	Courses in the Area and Average Number of Sections per Year	Number of faculty Members in Each Area	Number of Faculty with Ph. D Degree
Area 1.	41 total courses 25 core courses 8 sections per year	19	12

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

All the faculty members remain current in the disciplines and sufficient time is provided for scholarly activities and professional development. The newly inducted faculty is given enough time to familiarize with the working environment of the Institute. During this time, they are monitored. Faculty is provided with centralized training by Registrar's office through DFDI at university, National Academy for Higher Education (NAHE) at HEC and other independent organizations / institutions. They are encouraged to attend international seminars. Some of the

faculty members had opportunity to get training and research experiences from foreign universities/institutions.

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

- The faculty members are regularly motivated and efforts are made to provide job satisfaction so that they excel in their profession. The satisfaction of the faculty and their input is measured by faculty survey form.

CRITERION 7: INSTITUTIONAL FACILITIES

Standard 7.1: The institution must have the infrastructure to support new trends in learning such as e-learning

Academic Building: (Dedicated/Owned)

1. Class rooms: 06
2. Computer Labs: 07
3. Video Conference room: 01
4. Conference Room: 01
5. H.O.D Office 01
6. Shared Faculty Offices 08

- Department building is fully equipped with all latest new technology.
- Projectors are used in the labs.
- Internet facility is available throughout department.
- Access to HEC digital library.

Standard 7.2: The library must possess an up-to-date technical collection relevant to the program and must be adequately staffed with professional personnel:

- 8000 of up-to-dated books are available in the library that covers all the areas of programs.
- Institute provides services of digital library.
- Common Science library is also available for books borrowing.

Standard 7.3: Classrooms must be adequately equipped and offices must be adequate to enable faculty to carry out their responsibilities:

- 6 class rooms, 7 labs, 1 conference room and 1 video conference room
- Office of Head of department.
- 8 shared faculty offices

CRITERION 8: INSTITUTIONAL SUPPORT

Standard 8.1: There must be sufficient support and financial resources to attract and retain high quality faculty and provide the means for them to maintain competence as teachers and scholars:

- Teachers are recruited on the basis of criterion established by the University.
- Existing faculty is sent to different courses of teaching organized to update the knowledge.
- Research incentive award by the university

Standard 8.2: There must be an adequate number of high quality graduate students, research assistants and Ph.D. students:

Table 16: Student-Faculty ratio

Program	Year	Student-Faculty ratio
B.S. Computer Science	2016	1:10
B.S. Computer Science	2017	1:10
B.S. Computer Science	2018	1:11

Standard 8.3: Financial resources must be provided to acquire and maintain Library holdings, laboratories and computing facilities:

- Budget for Laboratory equipment is 0.1 Million

Appendix A

Table 17: Training / Workshop / Seminar

Sr.#	Title of Training / Workshop / Seminar	Year	Category		
			HEC	Other National	International
1.	Teaching and Research methodologies in computing	2017	-	DFDI LCWU	-
2.	Language Usage Competency	2017	-	DFDI, Lahore College for Women University, Lahore	-
3.	Research Colloquium	2017	-	yes	-
4.	GRE	2017	HEC	-	-
5.	Andragogical and Communication Skills	2016	HEC	LCWU, Pakistan	-
6.	Workshop on Robotics & E-Agriculture	2016	-	Lahore University of Management Sciences, Pakistan Agricultural Research Council	UNIVERSITAT SIEGEN
7.	Training on LCWU semester system/ annual system policy and online inventory of award list	2016	-	LCWU, Pakistan	-

Appendix B

Table 18: Training / Workshop / Seminar

Sr. No.	Conference Title/Paper Title	Name of Author(s)/Presenter	Year
1.	FAB: Fast Angular Binary Descriptor for Matching Corner Points in Video Imagery	Mehwish Tahir, Nadia Kanwal, Fatima Anjum	2016
2.	Adoption of e-Government Services in Pakistan: A Comparative Study Between Online and Offline Users	Mariam Rehman, Muhammad Mustafa Kamal, Vatcharaporn Esichaikul	2016
3.	Social Networking Sites Shaping Behavior	Maria Anjum, Mariam Rehman, Hajra Waheed, Muhammad Asif Kamran	2016
4.	Comparing Multiple Corner Detection Algorithms using Non-Parametric Statistical Tests	Fatima Anjum, Nadia Kanwal, Zunera Altaf, Anum shaukat	2016
5.	Identifying Complementary Corner Detectors For Correct Image Pixels Classification	Nadia Kanwal, Erkan Bostanci, Adrian F. Clark and Sidra Rafique	2016
6.	Information Communication Technologies For Irrigation Management Systems: An Empirical Investigation	Kamran, M., Anjum, M., Rehman, M., Kamran, M. Asif, Saleemi, F.	2016
7.	QoS Oriented Multiobjective Optimizer for Radio Resource Management of LTE-A Femtocells	Haider Ali, A., & Nazir, M. M.	*2016*
8.	Automated Classification of Hair Care Plants Using Geometrical and Textural Features from Leaf Images: A Pattern Recognition Based Approach	Anum Shaukat, Saima Farhan, Mehwish Tahir, Muhammad Abuzar Fahiem, Huma Tauseef	*2016*
9.	A Classification Approach based on Genetic-Data-Structuring for the Prediction of Hypertension.	Attia Anis, Muhammad Abuzar Fahiem, Huma Tauseef	*2016*
10.	An Average-Based Approach For Initial Centroid Selection In K-Means Algorithm	Shafiq, A., Rehman, M and Anjum, M.	2016
11.	Measuring information, system and service qualities for the evaluation of e-learning systems in Pakistan	F.Kanwal and M.Rehman	2016
12.	An Empirical Investigation for User Satisfaction About E-Learning Systems in Pakistan	Samiya Rafiq, Maria Saleemi, Mariam Rehman, Maria Anjum, Farhat Saleemi, Sehar Qayyum, Muhammad Asif Kamran, Muhammad Khalid Bashir	2016

13.	Classification of Information Systems in E-agriculture: A Mapping Study	Kamran, M., Anjum, M., Rehman, M., Ahmad, H and Kamran, M. A.	2016
14.	Evaluation Method, Dataset Size or Dataset Content: How to Evaluate Algorithms for Image Matching	Nadia Kanwal, Erkan Bostanci, Adrian F. Clark	2016
15.	Development of Information Dissemination Platform by Integrating Web and Android Technologies.	S. Butt, M. Anjum, M. Rehma	2016
16.	1st National Conference on Trends and Innovations in Information Technology, 24-26 February 2016, Nawabshah, Pakistan	Dr. M. Mohsin Nazir	2016
17.	Nondestructive Evaluation of Solid Pharmaceutical Products using Wavelet Transformations and Multispectral Data	Fahima Tahir, Muhammad Abuzar Fahiem, Saima Farhan, Huma Tauseef	2017
18.	Factors Affecting E-Learning Adoption in Developing Countries—Empirical Evidence From Pakistan's Higher Education Sector	Faria Kanwal, Mariam Rehman	*2017*
19.	A Novel Approach for the Prediction of Conversion from Mild Cognitive Impairment to Alzheimer's Disease using MRI Images	Amna Ayub, Saima Farhan, Muhammad Abuzar Fahiem, Huma Tauseef	*2017*
20.	Fully Automated Active-Contour Model-Based Approach for Segmentation of Common Carotid Artery Using Ultrasound Images	Tauseef, H., Fahiem, M. A., Farhan, S	*2017*
21.	Investigation of user behavior on social networking sites	Hajra Waheed, Maria Anjum, Mariam Rehman, Amina Khawaja	2017
22.	eServices Classification, Trends, and Analysis: A Systematic Mapping Study	Maria Saleemi, Maria Anjum and Mariam Rehman	2017
23.	Seizure detection from EEG signals using Multivariate Empirical Mode Decomposition	Asmat Zahra, Nadia Kanwal, Naveed ur Rehman, Shoaib Ehsan, Klaus D. McDonald	2017
24.	Sensor fusion of camera, GPS and IMU using fuzzy adaptive multiple motion models	Erkan Bostanci, Betul Bostanci, Nadia Kanwal, Adrian F. Clark	2017
25.	An Automated Pattern Recognition Based Approach for Classification of Soiled Paper Currency Using Textural and Geometrical Features	Altaf, Z., Farhan, S., Fahiem, M. A.	2017
26.	An Algorithm For Facial Expression Based Automatic Deceptive Pain Detection	Shafiq, S., Tauseef, H., Fahiem, M. A., Farhan, S	*2017*
27.	A Facial Image Analysis based Algorithm to Detect Human Personality	Waheed, M., Tauseef, H., Shafiq, S., Fahiem, M. A., Farhan, S	*2017*
28.	Bi-Lingual Framework for E-banking	Taskeen Aslam, Maria	2017

	Applications: A case Study of Semi-Literate Users.	Saleemi, Mariam Rehman,Maria Anjum, M. A Kamran, Farhat Saleemi	
29.	Effective Compression of Center Symmetric Local Binary Pattern	Junaid Baber, Maheen Bakhtyar, Ullah, I., Mariam Rehman, and Muhammad Khalid	2017
30.	Critical Factors of E-Learning Adoption and Acceptance in Pakistan: A Literature Review	Faria Kanwal, Mariam Rehman, Komal Bashir, Uzma Qureshi	2017
31.	Framework for Applicability of Agile Scrum Methodology: A Perspective of Software Industry	Anum Ali, Mariam Rehman and Maria Anjum	2017
32.	Critical Factors of E-Learning Adoption and Acceptance in Pakistan: A Literature Review	Faria Kanwal, Mariam Rehman, Komal Bashir and Uzma Qureshi	2017