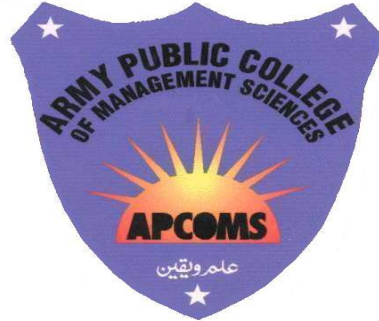


**ARMY PUBLIC COLLEGE OF
MANAGEMENT & SCIENCES**



APCOMS

Affiliated with
**University of Engineering & Technology,
Taxila
UET - TAXILA**

BSc (Software Engineering)
Bachelor of Science in Software Engineering

CRITERIA – 3

(Curriculum and Learning Process)

SYLLABUS

Program Structure BSc (SE)

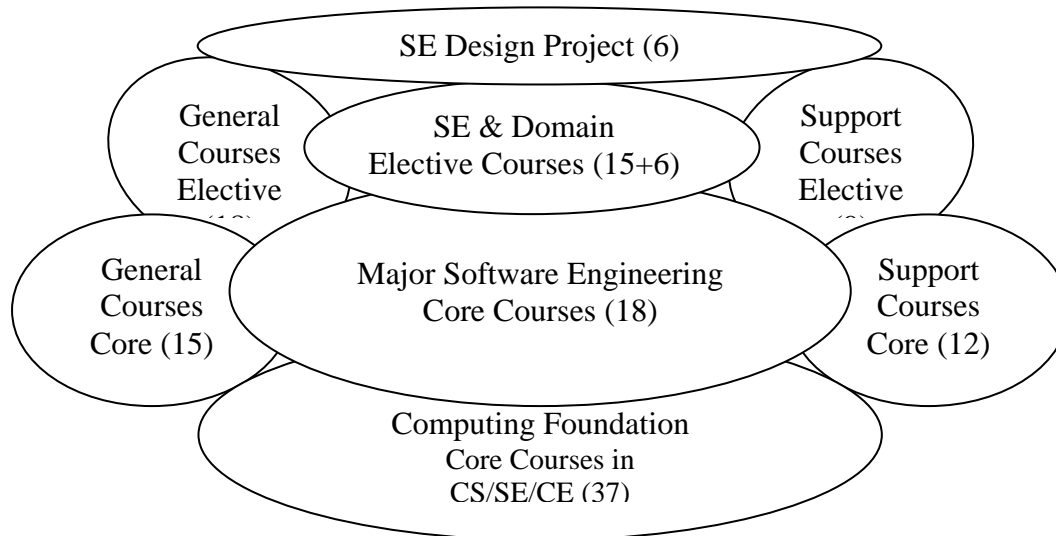
Program Title : **Bachelor of Science in Software Engineering**

Nomenclature : **BSc(SE)**

Duration: **4 Years**

Semesters: **8 Semesters**

Total Credit Hours: **130 credit hours** Minimum



Curriculum Break down

Category	Credit Hours	Cumulative Credit Hours
Computing-Core Courses	43	82
Major (Computer Sciences/Software Engineering/Information Technology)-Core Courses	18	
Major (Computer Sciences/Software Engineering/Information Technology) Based -Electives	21	
Supporting Sciences	21	48
General Electives	15	
University Electives	12	
Total Credit Hours		130

**Composition of Curriculum for BSc Software
Engineering
All Semesters Including Credit Hours**

Semester – 1			Semester – 2		
Course Code	Subject	Cr Hr	Course Code	Subject	Cr Hr
ASE-101	Introduction to Computing	3+1	ASE-106	Intro to Software Engineering	3+0
AME-102	Discrete Structure	3+0	AEE-107	Digital Logic Design	3+1
AHU-103	Applied Physics	3+1	ASE-108	Programming Fundamentals	3+1
AHU-104	English-I (Functional English)	3+0	AMA-109	Linear Algebra	3+0
AMA-105	Calculus and Analytical Geometry	3+0	AHU-110	English-II (Communication Skills)	3+0
Total Credit Hrs		15+2=17	Total Credit Hrs		15+2=17

Semester – 3			Semester – 4		
AMA-201	Numerical and Symbolic Computing	2+1	ASE-206	Operating Systems	3+1
ASE-202	S/W Requirement and Specification	2+1	ASE-207	Software Architecture Design	3+0
ASE-203	Data Structures & Algorithm	3+1	ASE-208	Object Oriented Programming	3+1
AHU-204	Pakistan Studies & Islamiyat	3+0	ASE-209	Intro to Database System	3+1
AHU-205	Technical Report Writing	3+0	AMG-210	Principles of Management	3+0
Total Credit Hrs		13+3=16	Total Credit Hrs		15+3=18

Semester – 5			Semester – 6		
ASE-301	Software Verification & Validation	2+1	ASE-306	Digital Image Processing	3+1
ASE-302	Object Oriented Software Engineering	2+1	ASE-307	Computer Communications & Networks	3+1
ASE-303	Software Engineering Economics	3+0	ASE-308	Elective General*	3+1
AMA-304	Probability & Statistics	3+0	ASE-309	Artificial Intelligence	3+0
ASE-305	Web Engineering	3+1	ASE-310	Domain Specific Elective*	3+0
Total Credit Hrs		13+3=16	Total Credit Hrs		15+3=18

Semester – 7			Semester – 8		
ASE-401	Software Testing	2+1	ASE-407	Human Computer Interaction	3+0
ASE-402	Preliminary of Project Studies	0+3	ASE-408	Design Project	0+3
ASE-403	Elective General*	3+1	ASE-409	Elective General *	3+0
ASE-404	Domain Specific Elective *	3+0	ASE-410	Professional Practices	3+0
ACS-405	Software Project Management	2+1	AMG-411	Marketing	3+0
AHU-406	Human Resource Management	3+0			
Total Credit Hrs		13+6=19	Total Credit Hrs		12+3=15

(Semester - I)						
Sno	course Code	Course Title	Pre-Req	Credit Hours		
				Total	Theory	Lab
1	ACS-101	Introduction to Computing	-	4 (3+1)	3	1
2	AME-102	Discrete Structure	-	3 (3+0)	3	0
3	AHU-103	Applied Physics	-	4 (3+1)	3	1
4	AGS-104	English - I (Functional English)	-	3 (3+0)	3	0
5	AMA-105	Calculus & Analytical Geometry	-	3 (3+0)	3	0
Total				17	15	2

Course Contents:

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

Course Name: Discrete Structures (AME-102)	
Course Structure: Lectures: 3 /Labs:0	Credit Hours: 3

Prerequisites: None
Objectives: Introduces the foundations of discrete mathematics as they apply to Computer Science, focusing on providing a solid theoretical foundation for further work. Further, this course aims to develop understanding and appreciation of the finite nature inherent in most Computer Science problems and structures through study of combinatorial reasoning, abstract algebra, iterative procedures, predicate calculus, tree and graph structures. In this course more emphasis shall be given to statistical and probabilistic formulation with respect to computing aspects.
Course Outline: Introduction to logic and proofs: Direct proofs; proof by contradiction, Sets, Combinatorics, Sequences, Formal logic, Propositional and predicate calculus, Methods of Proof, Mathematical Induction and Recursion, loop invariants, Relations and functions, Pigeonhole principle, Trees and Graphs, Elementary number theory, Optimization and matching. Fundamental structures: Functions; relations (more specifically recursions); pigeonhole principle; cardinality and countability, probabilistic methods.
Reference Material: 1. Kenneth H. Rosen, <i>Discrete Mathematics and Its Applications</i> , 6 TH edition, 2006, Mcgraw Hill Book Co. 2. Richard Johnsonbaugh, <i>Discrete Mathematics</i> , 7 TH edition, 2008, Prentice Hall Publishers. 3. Kolman, Busby & Ross, <i>Discrete Mathematical Structures</i> , 4 th edition, 2000, Prentice-Hall Publishers. 4. Ralph P. Grimaldi, <i>Discrete and Combinatorial Mathematics: An Applied Introduction</i> , Addison-Wesley Pub. Co., 1985.

Course Name: Applied Physics (AHU-103)	
Course Structure: Lectures:3 Labs:1	Credit Hours: 04
Prerequisites:	
Objectives:	
Course Outline: Introduction: Scientific notation and significant figures. Unit in different systems. Vectors: Review of vectors, Vector derivatives, Line and surface integrals, Gradient of scalar. Mechanics: Coordinate systems. Motion under constant acceleration, Newton laws and their applications, Uniform circular motion. Vortex Motion, Frictional forces. 118 Work and energy. Potential energy, energy conservation, energy and our environment. Electrostatic and magnetism: Coulombs law. Gauss"s law. Electric field around conductors. Dielectrics. Magnetic fields. Magnetic force on current. Semiconductor Physics: Energy levels in a semiconductor. Hole concept. Intrinsic and extrinsic regions. Law of mass	

action. P-N junction. Transistor.

Waves and Oscillation:

Free oscillation of systems with one degree of freedom. Classical wave equation. Transverse modes for continuous string. Standing waves. Dispersion relation for waves.

Optics and Laser:

Basic introduction to Optics and Laser. Diffraction grating. Lasers, population inversion. Resonant cavities. Quantum efficiency. He-Ne, Ruby and CO₂ lasers. Doppler effect and sonic boom.

Modern Physics:

Photoelectric effect, Compton effect. Bohr theory of hydrogen atom, atomic spectra, reduce mass, De-broglie hypothesis braggs law, electron microscope, zeeman effect, atomic nucleus, mass energy relation, binding energy, nuclear forces and fundamental forces. Exponential decay and half life.

Course Name: English I (Functional English) (AHU-104)

Course Structure: Lectures:3 Labs:0

Credit Hours: 3

Prerequisites:

Objectives: Enhance language skills and develop critical thinking.

Recommended books:

1. **Functional English**

a) Grammar

1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492
2. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313506

b) Writing

1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.

c) Reading/Comprehension

1. Reading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.

d) Speaking

Course Contents

Basics of Grammar
Parts of speech and use of articles
Sentence structure, active and passive voice
Practice in unified sentence
Analysis of phrase, clause and sentence structure
Transitive and intransitive verbs
Punctuation and spelling

Comprehension

Answers to questions on a given text

Discussion

General topics and every-day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students)

Listening

To be improved by showing documentaries/films carefully selected by subject teachers

Translation skills

Urdu to English

Paragraph writing

Topics to be chosen at the discretion of the teacher

Presentation skills

Introduction

Course Name: Calculus and Analytic Geometry (AMA-105)

Course Structure: Lectures: 3, Labs: 0

Credit Hours: 3

Prerequisites: None

Objectives: To provide foundation and basic ground for calculus and analytical geometry background.

Course Outline: Complex Numbers, DeMoivre's Theorem and its Applications, Simple Cartesian Curves, Functions and Graphs, Symmetrical Properties, Curve Tracing, Limit and Continuity, Differentiation of Functions. Derivative as Slope of Tangent to a Curve and as Rate of Change, Application to Tangent and Normal, Linearization, Maxima/Minima and Point of Inflexion, Taylor and Maclaurin Expansions and their convergence. Integral as Anti-derivative, Indefinite Integration of Simple Functions. Methods of Integration: Integration by Substitution, by Parts, and by Partial Fractions, Definite Integral as Limit of a Sum, Application to Area, Arc Length, Volume and Surface of Revolution.

Reference Material:

1. Swokowski, Olinick and Pence, Calculus and Analytical Geometry, 6th edition, 1994, Brooks/Cole Publishers.
2. Howard Anton, Calculus, 7th edition, 2002, John Wiley and Sons (WIE).
3. William E. Boyce Richard C. Diprima, Calculus, John Wiley & Sons, ISBN: 0471093335.
4. Thomas Finny, Calculus and Analytical Geometry, 10th edition, John Wiley and Sons.
5. Erwin Kreyzig, Advanced Engineering Mathematics, 7th edition, 1993, John Wiley & Sons Inc.

Semester - II						
Sno	course Code	Course Title	Pre-Req	Credit Hours		
				Total	Theory	Lab
1	ASE-106	Intro to Software Engineering	-	3 (3+0)	3	0
2	AEE-107	Digital Logic & Design	-	4 (3+1)	3	1
3	ASE-108	Programming Fundamentals	-	4 (3+1)	3	1
4	AMA-109	Linear Algebra	-	3 (3+0)	3	0
5	AHU-110	English - II (Communication Skills)	-	3 (3+0)	3	0
Total				17	15	2

Course Contents:

Course Name: Introduction to Software Engineering (ASE-106)	
Course Structure: Lectures: 2, Labs: 1	Credit Hours: 3
Prerequisites: Object Oriented Paradigm/Programming	
Objectives: To study various software development models and phases of software development life cycle. The concepts of project management, change control, process management, software development and testing are introduced through hands-on Team Projects.	
Course Outline: Introduction to Computer-based System Engineering; Project Management; Software Specification; Requirements Engineering, System Modelling; Requirements Specifications; Software Prototyping; Software Design: Architectural Design, Object-Oriented Design, UML modelling, Function-Oriented Design, User Interface Design; Quality Assurance; Processes & Configuration Management; Introduction to advanced issues: Reusability, Patterns; Assignments and projects on various stages and deliverables of SDLC.	
Reference Material:	
1. <i>Software Engineering 8E</i> by Sommerville Addison Wesley, 2006	
2. <i>Software Engineering: A Practitioner's Approach /7E</i> , Roger Pressman, McGraw-Hill, 2009	

Course Name: Digital Logic & Design		(AEE-107)
Course Structure: Lectures:3 Labs:01		Credit Hours: 04
Prerequisites:		
Objectives: Objective:		
<p>To provide the students a basic understanding of the Digital Electronics (Digital systems and circuits).</p> <p>To provide the student a pre-requisite background for future studies in microprocessors and microcomputer interfacing.</p>		
Aims:		
This course is a comprehensive study of the principles and techniques of modern digital systems.		
Course Outline:		
<p>Number systems & Codes ; Binary, Octal, Hexadecimal number systems and their inter-conversion; Binary Arithmetic (Addition, Subtraction, Multiplication and Division); Error detection and correction; Boolean Algebra, basic theorems and properties of Boolean Algebra, Boolean functions, 21 Canonical and Standard forms; Digital Logic Gates; Various logic families, like TTL and CMOS, working and their characteristics; Combinational Logic Design ; The K-map method, two, three, four and five variable maps ; Sum of products and Product of Sums simplification, NAND and NOR implementation; Ex-OR and EX-NOR functions; MSI circuits: Binary adder and subtractor, comparators, decoders, BCD-to-Seven segment decoder/drivers, seven-segment displays, encoders, code converters, multiplexers, de-multiplexers; Introduction to Sequential logic, S-R Flip-flops, JK flip-flop, D flip-flop, T flip-flop, master slave flip-flops; Classification of sequential circuits, registers, A to D and D to A converter circuits, Counters; Semiconductor memories, introduction, memory organization, classification and characteristics of memories.</p>		
Lab Outline:		
<ol style="list-style-type: none"> 1. Verification of truth tables of logic gates 2. TTL & CMOS characteristics Logic family interconnection (TTL to CMOS & CMOS to TTL) 3. Arithmetic circuits 4. Half adder 5. Full adder 6. adder/subtractor 7. Combinational logic design using decoders 8. Encoders 9. MUXs & DEMUXs 10. Comparators with gates and ICs 11. Code converters and parity circuits using basic gates 12. BCD to Decimal 13. BCD to 7 segment decoder 14. Flip flop circuits (RS latch, D, JK and Master Slave) using basic gates and ICs 15. Design and verify the operation of shift registers and counters using flip flops and ICs 		
Recommended Books:		
1. Morris Mano, Digital Design, Prentice Hall of India.		

2. Thomas L. Floyd & R.P Jain, “Digital Fundamentals”.
3. Ronald J. Tocci, Neal S. Widmer, “Digital Systems Principles and Applications”.
4. William Kleitz, “Digital Electronics Practical Approach”.

Course Name: Programming Fundamentals (ASE – 108)	
Course Structure: Lectures: 3, Labs:1	Credit Hours: 4
Prerequisites: None	
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.	
Course Outline: Overview of computers and programming. Overview of language for e.g. C language C. Basics of structured and Modular programming. Basic Algorithms and problem solving, development of basic algorithms, analyzing problem, designing solution, testing designed solution. Fundamental programming constructs, translation of algorithms to programmes, data types, control structures, functions, arrays, records, files, testing programmes.	
Reference Material:	
<ol style="list-style-type: none"> 1. Problem Solving and Program Design in C / 6E Hanly & Koffman Addison-Wesley Published: 02/06/2009 ISBN-10: 0321535421 ISBN-13: 9780321535429 2. C How to Program, 5/E (Harvey & Paul) Deitel & Deitel, ISBN-10: 0132404168 ISBN-13: 9780132404167 Publisher: Prentice Hall Copyright: 2007 	

Course Name: Linear Algebra (AMA-109)	
Course Structure: Lectures: 3, Labs: 0	Credit Hours: 3
Prerequisites: None	
Objectives: To provide fundamentals of solution for system of linear equations, operations on system of equations, matrix properties, solutions and study of their properties.	
Course Outline: Vectors, Vector Spaces, Matrices & Determinants, Cofactor and Inverse, Rank, Linear Independence, Solution of system of Linear systems, Positive Definite matrix, Linear Transformations, Operations on matrices, Inner products, orthogonality and least squares, Eigenvalue & Eigenvectors. Applications to Systems of Equations and to Geometry, Singular Value Decomposition.	
Reference Material:	
<ol style="list-style-type: none"> 1. Bernard Kolman, David Hill, Elementary Linear Algebra with Applications, 9th edition, Prentice Hall PTR, 2007. 2. Gilbert Strang, Strang, Brett Coonley, Andy Bulman-Fleming, Andrew Bulman-Fleming, Strang's Linear Algebra And Its Applications, 4th edition, Brooks/Cole, 2005 3. Howard Anton, Chris Rorres, Elementary Linear Algebra: Applications Version, 9th edition, Wiley, 2005. 4. David C. Lay, Linear Algebra and Its Applications, 2nd edition, Addison-Wesley, 2000. 	
Course Name: English II (Communication Skills) (AHU-110)	

Course Structure: Lectures:03 , Labs:	Credit Hours:03
Prerequisites:	
Objectives: Enable the students to meet their real life communication needs	
Course Contents	
<p>Paragraph writing Practice in writing a good, unified and coherent paragraph</p> <p>Essay writing Introduction</p> <p>CV and job application Translation skills Urdu to English</p> <p>Study skills Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension</p> <p>Academic skills Letter/memo writing, minutes of meetings, use of library and internet</p> <p>Presentation skills Personality development (emphasis on content, style and pronunciation) <i>Note: documentaries to be shown for discussion and review</i></p> <p>Recommended books:</p> <p>Communication Skills</p> <p>a) Grammar Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6.</p> <p>b) Writing Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking). 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).</p> <p>c) Reading Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0. 2. Reading and Study Skills by John Langan Study Skills by Richard Yorky.</p>	

Semester - III						
Sno	course Code	Course Title	Pre-Req	Credit Hours		
				Total	Theory	Lab
1	AMA-201	Numerical and Symbolic Computing	-	3 (2+1)	2	1
2	ASE-202	S/W Requirement and Specification	-	3 (2+1)	2	1
3	ASE-203	Data Structure & Algorithm	-	4 (3+1)	3	1
4	AHU-204	Pakistan Studies & Islamiyat	-	3 (3+0)	2	0
5	AHU-205	Technical Report Writing	-	3 (3+0)	3	0
Total				16	13	3

Course Contents:

Course Name: Software Requirements and Specifications (ASE-202)	
Course Structure: Lectures:2 Labs:1	Credit Hours: 3
Prerequisites: Introduction to Software Engineering	
Course Outline:	
<p>Definition of Requirements Engineering and role in system development, Fundamental concepts and activities of Requirements Engineering, Information elicitation techniques, Modeling scenarios. Fundamentals of goal-oriented Requirements Engineering, Modelling behavioural goals, Modelling quality goals, Goal modelling heuristics, Object modelling for Requirements Engineering, Object modelling notations, Object modelling heuristics, Identifying objects from goals, Modelling Use Cases and state machines, Deriving operational requirements from goals, Requirements Specification, Requirements verification and validation. Management of inconsistency and conflict, Techniques for requirements evaluation, selection and prioritization; Requirements management; Requirements traceability</p>	
Reference Materials:	
<ol style="list-style-type: none"> 1. <i>Requirements Engineering: Processes and Techniques</i>, Gerald Kotonya and Sommerville, John-Wiley Sons, 1998 (or Latest Edition). 2. <i>Software Requirements</i>, Karl E. Wiegers, Microsoft Press, 2003 (or Latest Edition). 3. <i>Software Requirements Specification</i>, David Tuffley, CreateSpace Independent Publishing Platform, 2010 (or Latest Edition). 4. <i>System Requirements Engineering</i>, Loucopoulos and Karakostas, McGraw-Hill, 1995 (or Latest Edition). 	

Course Name: Data Structure & Algorithms	ASE-203
Course Structure: Lectures:3 Labs:1	Credit Hours: 4
Prerequisites: Computer Organization & Architecture , DLD	
Objectives:	
<p>Overview of c++ classes, Template Functions, Template classes Introduction to data structures, revision of pc allocation, creating header files Arrays, memory representation, Array as a dynamic data structure.Linked Lis based Implementation of list.Dynamic implementation of Singly linked list.Doubly Linked Lists, Basic opera</p> <p>Stacks: Array Based Implementation, Linked List Implementation Queues: Array Based Implementation Vs Linked List Implementation Priority Queues, Dequeues. Trees, Binary Trees ,Operations and Applications Binary search Trees, AVL trees Sorting and searching Techniques and their comparison Hashing, Linear Probing and Chaining Graphs And Their Applications Project Presentations</p>	
Reference Materials:	
<p>1. <i>Data Structures and Algorithm Analysis</i>, Mark Allen Weiss, Florida International University, Addison-Wesley (latest Edition) 2. <i>Algorithms</i>, Robert Sedgewick, Princeton University Publisher: Addison-Wesley Professional (latest Edition) 3. <i>Data Structures: Abstraction and Design Using Java</i>, Koffman and Wolfgang, Wiley; 2nd Edition (or latest Edition), 2010</p>	

Course Name: Pakistan Studies	(AHU-204)
Course Structure: Lectures:2 Labs:0	Credit Hours: 0
Prerequisites:	
Objectives:	
<ul style="list-style-type: none"> • 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. 	
Course Outline	
<p>1. Historical Perspective</p> <p>a. Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-i-Azam Muhammad Ali Jinnah.</p> <p>b. Factors leading to Muslim separatism</p> <p>c. People and Land</p> <p>i. Indus Civilization</p> <p>ii. Muslim advent</p>	

iii. Location and geo-physical features.

2. **Government and Politics in Pakistan**

Political and constitutional phases:

- a. 1947-58
- b. 1958-71
- c. 1971-77
- d. 1977-88
- e. 1988-99
- f. 1999 onward

3. **Contemporary Pakistan**

- a. Economic institutions and issues
- b. Society and social structure
- c. Ethnicity
- d. Foreign policy of Pakistan and challenges
- e. Futuristic outlook of Pakistan

Books Recommended

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

Course Name: ISLAMIC STUDIES		(AHU-204)
Course Structure: Lectures:2 , Labs:		Credit Hours: 2
Prerequisites:		
Objectives:. This course is aimed at:		
1 To provide Basic information about Islamic Studies		
2 To enhance understanding of the students regarding Islamic Civilization		
3 To improve Students skill to perform prayers and other worships		
4 To enhance the skill of the students for understanding of issues related to faith and religious life.		

Introduction to Quranic Studies

- 1) Basic Concepts of Quran
- 2) History of Quran
- 3) Uloom-ul -Quran

Study of Selected Text of Holly Quran

- 1) Verses of Surah Al-Baqra Related to Faith (Verse No-284-286)
- 2) Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18)
- 3) Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11)
- 4) Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77)
- 5) Verses of Surah Al-Inam Related to Ihkam (Verse No-152-154)

Study of Selected Text of Holly Quran

- 1) Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.)
- 2) Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment
- 3) Verses of Surah Al-Saf Related to Tafakar, Tadabar (Verse No-1,14)

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

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

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

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

Introduction To Sunnah

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

Selected Study from Text of Hadith**Introduction To Islamic Law & Jurisprudence**

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

Islamic Culture & Civilization

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

Islam & Science

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

Islamic Economic System

- 1) Basic Concepts of Islamic Economic System
- 2) Means of Distribution of wealth in Islamic Economics

- 3) Islamic Concept of Riba
- 4) Islamic Ways of Trade & Commerce

Political System of Islam

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

Islamic History

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

Social System of Islam

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

Reference Books:

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

Course Name: (Technical and Report Writing) (AHU-205)	
Course Structure: Lectures: 3, Labs: 0	Credit Hours: 3
Prerequisites: None	
Objectives: Enhance language skills and develop critical thinking	
Course Contents	
Presentation skills	
Essay writing Descriptive, narrative, discursive, argumentative	
Academic writing How to write a proposal for research paper/term paper How to write a research paper/term paper (emphasis on style, content, language, form, clarity,	

consistency)

Technical Report writing

Progress report writing

Note: Extensive reading is required for vocabulary building

Recommended books:

Technical Writing and Presentation Skills

a) Essay Writing and Academic Writing

1. 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).
2. College Writing Skills by John Langan. Mc=Graw-Hill Higher Education. 2004.
3. Patterns of College Writing (4th edition) by Laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press.

b) Presentation Skills

c) Reading

The Mercury Reader. A Custom Publication. Compiled by norther Illinois University. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and Maurice Scharon. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students).

Semester - IV						
Sno	course Code	Course Title	Pre-Req	Credit Hours		
				Total	Theory	Lab
1	ASE-206	Operating Systems	-	4 (3+1)	3	1
2	ASE-207	Software Architecture Design	-	3 (3+0)	3	0
3	ASE-208	Object Oriented Programming	-	4 (3+1)	3	1
4	ASE-209	Intro to Database System	-	4 (3+1)	3	1
5	AMG-210	Principles of Management	-	3 (3+0)	3	0
Total				18	15	3

Course Contents:

Course Name: Operating Systems (ASE-206)	
Course Structure: Lectures: 3, Labs: 1	Credit Hours: 4
Prerequisites: None	
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.	
Course Outline: History and Goals, Evolution of multi-user systems, Process and CPU management, Multithreading, Kernel and User Modes, Protection, Problems of cooperative processes, Synchronization, Deadlocks, Memory management and virtual memory, Relocation, External Fragmentation, Paging and Demand Paging, Secondary storage, Security and Protection, File systems, I/O systems, Introduction to distributed operating systems. Scheduling and dispatch, Introduction to concurrency. Lab assignments involving different single and multithreaded OS algorithms.	
Reference Material:	
<ol style="list-style-type: none"> 1. <i>Applied Operating Systems Concepts</i>, 7th Edition, Silberschatz A., Peterson, J.L., & Galvin P.C. 2004. 2. <i>Modern Operating Systems</i>, 3rd Edition, Tanenmaum A.S., 2008. 	

Course Name: <u>Software Design and Architecture ASE-207</u>	
Course Structure: Lectures: 2 / Labs: 3	Credit Hours: 3
Prerequisites: Software Requirement Engineering	

Objectives: An in-depth look at software design. Continuation of the study of design patterns, frameworks, and architectures. Survey of current middleware architectures. Design of distributed systems using middleware. Component based design. Measurement theory and appropriate use of metrics in design. Designing for qualities such as performance, safety, security, reusability, reliability, etc. Measuring internal qualities and complexity of software. Evaluation and evolution of designs. Basics of software evolution, reengineering, and reverse engineering.

Upon completion of this course, students will have the ability to:

- Apply a wide variety of design patterns, frameworks, and architectures in designing a wide variety of software
- Design and implement software using several different middleware technologies
- Use sound quality metrics as objectives for designs, and then measure and assess designs to ensure the objectives have been met
- Modify designs using sound change control approaches
- Use reverse engineering techniques to recapture the design of software

Course Outline:

Introduction: Putting Software Architecture in Context, Software Architecture as a Design Plan, Software Architecture as an Abstraction, Software Architecture Terminology, Four Views of Software Architecture, Loose coupling between Views, Engineering concerns addressed by different views, Using the four Views.

Global Analysis: Overview of Global Analysis Activities. Analyze Factors. Develop Strategies. Analyze Organizational Factors. Begin Developing Strategies. Analyze Technological Factors. Continue Developing Strategies. Analyze Product Factors. Continue Developing Strategies.

Conceptual Architecture View: Design Activities for the Conceptual Architecture View. Central Design Tasks: Components, Connectors, and Configuration. Final Design Task: Resource Budgeting, Traceability, Uses for the Conceptual Architecture View.

Module Architecture View: Design Activities for the Module Architecture View. Central Design Tasks: Modularization and Layering, Final Design Task: Interface Design, Traceability, Uses for the Module Architecture View.

Execution Architecture View: Design Activities for the Execution Architecture View. Central Design Tasks: Runtime Entities, Communication Paths, and Configuration, Final Design Task: Resource Allocation, Traceability, Uses for the Execution Architecture View.

Code Architecture View: Design Activities for the Code Architecture View. Central Design Tasks, Final Design Tasks, Traceability, Uses for the Code Architecture View.

Role of Architect: The Architect as a Key Technical Consultant, The Architect Makes Decisions, The Architect Coaches, The Architect Coordinates, The Architect Implements, The Architect Advocates, Software Architecture as a Career.

Reference Materials:

1. *Software Architecture and Design Illuminated*, Kai Qian, Xiang Fu, Lixin Tao, Chong-Wei Xu, Jorge L. Diaz-Herrera, Jones and Bartlett Publishers,

1st Edition, 2009 (or Latest Edition).

2. *Introduction to Software Engineering Design: Processes, Principles and Patterns with UML2*, Christopher Fox, Addison-Wesley Professional, 2006 (or Latest Edition).

3. *Software Engineering Design: Theory and Practice*, Carlos Otero, CRC Press, 2012 (or Latest Edition).

4. *Software Engineering Techniques: Design for Quality*, Krzysztof Sacha, Springer, 2006 (or Latest Edition).

Course Name: Object Oriented Programming (ACE-208)	
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Course Structure: Lectures: 2, Labs: 1	Credit Hours: 3
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Prerequisites: Programming Fundamentals

Objectives: The course aims to focus on object-oriented concepts, analysis and software development.

Course Outline: Evolution of Object Oriented (OO) programming, OO concepts and principles, problem solving in OO paradigm, OO programme design process, classes, methods, objects and encapsulation; constructors and destructors, operator and function overloading, virtual functions, derived classes, inheritance and polymorphism. I/O and file processing, exception handling

Reference Material:

1. C++ How to Program, 6/E

(Harvey & Paul) Deitel & Deitel ISBN-10: 0136152503

ISBN-13: 9780136152507 Publisher: Prentice Hall

2. Java How to Program, 7/E

(Harvey & Paul) Deitel & Deitel ISBN-10: 0132222205 ISBN-13: 9780132222204 Publisher:

Prentice Hall

Course Name: Database Systems (ACS-402)	
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Course Structure: Lectures: 3, Labs: 1	Credit Hours: 4
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Prerequisites: Data Structures and Algorithms

Objectives: 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 Outline: Basic database concepts; Entity Relationship modelling, Relational data model and algebra, Structured Query language; RDBMS; Database design, functional dependencies and normal forms; Transaction processing and optimization concepts; concurrency control and recovery techniques; Database security and authorization. Small Group Project implementing a database. Physical database design: Storage and file structure; indexed files; b-trees; files with dense index; files with variable length records; database efficiency and tuning.

Reference Material:

1. *Database Systems 8E*, C.J.Date, Addison Wesley Pub. Co. (2004).

2. *Database Systems: A Practical Approach to Design, Implementation and Management 5E*, R.Connolly and P.Begg, Addison-Wesley Pub. Co (2009).

3. *Fundamentals of Database Systems, 5/E*, Elmasri and Navathe, Addison-Wesley, ISBN: 0-201-74153-9.

Course Name: Principles of Management (AMG-210)	
Course Structure: Lectures: 3,	Credit Hours: 3
Prerequisites: None	
Course Outline: Introduction to Managers and Management. Organizational Culture and Environment. Decision Making. The Essence of Manager's Job. Planning. Organization Structure and Design. Motivation. Leadership. Communication. Controlling. The Personnel Function. Job Design and Analysis. Human Resource Planning. Recruitment and Selections/Testing and Interview. Union and Management, Compensation Administration, Health and Safety.	
Reference Materials: 1. <i>Management</i> by Robbins, S.P. & Coulter, Mary, Prentice Hall; 10 th Edition (November 3, 2008). ISBN-10: 0132090716143 2. <i>Fundamentals of Management</i> by Robbins, S.P. & DeCenzo, David A, Prentice Hall; 7 th Edition (January 13, 2010). ISBN-13: 978-0132090711 3. <i>Principles of Management</i> by Charles W. L. Hill and Steven McShane, McGraw-Hill/Irwin; 1 st Edition (2006). ISBN-10: 0073530123 4. <i>Management</i> by Richard L. Daft, South-Western College Pub; 10 th Edition (January 27, 2011). ISBN-10: 0538479531 5. <i>Fundamentals of Management</i> by Stephen P. Robbins, David A. DeCenzo and Mary Coulter, Prentice Hall; 7 th Edition (January 13, 2010). ISBN-10: 0136109829.	

Semester - V						
Sno	course Code	Course Title	Pre-Req	Credit Hours		
				Total	Theory	Lab
1	ASE-301	Software Verification & Validation	-	3 (2+1)	2	1
2	ASE-302	Object Oriented Software Engineering	-	3 (2+1)	2	1
3	ASE-303	Software Engineering Economics	-	3 (3+0)	3	0
4	AMA-304	Probability & Statistics	-	3 (3+0)	3	0
5	ASE-305	Web Engineering	-	3 (3+1)	3	1
Total				16	13	3

Course Contents:

Course Name: Software Verification and Validation (ASE-301)	
Course Structure: Lectures:2 /Labs:1	Credit Hours: 3
Prerequisites: (Intro to) Software Engineering	
Course Outline:	
<p>Introduction to software quality assurance, The Quality Challenge, Quality Control v/s Quality Assurance, Quality Assurance in Software Projects (Phases), Principles and Practices, Quality Management, Quality Assurance and Standards, Quality Planning and Quality Control, Verification and Validation, Planning Verification and Validation, Critical System Validation, Reliability Validation, Safety Assurance, Security assessment, Inspections and reviews, Principles of software validation, Software verification, Planning for Software Quality Assurance, Software Quality Assurance (SQA) Plans, SQA-Organizational Level Initiatives, SQA Planning (Observations, Numbers, Results), Software Testing, Specification based test construction techniques, White-box and grey-box testing, Others comprehensive software testing techniques for SDLC, Control flow oriented test construction techniques, Data flow oriented test construction techniques, Clean-room approach to quality assurance, Product Quality and Process Quality, Standards for process quality and standards for product quality, Walkthroughs and Inspections, Structure, checklist, Audits, Roles and Responsibilities (Reviews, Inspections, etc), How to make Reviews and Inspections most effective.</p>	
Reference Materials:	
<ol style="list-style-type: none"> 1. <i>Fundamentals of Software Testing</i>, Bernard Hom, Wiley, 2012, (or Latest Edition). 2. "Software Quality Assurance: Principles and Practice", Nina S. Godbole, Alpha Science, 2004 (or Latest Edition). 3. <i>Software Quality Engineering: Testing, Quality Assurance, and Quantifiable improvement</i>, Jeff Tian, John-Wiley & sons, 2005 (or Latest Edition). 4. <i>Software Testing in the Real World: Improving the Process</i>, Kit, Edward, Addison-Wesley, 1998 (or Latest Edition). 5. <i>Perfect Software: And other illusions about testing</i>, Gerald M. Weinberg, Dorest House, 2008 (or Latest Edition). 	

Course Name: Object Oriented Software Engineering (ASE-302)	
Course Structure: Lectures: 2 / Labs: 1	Credit Hours: 3
Prerequisites: Object Oriented Programming	
Course Outline: Introduction to Software Engineering, Modeling with UML, Project Organization and Communication, Requirements Elicitation, Analyses, System Design: Decomposing the System, System Design: Addressing Design Goals, Object Design: Reusing Pattern Solutions, Object Design: Specifying Interfaces, Mapping Models to Code, Testing, Rationale Management, Configuration Management, Project Management, Software Life Cycle, Methodologies: Putting It All Together.	
Reference Materials: 1. <i>Object-Oriented Software Engineering: Using UML, Patterns, and Java</i> , Bernd Bruegge, Allen H. Dutoit, Prentice Hall, 2010 (or Latest Edition) 2. <i>Object-Oriented Software Construction</i> , Bertrand Meyer, 2 nd Edition, Prentice Hall in 1997 (or Latest Edition) 3. <i>Formal Methods in Computing</i> , M. Ferenczi, and Andras Pataricza , Akademiai Kiado, 2005 (or Latest Edition) 4. <i>Code Complete: A practical handbook of software construction</i> , Microsoft Press, 2004. (or Latest Edition) 5. <i>Software Engineering</i> , Ian Sommerville, 8 th edition, Addison & Wesley. 2006 (or Latest Edition)	

Course Name: Software Engineering Economics (ASE-303)	
Course Structure: Lectures: 3 / Labs: 0	Credit Hours: 3
Prerequisites:	
Objectives: Determine how new software development technologies affect the economics and risks of software development. Understand and characterize how the paradigm shift affects or replaces our current methods of software cost, schedule and risk estimation. Identify best practices and lessons learned with Web-based developments. Identify acquisition and lifecycle risks	
Course Outline: Programming aspects, economic aspects, human relations aspects, software trends: cost, social impact, the plurality of SE Means, The GOALS Approach to Software Engineering, The Software Work Breakdown Structure (WBS), Software Maintenance, introduction to COCOMO, definitions and assumptions, development effort and schedule, phase distribution, The Rayleigh Distribution, interpolation, basic software maintenance effort estimation. Performance Models, Optimal Performance, Sensitivity Analysis, Cost-Effectiveness Models.	

<p>Resources: Boehm, Software Engineering Economics, Prentice Hall, 1981. Boehm et al., Software Cost Estimation with COCOMO II, Prentice Hall, 2000. Reifer, Don. Making the Software Business Case: Improvement by the Numbers, Addison Wesley, 2001.</p>

Course Name: Probability and Statistics (AMA-304)	
Course Structure: Lectures: 3, Labs: 0	Credit Hours: 3
Prerequisites: None	
Objectives: To introduce the concepts of data analysis, presentation, counting techniques, probability and decision making.	
Course Outline: Introduction to Statistics, Descriptive Statistics, Statistics in decision making, Graphical representation of Data Stem-and Lead plot, Box-Cox plots, measures of central tendencies and dispersion, moments of frequency distribution; Counting techniques, introduction to probability, sample space, events, laws of probability, Conditional probability and Baye’s theorem with application to random variable (Discrete and continuous) Binomial, Poisson, Geometric, Negative Binomial Distributions; Exponential Gamma and Normal distributions. Regression and Correlation, Estimation and testing of hypotheses, use of elementary statistical packages for explanatory Data analysis.	
Reference Material:	
<ol style="list-style-type: none"> 1. Ronald Walpole, Myers, Myers, Ye, “Probability & Statistics for Engineers & Scientists”, 8th edition, 2008, Prentice Hall Publisher. 2. Lay L. Devore, Probability and Statistics for Engineering and the Sciences, 2003, Duxbury Publishers. 3. G. Cowan, <i>Statistical Data Analysis</i>, 1998, Clarendon, Oxford. 	

Course Name: Web Engineering (AMA-305)	
Course Structure: Lectures:3 Labs:1	Credit Hours: 3+1
Prerequisites: Data Warehousing	
Objectives: Design and implementation of web based applications.	
Course Outline: Overview of Protocols: TCP/IP, HTTP, Overview of 3-tier Architecture, Web Based Applications Architecture. Developing Front End Applications: Front End Development Tools, HTML, DHTML, Scripting (Java Script, Jscript, Vbscript), Java Applets, ActiveX.	
Reference Material:	
Web enabled Commercial Application Development Using...HTML, DHTML, JavaScript, Perl, CGI, Ivan Bayross, BPB Publications.	

Semester - VI

Sno	course Code	Course Title	Pre-Req	Credit Hours		
				Total	Theory	Lab
1	ASE-306	Digital Image Processing	-	4 (3+1)	3	1
2	ASE-602	Computer Communication & Networks	-	4 (3+1)	3	1
3	ASE-308	Elective General	-	4 (3+1)	3	1
4	ASE-309	Artificial Intelligence	-	3 (3+0)	3	0
5	ASE-310	Domain Specific Elective	-	3 (3+0)	3	0
Total				18	15	3

Course Name: Digital Image Processing (ASE-306)

Course Structure: Lectures: 3, Labs: 1

Credit Hours: 4

Prerequisites: None

Course Outline: Course Outlines:

Introduction: Elements of digital image processing, Image model, Sampling and quantization, Relationships between pixels, Image Enhancement: Enhancement by point processing, Spatial filtering, Enhancement in the frequency domain, Colour Image Processing, image Segmentation: Discontinuity detection, Edge linking and boundary detection, Tresh holding, Region oriented segmentation, Use of motion for segmentation, Image Registration: Introduction to image registration, Techniques of image registration, Representation and Description: Boundary description, Regional description, Morphological Image Processing: Dilation and Erosion, Opening and Closing, Some basic morphological algorithms, Extensions to gray level images, Image Transforms: Discrete Fourier Transform, Discrete Cosine Transform, Haar Transform, Hadamard Transform

Reference Material:

1. *Digital Image Processing*, R. C. Gonzalez & R. E. Woods, 3rd edition, Prentice Hall, 2008, ISBN 9780131687288.
2. *Digital Image Processing (3rd Edition)* by Rafael C. Gonzalez, Prentice Hall; 3rd edition (2007)36
3. *Understanding Digital Signal Processing (3rd Edition)* by Richard G. Lyons, Prentice Hall; 3rd edition (2010)

Course Name: Computer Communication and Networks (ASE-307)

Course Structure: Lectures: 2, Labs: 1

Credit Hours: 3

Prerequisites: None

Objectives: To introduce students to the concept of computer communication. Analogue & digital transmission. Network Layers, Network models (OSI, TCP/IP) and Protocol Standards. Emphasis is given on the understanding of modern network concepts.

Course Outline: Analogue and digital Transmission, Noise, Media, Encoding, Asynchronous and Synchronous transmission, Protocol design issues. Network system architectures (OSI, TCP/IP), Error Control, Flow Control, Data Link Protocols (HDLC, PPP). Local Area Networks and MAC Layer protocols (Ethernet, Token ring), Multiplexing, Switched and IP Networks, Inter-networking, Routing, Bridging, Transport layer protocols TCP/IP, UDP. Network security issues. Programming exercises, labs or projects involving implementation of protocols at different layers.

Reference Material:

1. Introduction to Computer Networks /4, A. S. Tanenbaum, Prentice Hall 2003
2. Computer Networks and Internets, 5/E, 2008
Douglas E. Comer, Purdue University ISBN-10: 0136061273 ISBN-13: 9780136061274 Publisher: Prentice Hall
3. Data and Computer Communications By William Stallings Published by Macmillan Pub. Co., 8th Edition 2006.

Course Name: Artificial Intelligence (ASE-309)

Course Structure: Lectures: 2 / Labs: 3

Credit Hours: 3

Prerequisites: Data Structures

Objectives: This course focuses on the set of computational tools and techniques, which mimic the human decision-making process and capability.

Course Outline: Introduction to Common Lisp. AI classical systems: General Problem Solver, rules, simple search, means-ends analysis. ELIZA, pattern matching, rule based translators, OPS-5. Knowledge Representation: Natural language, rules, productions, predicate logic, semantic networks, frames, objects, scripts. Search: Depth first search, breadth first search, best first search, hill climbing, min-max search, A* search. Symbolic Mathematics: student, solving algebra problems, translating English equations, solving algebraic equations, simplification rules, re-write rules, meta-rules, Macsyma, PRESS, ATLAS. Logic Programming: Resolution, unification, horn-clause logic, Prolog, Prolog programming. Sample case studies of shells and Knowledge Based Systems. A brief appreciation of state of the art computational techniques like neural networks, genetic algorithm, fuzzy sets.

Reference Material:

1. *Artificial Intelligence* by Luger, 4th edition Pearson Education.
2. Russell and Norvig, *Artificial Intelligence: A Modern Approach*, 2nd ed, Pearson Education.

Semester - VII						
Sno	course Code	Course Title	Pre-Req	Credit Hours		
				Total	Theory	Lab
1	ASE-401	Software Testing	-	3 (2+1)	2	1
2	ASE-402	Preliminary of Projects Studies	-	3 (0+3)	0	3
3	ASE-403	Elective General	-	4 (3+1)	3	1
4	ASE-404	Domain Specific Elective*	-	3 (3+0)	3	0
5	ACS-405	Software Project management	-	3 (2+1)	2	1
6	AHU-406	Human Resource Management	-	3 (3+0)	3	0
Total				19	13	6

Course Contents:

Course Name: Software Testing (ASE-401)
Course Structure: Lectures: 2 / Labs: 1 Credit Hours: 3
Prerequisites: Software Construction
<p>Objectives: Testing techniques and principles: Defects vs. failures, equivalence classes, boundary testing. Types of defects. Black-box Vs. Structural testing. Testing strategies: Unit testing, integration testing, profiling, test driven development. State based testing; configuration testing; compatibility testing; web site testing. Alpha, beta, and acceptance testing. Coverage criteria. Test instrumentation and tools. Developing test plans. Managing the testing process. Problem reporting, tracking, and analysis.</p> <p><i>Learning objectives:</i></p> <p>Upon completion of this course, students will have the ability to:</p> <ul style="list-style-type: none"> ○ Analyze requirements to determine appropriate testing strategies. ○ Design and implement comprehensive test plans ○ Apply a wide variety of testing techniques in an effective and efficient manner ○ Compute test coverage and yield according to a variety of criteria ○ Use statistical techniques to evaluate the defect density and the likelihood of faults. ○ Conduct reviews and inspections.
<p>Lab Work</p> <p><i>Additional teaching considerations:</i></p> <p>This course is intended to be 95% testing, with deep coverage of a wide variety of testing techniques. The course should build skill and experience in the student, preferably with production code.</p>
<p>Outline: Introduction and overview: Testing and inspection concepts, Testing categories, Inception process: Objective of formal inspection Organizing Test cases: Decision Tables, Black box and white box testing Unit testing, Integration testing, Regression testing, System testing, user acceptance testing, Metrics and complexity, State based testing, Syntax testing; Use of software testing tools.</p>
<p>Resources:</p> <p><i>Introduction to Software Testing by Paul Ammann and Jeff Offutt Published February 2008. , Cambridge</i></p>

University Press, Cambridge, UK..
Software Testing by Ron Patton, 2nd edition, SAMS publishing, 2005
Software Testing in the Real World: Improving the Process by Kit, Edward. (1995)

Course Name: Software Project Management (ASE-701)

Course Structure: Lectures: 3 /Labs: 0

Credit Hours: 3

Prerequisites: Introduction to Software Engineering

Objectives: To develop ability to plan and manage software development projects successfully, maximizing the return from each stage of the software development life cycle.

Course Outline: Software Crisis and Software Engineering, Classic Mistakes, Overview of Project Management, PMI Process Groups, Software project Phases, Project charter, Statement of Work (SOW), Planning Phase: Development lifecycle models, matching lifecycles to projects, Project plans, Work Breakdown Structures (WBS), Estimation of effort and cost (Expert Judgment, FP and Use Case point methods), Scheduling: Project network diagram fundamentals, CPM, PERT, Gantt charts, Critical chain scheduling, Using MS-Project, Assigning Resources, Resource leveling, Team models, Managing conflict and motivating, Project Monitoring and Control: Status reporting, Project metrics, EVM, Communications Techniques, Risk management and Change control Project Recovery, Documentation, Cutover/Migration, Post Project Reviews, Closing.

Course Name: Human Resources Management (AHU-406)

Course Structure: Lectures: 3 /Labs: 0

Credit Hours: 3

Prerequisites: None

Objectives: To develop ability to plan and manage software development projects successfully, maximizing the return from each stage of the software development life cycle.

Course Outline: Managing Human Resources. Understanding the External and Organizational Environments. Ensuring Fair Treatment and Legal Compliance. HR Planning for Alignment and Change. Using Job Analysis and Competency Modeling. Recruiting and Retaining Qualified Employees. Selecting Employees to Fit the Job and the Organization. Training and Developing a Competitive Workforce. Conducting Performance Management. Developing an Approach to Total Compensation. Using Performance-Based Pay to Achieve Strategic Objectives. Providing Benefits and Services for Employees' Well-Being, Risk Management. Employee Relations. Risk Management. Health, Safety, and Employee Well-Being. Understanding Unionization and Collective Bargaining.

Reference Materials:

1. *Managing Human Resources* by Susan E. Jackson, Randall S. Schuler and Steve Werner, South-Western College Pub; 11th Edition (June 16, 2011). ISBN-10: 1111580227
2. *Management of Human Resources* by Gary Dessler, Carolin Rekar Munro and Nina D. Cole, Pearson Education Canada; 3rd Edition (February 28, 2010). ISBN-10: 0321687140
3. *Human Resource Management* by Robert L. Mathis and John H. Jackson, South-Western Cengage Learning; 13th Edition (August 19, 2010). ISBN-10: 053845315X
4. *Human Resource Management Applications: Cases, Exercises, Incidents, and Skill Builders* by Stella M. Nkomo, Myron D. Fottler and R. Bruce McAfee, South-Western Cengage Learning; 7th Edition

Semester - VIII

Sno	course Code	Course Title	Pre-Req	Credit Hours		
				Total	Theory	Lab
1	ASE-407	Human Computer Interection	-	3 (3+0)	3	0
2	ASE-408	Design Project	-	0 (0+3)	0	3
3	ASE-409	Elective General*	-	3 (3+0)	3	0
4	ASE-410	Professional Practices	-	3 (3+0)	3	0
5	AMG-411	Marketing	-	3 (3+0)	3	0
Total				15	12	3

Course Contents:

Course Name: Human Computer Interaction		(ASE-407)
Course Structure: Lectures: 3, Labs:0		Credit Hours: 3
Prerequisites: Data Structures and Algorithms		
<p>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.</p>		
<p>Course Outlines: The Human, Computer and Interaction, Usability paradigm and principles, Introduction to design basics, HCI in software process, Design rules, prototyping, evaluation techniques, task analysis, Universal design and User support and Computer Supported Cooperative Work. Introduction to specialized topics such as Groupware, pervasive and ubiquitous applications.</p>		
<p>Resources:</p> <ol style="list-style-type: none"> Human-Computer Interaction, 3/E Alan Dix, <i>Computing Dept, Lancaster University</i> Janet E. Finlay, <i>Leeds Metropolitan University</i>, Gregory D. Abowd, <i>Georgia Institute of Technology</i>, Russell Beale, <i>University of Birmingham</i> ISBN-10: 0130461091 ISBN-13: 9780130461094 Publisher: Prentice Hall Designing the User Interface: Strategies for Effective Human-Computer Interaction, 4/E Ben Shneiderman, <i>University of Maryland</i> Catherine Plaisant, <i>University of Maryland</i> ISBN-10: 0321197860 ISBN-13: 9780321197863 Publisher: Addison-Wesley 		

Course Name: Professional Practices		(ASE-410)
Course Structure: Lectures: 3, Labs:0		Credit Hours: 3
Prerequisites: None		
Course Outline: Historical, social, and economic context of Computing (software engineering, Computer Science, Information Technology); Definitions of Computing (software engineering, Computer Science, Information Technology) subject areas and professional activities; professional societies; professional ethics; professional competency and life-long learning; uses, misuses, and risks of software; information security and privacy; business practices and the economics of software; intellectual property and software law (cyber law); social responsibilities, software related contracts, Software house organization.		
Reference Material: 3. 1. <i>Professional Issues in Software Engineering</i> M.F. Bott et al.		