University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Minutes of Board of Studies Meeting

The meeting of Board of Studies (BOS) Department of Computer & Software Technology (DC&ST) held on 27th Jan 2015 at 11:00 AM at Committee Room University of Swat (UOS), main Campus Odigram Swat.

The Agenda of the meeting was as under:

Item I: Scheme of Studies adopted for Previous Batches (2010 till date)
Item-II: Scheme of Study BS Computer Science
Item-III: Scheme of Study BS software Engineering
Item-IV: Scheme of Study BS Infor mation Technology
Item-V: Scheme of Study MCS (2 year)

The meeting was chaired by Head, Department of Computer and Software Technology, Assistant Professor Fida Hussain. The following members of BOS have participated in the meeting:

1. Dr. Sehatullah, Assistant Professor
   Department of Computer Science & IT, University of Malakand
2. Mr. Muzammil Khan, Lecturer
   Department of Computer & Software Technology, University of Swat
3. Mr. Habib Un Nabi, Associate Professor in Computer Science
   GDC Jowarr, Buner
4. Mr. Iftikhar Ahmad, Lecturer
   Department of Mathematics & Statistics, University of Swat
5. Mr. Amir Khan, Lecturer
   Department of Mathematics & Statistics, University of Swat
6. Mr. Abdullah Khan, Lecturer in Computer Science
   Govt. Afzal Khan Lala Post Graduate College Matta Swat
7. Mr. Liaqat Ali, Lecturer in Mathematics
   Govt. Post Graduate Jahanzeb College Saidu Sharif Swat

Two members Dr. Saeed Mahfooz and Dr. Inayatullah Babar excused to participate in the BOS meeting due to their unavoidable engagement and communicated the same one day before the meeting.

Annexure-D

BS Computer Science Scheme of Study

Vision

The basic intention of an academic program in Computer Science is to develop the student's critical professional thinking and intuition. The curriculum must be structured to provide a balanced mixture of learning experiences to make the graduate capable of sound professional decisions.

Aims

The program should also provide an excellent foundation for further formal learning and training. The Computer Science curriculum is expected to provide environments to put into practice, the principles and techniques learnt during the course of implementation of academic program. As a result, the graduate should be able to assume responsible positions in business, government, and education at the research, development, and planning levels.

Objectives

- The program should provide a broad understanding of the field via introducing concepts, theory, and techniques.
- Intensive education/training in focused areas of Computer Science is desirable.
- The program may encourage students to develop and use abstract models in addition to apply respective technology in practical situations.
- Computer Science graduates require special communication skills both orally and in writing. They must be able to produce well-organized reports, which clearly delineate objectives, methods of solution, results, and conclusions for a complex task.
- Analyze the local and global impact of computing on individuals, organizations, and society.
- Recognize the need for and an ability to engage in continuing professional development.
- Use the current techniques, skills, and tools necessary for computing practice.
- Use and apply the latest technical concepts and practices in the core information technologies.
- Identify and analyze user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems.
- Understand the best practices and standards and their application.
- Assist in the creation of an effective project plan

Program Structure

The program structure is given as under;

Program Duration	8 Semesters spread over 4 years
No of Semester per year	2 Semesters (Fall Semester & Spring Semester)
Minimum Credit Hours required	130

Eligibility

The eligibility criterion for admission to BS Computer Science is given as under;

- FA/FSc with mathematics or equivalent

Program Structure

As per **HEC** guidelines of **BS Computer Science 2013**, the courses distribution as under;

#	Category	Credit Hours	
1	Computing Courses		52
	Core Courses	40	
	Supporting Areas Courses	12	
2	Computer Science Courses		48
	Computer Science Core Course	21	
	Computer Science Supporting Courses	9	
	Computer Science Electives Courses	18	
3	General Education Courses	18	18
4	University Elective Courses	12	12
	Total Credit Hours		**130**

Computing – CS Core Courses (CCC)				
S. No	**Pre-Requisite**	**Course Title**	**Credit Hours**	**Proposed Semester**
01	-	Programming Fundamentals	4 (3+1)	1
02	1	Object Oriented Programming	4 (3+1)	2
03	1	Data Structure and Algorithms	3 (2+1)	3
04	-	Discrete Structures	3	1
05	-	Digital Logic Design	3 (2+1)	3
06	3	Operating Systems	4 (3+1)	5
07	-	Database Systems	4 (3+1)	5
08	2	Software Engineering	3	6
09	-	Data Communications and Computer Networks	3 (2+1)	6
10	-	Human Computer Interaction	3 (2+1)	7, 8
11	-	Final year Project	6	1
		Total Credit Hours	**40**	
Computing – Supporting Courses (SCC)				
12	-	Calculus and Analytical Geometry	3	1
13	-	Probability and Statistics	3	3
14	-	Linear Algebra	3	2
15	-	Physics-I	3 (2+1)	2
		Total Credit Hours	**12**	
Computing – General Education Courses (CGE)				
16	-	English Composition and Comprehension	3	1
17	-	Communication Skills	3	2
18	-	Technical and Business Writing	3	3
19	-	Islamic Studies	2	1
20	-	Pakistan Studies	2	2
21	-	Professional Practices	3	7

22	-	Introduction to Information and Communication Technologies	3 (2+1)	1
		Total Credit Hours	**19**	
Computer Science – Core Courses (CSC)				
23	5	Microprocessor and Assembly Language	3 (2+1)	4
24	-	Theory of Automata	3	5
25	3	Design and Analysis of Algorithms	3	5
26	3	Artificial Intelligence	3 (2+1)	6
27	5	Computer Architecture and Organization	3	4
28	24	Compiler Construction	3 (2+1)	7
29	9	Information Security	3	7
		Total Credit Hours	**21**	
Computer Science – Supporting Courses (CSS)				
30	12	Numerical Computing	3 (2+1)	8
31	12	Multivariate Calculus	3	4
32	12	Differential Equations	3	5
		Total Credit Hours	**09**	
Computer Science – Elective Courses (CEC) **Not limited to the list below**				
33	-	Computer Graphics	3 (2+1)	6
34	-	Digital Image Processing	3 (2+1)	6
35	-	Digital Signal Processing	3	6
36	-	Introduction to Software Development	3	4
37	-	Distributed Computing	3 (2+1)	6
38	-	Data and Network Security	3	7
39	-	Wireless Networks	3 (2+1)	6
40	-	Mobile Application and Development	3 (2+1)	8
41	-	Web Fundamentals	3 (2+1)	8
42	-	Data Warehousing	3 (2+1)	5
43	-	Expert Systems	3	
44	07	Distributed Database System	3	
45	41	Web Engineering	3 (2+1)	
46	-	Fundamentals of Data Mining	3	
47	-	Physics II (Electromagnetisms)	3	
48	-	Game Development	3 (2+1)	
49	-	Formal Methods for Software Engineering	3	
50	-	Microprocessor Interfacing	3 (2+1)	
51	02	Modern Programming Language	3 (2+1)	
52	02	Visual Programming	3 (2+1)	
53	09	Network Strategies	3	
Computer Science – University Elective Courses (UEC) **Not limited to the list below**				

54	08	Software Engineering II	3	54
55	-	Principles of Accounting	3	
56	-	Principles of Management	3	4
57	-	Human Resource Management	3	5
58	-	Organization Behavior	3	6
59	-	Principles of Psychology	3	7
60	-	Principles of Philosophy	3	6
61	-	Foreign/Regional Languages (Urdu, Pashto, Sindhi, German, Punjabi, French etc)	3	7
62	07	Advanced Database Systems	3	
63	-	Network Management	3	
64	08	Software Project Management	3	
65	-	Data Mining	3	
66	-	Database Management Systems	3	
67	-	Web Mining	3	
68	-	Information Retrieval Techniques	3	
69	-	Wireless Sensor Network	3	
70	65	Collaborative Data Mining	3	

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A Student majoring in **Bachelor of Science in Computer Science (BS-CS)** must complete minimum of **130 Credit Hours** courses. The courses semester wise structure is as follows:

Semester I			
Pre-requisite	Course Code	Title	Credit Hours
-	CGE-022	Introduction to Information and Communication Technology	3 (2+1)
-	SCC-015	Physics-I	3
-	SCC-012	Calculus and Analytical Geometry	3
-	CCC-001	Programming Fundamentals	4 (3+1)
-	CGE-019	Islamic Studies	2
-	CGE-016	English Composition and Comprehension	3
Total Semester Credit Hours			**18**
Semester II			
Pre-requisite	Course Code	Title	Credit Hours
CCC-001	CCC-002	Object Oriented Programming	4 (3+1)
CCC-001	CCC-003	Data Structures and Algorithms	3 (2+1)
-	CCC-005	Digital Logic Design	3 (2+1)
SCC-012	CSS-032	Differential Equations	3
-	CGE-017	Communication Skills	3
-	CGE-020	Pakistan Studies	2
Total Semester Credit Hours			**18**
Semester III			
Pre-requisite	Course Code	Title	Credit Hours
CCC-003	CCC-006	Operating Systems	4 (3+1)
-	CCC-009	Data Communication and Computer Networks	3 (2+1)
-	CEC-041	Web Fundamentals	3 (2+1)
-	CEC-047	Physics-II	3
-	CGE-018	Technical and Business Writing	3
Total Semester Credit Hours			**16**
Semester IV			
Pre-requisite	Course Code	Title	Credit Hours
-	SCC-014	Linear Algebra	3
CCC-003	CSC-026	Artificial Intelligence	3
CCC-002	CCC-008	Software Engineering-I	3
CCC-005	CSC-023	Microprocessor & Assembly Language	3 (2+1)
-	CCC-004	Discrete Structures	3 (2+1)
CCC-002	CEC-051	Modern Programming Language	3 (2+1)
Total Semester Credit Hours			**18**

Semester V			
Pre-requisite	Course Code	Title	Credit Hours
-	CCC-007	Database Systems	4 (3+1)
CCC-009	CEC-053	Network Strategies	3
CCC-005	CSC-027	Computer Architecture & Organization	3
-	CCC-010	Human Computer Interaction	3 (2+1)
CEC-041	CEC-045	Web Engineering	3 (2+1)
Total Semester Credit Hours			**16**
Semester VI			
Pre-requisite	Course Code	Title	Credit Hours
-	CSC-024	Theory of Automata	3
CCC-008	UEC-054	Software Engineering-II	3
CCC-003	CSC-025	Design and Analysis of Algorithms	3
-	CSC-013	Probability and Statistics	3
CCC-007	UEC-062	Advanced Database Systems	3 (2+1)
-	UEC-063	Network Management	3 (2+1)
Total Semester Credit Hours			**18**
Semester VII			
Pre-requisite	Course Code	Title	Credit Hours
CSC-024	CSC-028	Compiler Construction	3 (2+1)
CCC-002	CEC-052	Visual Programming	3 (2+1)
CCC-007	CEC-044	Distributed Database Systems	3
-	CEC-033	Computer Graphics	3 (2+1)
CCC-009	CSC-029	Information Security	3 (2+1)
Total Semester Credit Hours			**15**
Semester VIII			
Pre-requisite	Course Code	Title	Credit Hours
CCC-008	UEC-064	Software Project Management	3
CCC-008	CGE-021	Professional Practices	3
SCC-012	CSS-030	Numerical Computing	3
-	CCC-011	Final Year Project (Thesis + Software)	6
Total Semester Credit Hours			**15**

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Computing – CS Core Courses

Course Name: **Programming Fundamentals**
Credit Hours: 4 (3+1)
Prerequisites: None

Objectives: To enable the students to program and learn the basic programming concepts. Analyze and explain the behavior of simple programs involving the fundamental programming constructs.

Learning Outcome: Explain Computer Programming concepts, like;
- Ability to design algorithmic solution to problems
- Ability to design programs with Interactive Input and Output
- Ability to design programs utilizing arithmetic expressions
- Ability to design programs utilizing repetition
- Ability to design programs utilizing decision making
- Ability to design programs utilizing arrays
- Ability to develop recursive solutions
- Ability to test and verifying programs
- Ability to develop simple search and sort algorithms

Course Outline:
This course covers overview of Computer Programming, Principles of Structured and Modular Programming, Overview of Structured Programming Languages, Algorithms and Problem Solving, Program Development: Analyzing Problem, Designing Algorithm/Solution, Testing Designed Solution, Translating Algorithms into Programs, Fundamental Programming Constructs, Data Types. Basics of Input and Output, Selection and Decision If, If -Else, Nested If- Else, Switch Statement and Condition Operator), Repetition While and For Loop, Do -While Loops), Break Statement, Continue Statement, Control Structures, Functions, Arrays, Pointers, Records, Files Input-Output), Testing & Debugging.

Reference Materials:
1. C How to Program by Paul Deitel and Harvey Deitel, Prentice Hall; 7 edition (March 4, 2012). ISBN-10: 013299044X
2. Programming in C by Stephen G. Kochan, Addison-Wesley Professional; 4 edition (September 25, 2013). ISBN-10: 0321776410
3. Java How to Program by Paul Deitel and Harvey Deitel, Prentice Hall; 9th edition (March, 2011
4. C++ How to Program by Paul Deitel and Harvey Deitel, Prentice Hall; 9th edition (February, 2013)

Course Name: **Object Oriented Programming**
Credit Hours: 4 (3+1)
Prerequisites: Programming Fundamentals

Objectives: To prepare object-oriented design for small/medium scale problems and to demonstrate the differences between traditional imperative design and object oriented design.

Learning Outcome:
- Describe the principles of object-oriented programming
- Apply the concepts of data encapsulation, inheritance, and polymorphism to large-scale software
- Acquire the concepts of Graphical User Interfaces Professional Skill
- Design and develop object-oriented computer programs, and develop programs with Graphical User Interfaces capabilities
- Formulate problems as steps so as to be solved systematically
- Develop software with team-work in mind

Course Outline:
Evolution of Object Oriented Programming OOP), Object Oriented concepts and principles, problem solving in Object Oriented paradigm, OOP design process, classes, functions/methods, objects and encapsulation; constructors and destructors, operator and function/method overloading, association, aggregation, composition, generalization, inheritance and its types, derived classes, function/method overriding, abstract and concrete classes, virtual functions, polymorphism, exception handling.

Reference Materials:
1. Java: How to Programme, Harvey M. Deitel and Paul J. Deitel, Prentice Hall; 8 edition (March 27, 2009). ISBN-10: 0136053068
2. C++: How to Programme, Prentice Hall; 8 edition March 25, 2011). ISBN - 10: 0132662361
3. Object Oriented Programming in C++ by Robert Lafore, Sams Publishing; 4 edition (December 29, 2001). ISBN-10: 0672323087
4.Java Programming: From the Ground Up by Ralph Bravaco and Shai Simonson, McGraw-Hill Higher Education New York, 2010, ISBN 978–0– 07–352335–4
5. Beginning Java by Ivor Horton, John Wiley & Sons, Inc, 7th Edition, 2011, ISBN: 978-0-470-40414-0

Course Name: **Data Structure and Algorithms**
Credit Hours: 3 (2+1)
Prerequisites: Programming Fundamentals

Course Objectives: To Teach the students how to design algorithm and analyze the complexity

Learning Outcome:
- Able to understand the concepts of data structure, data type and array data structure.
- Able to analyze algorithms and determine their time complexity.
- Able to implement linked list data structure to solve various problems.
- Able to understand and apply various data structure such as stacks, queues, trees and graphs to solve various computing problems using C-programming language.
- Able to implement and know when to apply standard algorithms for searching and sorting.
- Able to effectively choose the data structure that efficiently model the information in a problem
-

Course Outline:
Introduction to Data Structures and Algorithms. Complexity Analysis. Arrays. Sorting Algorithms: Insertion Sort, Selection Sort, Bubble Sort, Shell Sort, Heap Sort, Quick Sort, Merge Sort, Radix Sort, Bucket Sort. Linked Lists: Singly Linked Lists, Doubly Linked Lists, Circular List. Stacks, Queues, and Priority Queue. Recursion: Function call and Recursion Implementation, Tail Recursion, Non-tail Recursion, Indirect Recursion, Nested Recursion, Backtracking. Trees: Binary Trees, Binary Heap, Binary Search. Tree Traversal, Insertion, Deletion, and Balancing a Tree. Heap. B-Tree, B+Tree, Spanning Tree, Splay Trees. Graphs: Representation, Treversal, Shortest Path, and Cycle Detection; Isomorphic Graphs. Graph Traversal Algorithms. Hashing. Memory Management and Garbage Collection.

Reference Materials:
1. Data Structures & Problem Solving Using Java by Mark Allen Weiss, Addison-Wesley, 4th Edition October 7, 2009). ISBN -10: 0321541405 or Latest Edition)
2. Algorithms, Robert Sedgewick, Princeton University Publisher: Addison-Wesley Professional latest Edition)
3. Data Structures: Abstraction and Design Using Java by Koffman and Wolfgang, Wiley; 2nd Edition (January 26, 2010). ISBN-10: 0470128704
4. Data Structures and Algorithms in C++ by Adam Drozdek, Course Technology; 4th Edition (August 27, 2012). ISBN-10: 1133608426

Course Name: Discrete Structures
Credit Hours: 3
Prerequisites: None

Objectives: To learn the application of formal logic proofs and/or informal, but rigorous, logical reasoning to real problems. Comprehend discrete structures and their relevance within the context of computer science.

Learning Outcome:
- Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, and integers.
- Evaluate elementary mathematical arguments and identify fallacious reasoning (not just fallacious conclusions).
- Synthesize induction hypotheses and simple induction proofs.
- Prove elementary properties of modular arithmetic and explain their applications in Computer Science, for example, in cryptography and hashing algorithms.

Course Outline:
Mathematical reasoning: introduction to logic, propositional and predicate calculus; negation disjunction and conjunction; implication and equivalence; truth tables; predicates; quantifiers; natural deduction; rules of Inference; methods of proofs; use in program proving; resolution prin-ciple; Set theory: Paradoxes in set theory; inductive definition of sets and proof by induction; Relations, representation of relations by graphs; properties of relations, equivalence relations and partitions; Partial function theory; Elementary combinatorics; counting techniques; recurrence relation; generating functions.Graph Theory: elements of graph theory, Planar Graphs, Graph Colouring, Euler graph, Hamiltonian path, trees and their applications.

Reference Materials:
1.Discrete Mathematical Structure with Application to Computer Science, J. P. Temblay and B Manohar, McGraw-Hill, 2nd Edition.

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Course Name: **Digital Logic and Design**
Credit Hours: 3 (2+1)
Prerequisites: None

Course Objectives: To introduce the basic tools for design with combinational and sequential digital logic and state machines. To learn simple digital circuits in preparation for computer science.

Learning Outcome:
- Upon successful completion, students will be able to:
- Realize complex logic functions utilizing programmable logic.
- Design machines for the purpose of manipulating data streams.
- Design complex digital systems.

Course Outline:
Number Systems, Logic Gates, Boolean Algebra, Combination logic circuits and designs, Simplification Methods K-Maps, Quinne, Mc-Cluskey,, Flip Flops and Latches, Asynchronous and Synchronous circuits, Counters, Shift Registers, Shift Registers Counters, Triggered devices & its types. Binary Arithmetic and Arithmetic Circuits, Memory Elements, State Machines. Introduction Programmable Logic Devices CPLD, FPGA); Lab Assignments using tools such as Verilog HDL/VHDL, MultiSim, etc.

Reference Materials:
1. Digital Fundamentals by Thomas L. Floyd, Prentice Hall; 11th edition.
2. Fundamentals of Digital Logic with Verilog Design by Stephen Brown and Zvonko Vranesic, McGraw-Hill; 3rd Edition February 12, 2013). ISBN -10: 0073380547
3. Digital Fundamentals: A Systems Approach by Thomas L. Floyd, Prentice Hall; (July 13, 2012). ISBN-10: 0132933950
4. Digital Design, by M. Morris Mano, Michael D. Ciletti, 4th Edition, Prentice Hall (2007). ISBN-10: 0131989243
5. Fundamentals of Logic Design by Jr. Charles H. Roth and Larry L Kinney, CL Engineering; 6th Edition (March 13, 2009). ISBN-10: 0495471690

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Course Name: Operating Systems
Credit Hours: 4 (3+1)
Pre-requisites: Data Structure and Algorithms

Objectives: To introduce the basic tools for design with combinational and sequential digital logic and state machines. To learn simple digital circuits in preparation for computer science. High-level understand what is an operating system and the role it plays. A high-level understanding of the structure of operating systems, applications, and the relationship between them.

Learning Outcome:
- Able to understand the difference between different types of modern operating systems, virtual machines and their structure of implementation and applications.
- Able to understand the difference between process & thread, issues of scheduling of user level processes / threads and their issues & use of locks, semaphores, monitors for synchronizing multiprogramming with multithreaded systems and implement them in multithreaded programs.
- Able to understand the concepts of deadlock in operating systems and how they can be managed / avoided and implement them in multiprogramming system.
- Able to understand the design and management concepts along with issues and challenges of main memory, virtual memory and file system.
- Able to Able to understand the types of I/O management, disk scheduling, protection and security problems faced by operating systems and how to minimize these problems.

Course Outline:
History and Goals, Evolution of operating systems. Operating System: Services, Structure, User Interface. Virtual Machines concept, System Boot, System Calls, Types of System Calls. Processes: Concept, Scheduling, Operations on Processes, Inter-process Communication. Threading: Multithreading Models, Thread Libraries, Threading Issues, processor scheduling; deadlock prevention, avoidance, and recovery; main-memory management; virtual memory management swapping, paging, segmentation and page-replacement algorithms); Disks management and other input/output devices; file-system structure and implementation; protection and security. Case studies: Linux/Windows Operating Systems.
*Lab assignments involving different single and multithreaded OS algorithms.

Reference Materials:
1. Operating System Concepts by Abraham Silberschatz, Peter B. Galvin, and Greg Gagne, Wiley; 9th edition December 17, 2012). ISBN -10: 1118063333
2. Operating Systems: Internals and Design Principles by William Stallings, Prentice Hall; 7 edition (March 10, 2011). ISBN-10: 013230998X
3. Applied Operating Systems Concepts by Silberschatz A., Peterson, J.L., & Galvin P.C. Wiley; 8th Edition 2011). ISBN -10: 1118112733

Course Name: **Database Systems**
Credit Hours: 4 (3+1)
Prerequisites: None

Objectives: To understand several requirement and operations that the analyst needed to analyze, design, and implement the database systems thru DBMS.

Learning Outcome
- Able to master the basic concepts and understand the applications of database systems.
- Able to construct an Entity-Relationship (E-R) model from specifications and to perform the transformation of the conceptual model into corresponding logical data structures.
- Able to understand the basic database storage structures and access techniques.
- Able to distinguish between good and bad database design, apply data normalization principles, and be aware of the impact of data redundancy on database integrity and maintainability.
- Able to construct queries and maintain a simple database using SQL.
- Able to apply database transaction management and database recovery.

Course Outline:
Basic Database Concepts, Database Architecture, DB Design Life Cycle, Schema Architecture, Conceptual, Logical and Physical Database Modelling and Design, , Entity Relationship Diagram ERD, Enhanced ERD, Relational Data Model, Mapping ERD to Relational Model, Functional Dependencies and Normalization, Relational Algebra, Structured Query Language SQL), Transaction Processing, Concurrency Control And Recovery Techniques, Query Optimization Concepts.

Reference Materials:
1. Database Systems A Practical Approach to Design, Implementation, and Management, Thomas Connolly and Carolyn Begg, Prentice Hall; 7th edition (March 10, 2011)
2. Modern Database Management by Fred McFadden, Jeffrey Hoofer, Mary Prescott, Prentice Hall; 11th Edition (July 26, 2012). ISBN-10: 0132662256
3. Fundamentals of Database Systems by R. Elmasri and S. Navathe. 6th Edition, Addison-Wesley (2010). ISBN-10: 0136086209.
4. Database Design and Relational Theory: Normal Forms and All That Jazz by C. J. Date, O'Reilly Media; 1st Edition (April 24, 2012). ISBN-10: 1449328016.
5. Modern Database Management by Fred McFadden, Jeffrey Hoofer, Mary Prescott, Prentice Hall; 11th Edition (July 26, 2012). ISBN-10: 0132662256

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Course Name: **Software Engineering (Introduction to Software Engineering)**
Credit Hours: 3
Prerequisites: Object Oriented Programming

Course Objectives: To learn the basic concepts, enable students to know about the fundamental construct of software and the activities evolve in the development of modular and effective software. To explain the major issues in contemporary software development and maintenance, as related to complex and critical software systems. Become more aware about the practices which typically apply in software development projects from cradle to grave. See software as a part of a larger system, and be aware of the principles of systems engineering as they are relevant to the engineering of software.

Learning Outcome

- Ability to gather and specify requirements of the software projects.
- Ability to analyze software requirements with existing tools
- Able to differentiate different testing methodologies
- Able to understand and apply the basic project management practices in real life projects
- Ability to work in a team as well as independently on software projects

Course Outline:

Overview of SE, Practice & Myths; the Software Processes, Generic Process Models: Framework Activity, Task Set, Process Patterns, Process Improvement, CMM. Prescriptive Process Models: Waterfall Model, Incremental Process Model, Evolutionary Process Model. Specialized Process Models: Component Based Development; The Formal Methods Models, Agile Development. Business Information Systems: Components; Types; and Evaluating methods. SDLC: Phases; System Planning; Preliminary Investigation, SWOT Analysis; the Importance of Strategic Planning; Evaluation of Systems Requests; Requirements Engineering. Difference between Structured Analysis and Object Oriented Analysis; Difference between FDD Diagrams & UML Diagrams; Data & Process Modelling. Diagrams: Data Flow, Context, Conventions, Detailed Level DFD's; the Design Process; Architecture Design Elements, Interface Design Elements, Component-Level Design Elements, Deployments Design Elements; System Architecture, Architectural Styles; User Interface Design; WebApps Interface Design; Software Quality Assurance. Validation Testing, System Testing. Internal and External View of Testing. Project Management. Risk Management; Maintenance and Reengineering.

Reference Materials:

1. Software Engineering 8E by Ian Sommerville, Addison Wesley; 8th Edition 2006).
   ISBN -10: 0321313798
2. Software Engineering: A Practitioner's Approach by Roger S. Pressman, McGraw-Hill Science/Engineering/Math; 7th Edition 2009. ISBN -10: 0073375977

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Course Name: **Computer Communications and Networks**
Credit Hours: 3
Prerequisites: None

Objectives: This Course introduces students to computer networks and concentrates on building a firm foundation for understanding Data Communications and Computer Networks. It is based around the OSI Reference Model that deals with the major issues in the bottom three (Physical, Data Link and Network) layers of the model. Students are also introduced to the areas of Network Security and Mobile Communications. This module provides the student with fundamental knowledge of the various aspects of computer networking and enables students to appreciate recent developments in the area.

Learning Outcome: Upon completion of this module, students will be able to:
- Have a good understanding of the OSI Reference Model and in particular have a good knowledge of Layers 1-3.
- Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies;
- Have a basic knowledge of the use of cryptography and network security;
- Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols;
- Have an understanding of the issues surrounding Mobile and Wireless Networks.
- Have a working knowledge of datagram and internet socket programming

Course Outline:
Data Communication concepts, Analogue and digital Transmission, Noise, Media, Encoding, Asynchronous and Synchronous transmission. Network system architectures OSI, TCP/I P), Error Control, Flow Control, Data Link Protocols, Bridging. Local Area Networks and MAC Layer protocols, Multiplexing, Switched and IP Networks, Inter-networking, Routing. Transport layer protocols TCP, UDP and SCTP. Application Layer Protocols, Wireless LANs, Lab exercises using tools such as Wireshark, OpNet, Packet tracer etc.

Reference Materials:
1. Data Communications and Networking, by Behrouz A. Forouzan, McGraw-Hill Science; 5th edition (February 17, 2012). ISBN-10: 0073376221
2. Data and Computer Communications by William Stallings, Prentice Hall; 9th Edition (August 13, 2010. ISBN -10: 0131392050
3. 3.Computer Networks by Andrew S. Tanenbaum and David J. Wetherall, Prentice Hall; 5th Edition (October 7, 2010. ISBN -10: 0132126958
4. 4.Computer Networks and Internets by Douglas E. Comer, Prentice Hall; 5th Edition (April 28, 2008). ISBN-10: 0136066984

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Course Name: **Human Computer Interaction**
Credit Hours: 3
Prerequisites: None

Objectives: To Design, implement and evaluate effective and usable graphical computer interfaces. Describe and apply core theories, models and methodologies from the field of HCI. Describe and discuss current research in the field of HCI. Implement simple graphical user interfaces using the Java Swing toolkit. Describe special considerations in designing user interfaces for older adults.

Learning Outcome: On completion of this course according to course goals, the student should be able to:
- Understand the basics of human and computational abilities and limitations.
- Understand basic theories, tools and techniques in HCI.
- Understand the fundamental aspects of designing and evaluating interfaces.
- Practice a variety of simple methods for evaluating the quality of a user interface.
- Apply appropriate HCI techniques to design systems that are usable by people.

Course Outline:
The human and the computer and their interaction, Human psychology and ergonomics, Interaction Paradigms, Interaction design basics, HCI in the software process, Design rules, Implementation support, Evaluation techniques, Universal design, User support, ,Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models, Task analysis, Dialog notations and design , Models of the system, Modeling rich interaction, Groupware, Ubiquitous computing and augmented realities

Reference Materials:
1. Human-Computer Interaction by Alan Dix, Janet E. Finlay, Gregory D. Abowd, Russell Beale, Prentice Hall; 3rd Edition December 20, 2003. ISBN-10: 0130461091
2. Human-Computer Interaction: Concepts And Design by J. Preece, Y. Rogers, H. Sharp, D. Benyon, S. Holland, T. Carey, Addison Wesley; 1st Edition (April 30, 1994). ISBN-10: 0201627698.
3. Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies, and Emerging Applications by Julie A. Jacko, CRC Press; 3 Edition (May 4, 2012. ISBN - 10: 1439829438
4. Interaction Design: Beyond Human - Computer Interaction by Yvonne Rogers, Helen Sharp, and Jenny Preece, Wiley; 3rd Edition June 15, 2011). ISBN-10: 0470665769
5. Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Rules by Jeff Johnson, Morgan Kaufmann; 1st Edition June 3, 2010). ISBN -10: 012375030X.

Computing - Supporting Courses

Course Name: Calculus and Analytical Geometry
Credit Hours: 3
Prerequisites: None

Objectives: To enable the students to think and use the applications of calculus and analytical geometry. Map other concepts with computer science perspectives.

Learning Outcome:
- Have knowledge related to the fundamentals of calculus and analytical geometry.
- Understand the differentiation integration and their applications.
- Apply the acquired knowledge to solve problems of practical nature.

Course Outline:
Real Numbers and the Real Line, Coordinates, Lines, and Increments, Functions, Shifting Graphs, Trigonometric Functions. Limits and Continuity: Rates of Change and Limits, Rules for Finding Limits, Target Values and Formal Definitions of Limits, Extensions of the Limit Concept, Continuity, Tangent Lines. Derivatives: The Derivative of a Function, Differentiation Rules, Rates of Change, Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation and Rational Exponents. Applications of Derivatives. Integration: Indefinite Integrals, Integration by Substitution, Definite Integrals, Substitution in Definite Integrals. Numerical Integration. Applications of Integrals. Transcendental Functions: Inverse Functions and Their Derivatives, Natural Logarithms, The Exponential Function, ax and logax, Growth and Decay, L'Hôpital's Rule, Relative Rates of Growth, Inverse Trigonomic Functions, Derivatives of Inverse Trigonometric Functions; Hyperbolic Functions. Conic Sections, Parametrized Curves, and Polar Coordinates. Graphing in Polar Coordinates. Polar Equations for Conic Sections. Integration in Polar Coordinates. Vectors and Analytic Geometry in Space; Vectors in the Plane Dot Products; Vector-Valued Function Cartesian Rectangular) Coordinates and Vectors in Space. Dot Pr oducts; Cross Products. Lines and Planes in Space; Cylinders and Quadric Surfaces; Cylindrical and Spherical Coordinates.

Reference Materials:
1. Calculus and Analytic Geometry by George B. Thomas and Ross L. Finney, Addison Wesley; 10th Edition (1995) ISBN-10: 0201531747
2. Calculus and Analytical Geometry by Swokowski, Olinick and Pence, 6th Edition, 1994, Brooks/Cole Publishers.
3. Calculus by Howard Anton, Irl C. Bivens, Stephen Davis, Wiley; 10th Edition (2012, ISBN -10: 0470647728
4. Calculus with Analytic Geometry: Student Solution Manual by Howard Anton, Wiley; 5th Edition (1995). ISBN-10: 0471105899

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: Probability and Statistics
Credit Hours: 3
Prerequisites: None

Objectives:
To enable the students to think and use the applications of calculus and analytical geometry. Map other concepts with computer science perspectives. To understand the fundamental concepts of statistics and probability. The role of probability in evaluation in computer science in related domain research.

Learning Outcome:
- Use statistical vocabulary, Construct various frequency distributions of grouped and ungrouped data.
- Calculate and interpret descriptive statistics of samples and populations. (Measures of central tendency, measures of dispersion.)
- Calculate simple probabilities, Find the mean and variance of a probability distribution including the binomial distribution.
- Understand and calculate expected values, Calculate the probabilities or scores of normal distributions and the normal approximation of the binomial distribution.
- Use the Central Limit Theorem to calculate the probabilities of the mean for any distribution.
- Formulate, calculate and interpret hypotheses test for one parameter and to compare two parameters, for both large and Small samples, Z and T for one two samples.

Course Outline:
Introduction to Statistics and Data Analysis, Statistical Inference, Samples, Populations, and the Role of Probability. Sampling Procedures. Discrete and Continuous Data. Statistical Modeling. Types of Statistical Studies.
Probability: Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Bayes' Rule. Random Variables and Probability Distributions. Mathematical Expectation: Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem. Discrete Probability Distributions. Continuous Probability Distributions. Fundamental Sampling Distributions and Data Descriptions: Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem. Sampling Distribution of S2, t -Distribution, F-Quantile and Probability Plots. Single Sample & One- and Two-Sample Estimation Problems. Single Sample & One- and Two-Sample Tests of Hypotheses. The Use of P-Values for Decision Making in Testing Hypotheses Single Sample & One - and Two-Sample Tests), Linear Regression and Correlation. Least Squares and the Fitted Model, Multiple Linear Regression and Certain, Nonlinear Regression Models, Linear Regression Model Using Matrices, Properties of the Least Squares Estimators.

Reference Materials:

1. Probability and Statistics for Engineers and Scientists by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying E. Ye, Pearson; 9th Edition January 6, 2011). ISBN -10: 0321629116
2. Probability and Statistics for Engineers and Scientists by Anthony J. Hayter, Duxbury Press; 3rd Edition (February 3, 2006), ISBN-10: 0495107573
3. Schaum's Outline of Probability and Statistics, by John Schiller, R. Alu Srinivasan and Murray Spiegel, McGraw-Hill; 3rd Edition 2008). ISBN -10: 0071544259

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: Linear Algebra
Credit Hours: 3
Prerequisites: None

Objective: The objective of the course is to provide a rigorous approach towards the solutions of linear models which involves more than one variable. The techniques discussed in this course can be implemented on a wide range of applications from physical world. The matrix algebra will be helpful in performing and understanding of matrix computations on a machine. The eigenvalues, eigenvectors, inner product spaces, orthogonality are useful concepts for the analysis of dynamical systems

Learning Outcome: On successful completion of this course unit students will be able to
- solve systems of linear equations by using Gaussian elimination to reduce the augmented matrix to row echelon form or to reduced row echelon form; understand the basic ideas of vector algebra: linear dependence and independence and spanning;
- be able to apply the basic techniques of matrix algebra, including finding the inverse of an invertible matrix using Gauss-Jordan elimination;
- know how to find the row space, column space and null space of a matrix, and be familiar with the concepts of dimension of a subspace and the rank and nullity of a matrix, and to understand the relationship of these concepts to associated systems of linear equations;
- be able to find the eigenvalues and eigenvectors of a square matrix using the characteristic polynomial and will know how to diagonalize a matrix when this is possible, recognize and invert orthogonal matrices, orthogonally diagonalize symmetric matrices, find the change-of-basis matrix with respect to two bases of a vector space, notations of a linear transformation and its matrix.

Course Outline:
Introduction to Vectors. Solving Linear Equations. Elimination Factorization. Vector Spaces and Subspaces. Orthogonality. DeTerminants. Eigenvalues and Eigenvectors. Linear Transformations. Linear Transformation, Applications of Matrices in Engineering. Graphs and Networks, Markov Matrices, Population, and Economics. Linear Programming. Fourier Series. Linear Algebra for Functions, Linear Algebra for Statistics and Probability, Computer Graphics. Numerical Linear Algebra. Complex Vectors and Matrices. Discrete Transforms and Simple Applications. Cosine Transform, The Discrete Fourier Transform. Simplification and Factorization of the DFT Matrix. Fast Fourier Transforms. The Discrete Time Fourier Transform. The Z-Transform.

Reference Materials:
1. Introduction to Linear Algebra by Gilbert Strang, Wellesley Cambridge Press; 4th Edition (February 10, 2009). ISBN-10: 0980232716
2. Linear Algebra: A Modern Introduction by David Poole by Brooks Cole; 3rd Edition (May 25, 2010).ISBN-10: 0538735457
3. Elementary Linear Algebra with Applications by Bernard Kolman, David Hill, 9th Edition, Prentice Hall PTR, 2007. ISBN-10: 0132296543

Course Name: Basic Electronics (Physics - I)
Credit Hours: 3
Prerequisites: None

Course Objectives: The subject aims to provide the student with: An understanding of basic EE abstractions on which analysis and design of electrical and electronic circuits and systems are based, including lumped circuit, digital and operational amplifier abstractions. The capability to use abstractions to analyze and design simple electronic circuits. The ability to formulate and solve the differential equations describing time behavior of circuits containing energy storage elements. The capability to design and construct circuits, take measurements of circuit behavior and performance, compare with predicted circuit models and explain discrepancies.

Learning Outcomes: Students will:
- Learn how to develop and employ circuit models for elementary electronic components, e.g., resistors, sources, inductors, capacitors, diodes and transistors;
- Become adept at using various methods of circuit analysis, including simplified methods such as series-parallel reductions, voltage and current dividers, and the node method;
- Gain an intuitive understanding of the role of power flow and energy storage in electronic circuits;
- Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis;
- Learn how the primitives of Boolean algebra are used to describe the processing of binary signals and to use electronic components such as MOSFET's as building blocks in electronically implementing binary functions;
- Learn how the concept of noise margin is used to provide noise immunity in digital circuits;
- Be introduced to the concept of state in a dynamical physical system and learn how to analyze simple first and second order linear circuits containing memory elements;
- Be introduced to the concept of singularity functions and learn how to analyze simple circuits containing step and impulse sources;
- Be introduced to the concept of sinusoidal-steady-state (SSS) and to use impedance methods to analyze the SSS response of first and second-order systems;
- Learn how to calculate frequency response curves and to interpret the salient features in terms of poles and zeros of the system function;
- Gain insight into the behavior of a physical system driven near resonance, in particular the relationship to the transient response and the significance of the quality factor Q;
- Learn how operational amplifiers are modeled and analyzed, and to design Op-Amp circuits to perform operations such as integration, differentiation and filtering on electronic signals;
- Be introduced to the concepts of both positive and negative feedback in electronic circuits;

- Learn how negative feedback is used to stabilize the gain of an Op-Amp-based amplifier and how positive feedback can be used to design an oscillator;
- Acquire experience in building and trouble-shouting simple electronic analog and digital circuits

Course Outline:
Zero Reference Level, Ohm's Law, Linear & Non-Linear Resistors, Cells in Series and Parallel. Resistive Circuits. Resistors, Inductors, Capacitors, Energy Sources. Magnetism and Electromagnetism; Theory of Solid State; P-N Junction; Forward Biased P-N Junction; Forward V/I Characteristics; Reverse Biased P-N Junction; Reverse Saturation Current; Reverse V/I Characteristics, Junction Breakdown, Junction Capacitance. Opto-electronics Devices; Spectral Response of Human Eye; Light Emitting Diode LED; Photoemission Devices, Photomultiplier Tube, Photovoltaic Devices, Bulk Type Photoconductive Cells, Photodiodes, P- N Junction Photodiode, PIN Photodiode, and Avalanche Photodiode; DC Power Supplies; Rectifiers. Filters, Voltage Multipliers, Silicon Controlled Rectifier SCR; The Basic Transistor; Transistor Biasing, Transistor Circuit Configuration; Modulation and Demodulation; Carrier Waves; Integrated Circuits.

Reference Materials:
1. Basic Electronics Solid State by B. L. Theraja, S Chand & Co Ltd, 5th Edition, 2007, ISBN-13: 978-8121925563
2. Electronic Principles by Albert Paul Malvino, 6th Edition, 1999, ISBN 0-07-115604-6

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Computing – General Education Courses

Course Name: English Composition and Comprehension
Credit Hours: 3
Prerequisites: None

Objectives: The student should be able to know about the composition process.

Learning Outcome:
• Practices correct English in speaking and writing.
• Comply even complex English language texts.
• Exhibit sound vocabulary and skills to use English in professional life.
• Avoid common errors usually made by the learners of English as second language.

Course Outline:
Punctuation Principles. Spelling Rules. Writing Mechanics. Frequently Confused Words. Frequently Misused Words, Phrases, Synonyms, Antonyms, Idioms. General Vocabulary. Use of Articles and One, A Little/ A Few, This, That, Care, Like, Love, Hate, Prefer, Wish, All, Each, Every, Both, Neither, Either, Some, Any, No, None, etc. Interrogatives. Kins of Nouns. Prepositions. Possessive, Personal, Reflexive, and Relative Pronouns and Clauses. Classes of Verbs. Usage of May, Can, Ought, Should, Must, Have To, Need for Obligation, Must, Have, Will and Should. The Auxiliaries Dare and Used. The Gerund & The Participles. Commands, Requests, Invitations, Advice, Suggestions. The Subjunctive. The Passive Voice. Indirect Speech. Conjunctions. Purpose. Clauses: Noun Clauses; Clauses of Reason, Result, Concession, Comparison, Time. Numerals, Dates, Weights and Measures. Phrasal Verbs. Irregular Verbs. Overview of Present, Past, Future and Perfect Tenses.

Reference Materials:
1. A Practical English Grammar by A. J. Thomson and A. V. Martinent,4th Edition Oxford University Press (1986).
2. Basic English Usage by Michael Swan, Oxford Univ Pr (Sd) (January 1986). ISBN-10: 0194311872
3. Functional English In Aglobal Society: Vocabulary Building and Communicative Grammar by Nicanor L. Guintomary Ann R. Sibal Brian D. Villaverde Dept. of Languages, Literature and Humanities College of Arts and Sciences Southern Luzon State University (2012)
4. English Composition and Grammar: Complete Course by John E. Warriner, Harcourt Brace Jovanovich; Complete Course Benchmark Edition (January 1988). ISBN-10: 0153117362
5. Companion to English: Vocabulary (Learners Companion) by George Davidson, Prim-Ed Publishing (March 1, 2003). ISBN-10: 9814070904

Course Name: **Communication Skills**
Credit Hours: 3
Prerequisites: None

Objectives: At the end of the course the student should be able to know about the composition process, grammar and punctuation use, and the way how to communicate.

Learning Outcome:

- Display intermediates to advanced level English language skills extending from the Freshman English I course.
- Express an enhanced ability in the general verbal and non-verbal English language Communication Skills which can support real life Electronic Engineering settings requiring team work and leadership skills.
- Practice basic research and writing skills associated to research work, to help them in writing research papers for the contemporary Engineering courses.
- Exhibit such supporting language techniques and personality grooming which cater to the requirements of the corporate sector.

Course Outline:
What is Communication, The Importance of Communication, Communication Skills. The Communication Process. Perspectives in Communication. Factors Affecting Communication Perspective. Language as a Representational System. Internal Representation of Our World: Visual, Auditory & inaesthetic Representational System. Elements of Communication. Communication Styles. Listening: Self-Awareness, Pseudo Listening, Active Listening, Effective Listening, Total Listing. Types of Expression. Rules of Effective Expression. Body Language. Para-language and Meta-messages. Hidden Agendas. Language Models. Communication Styles. Assertiveness. Responding to Criticism. Making Contact. The Art of Conversation. Negotiations. Prejudgment. The Power of Validation. Validation Strategies. Influencing Others. Public Speaking. Preparing Formal Oral Presentations: Design elements, elements of effective Delivery, Tension & Nerves, Handle Questions, Handling Tough Situations, Common Mistakes & Their Remedies, Dealing with Unexpected Disasters, Presentation for International Audience, Dealing People with Disabilities. Interviewing. Elements of Effective Written Communication. Building Rapports.

Reference Materials:
1. Effective Communication Skills, MTD Training & Ventus Publishing ApS. 2010) ISBN 978 -87-7681-598-1 (TB1)
2. Messages: The Communication Skills Book by Matthew McKay PhD, Martha Davis PhD, and Patrick Fanning, New Harbinger Publications; 3rd Edition (March 3, 2009). ISBN-10: 1572245921
3. Secrets of Successful Presenters: A Guide for Successful Presenters by Dr. M. A. Pasha & Dr. S. Pasha, Lambert Academic Publishing 2012. ISBN-10:3659217557

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: Technical and Business Writing
Credit Hours: 3
Prerequisites: None

Objectives: To enable students with technical writings, writings in business. The reports, applications, leaflets, broachers', handbooks, research papers, manuals feasibility reports and documentation is the main objectives of the course.

Learning outcome:
- Demonstrate paragraph unity, support, and coherence
- Use transitions for clarity of thought and readability
- Construct all sentence types
- Recognize and correct major grammatical errors
- Edit their writing assignments
- Give constructive peer feedback
- Use the computer for assignment submissions

Course Outline:
Characteristics of Academic, Public, Work and Electronic Communities. Myths and Realities about Writing. Effective Writing: Discovering and Planning; Purpose, Thesis, and Audience; Drafting: Drafting Collaboratively, Drafting in Digital Environments; Revising, Editing, and Proofreading. Paragraphs: Unfocused Paragraphs, Incoherent Paragraphs, Poorly Developed Paragraphs, Special-Purpose Paragraphs. Unclear, Clear and Emphatic Sentences. Reasoning Critically. Reading Critically. Arguing Persuasively & Logically. Designing Documents. Writing in Online Communities. Speaking Effectively. Academic Writing for Social and Natural Sciences: Goals of Writing, Audiences, Writing Tasks, Types of Writing: Abstract, Informative Report, Lab Report, Research Report, Project Reports Public Writing: Goals of Public Writing, Public Audiences, Public Writing Tasks, Types of Public Writing, Public Flyer, Letter to the Editor. Researching and Writing: Types of Research Writing, Developing a Research Question, Developing a Preliminary Thesis, Creating a Research File and a Timeline, Reading and Note taking, Summarizing, Paraphrasing, and Synthesizing. Writing a Position Paper.

Reference Materials:
1. Writer's Companion – The Longman by Chris M. Anson, Robert A. Schwegler and Marcia F. Muth, Pearson Longman, 4th Edition 2007. ISBN10: 0-20556-252-3
2. Technical English: Writing, Reading, and Speaking by Pickett and Laster. 8th Edition
3. The Technical Writer's Companion by Alred, Gerald, Charles T. Brusaw and Walter E.Oliu, 3rd Edition. ISBN 0-312-25978-6.

University of Swat

Course Name: **Islamic Studies**
Credit Hours: 2
Prerequisites: None

Objectives: This course is aimed at: To provide Basic information about Islamic Studies, enhance understanding of the students regarding Islamic Civilization, improve Students skill to perform prayers and other worships and enhance the skill of the students for understanding of issues related to faith and religious life.

Learning Outcome: The students are able:
- To know about the basics of the religion of Islam.
- To know about the personal words of Allah Taa'la.
- To clear their minds about the sources of Shariah.
- To awake the students about their political, social, cultural economic and religious.
- They are able to understand the legal political, economic, social, moral and spiritual aspects of Islam and to implement in their daily lives

Course Outline: Introduction to Quranic Studies, Basic Concepts of Quran, History of Quran, Uloom-ul-Quran, Study of Selected Text of Holly Quran, Verses of Surah Al-Baqra Related to FaithVerse No -284-286), Verses of Surah Al-Hujrat Related to Adab Al-Nabi Verse No -1-18), Study of Selected Text of Holly Quran, Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.), Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment, Verses of Surah Al-Saf Related to Tafakar,Tadabar (Verse No-1,14) , Seerat of Holy Prophet S.A.W I, Seerat of Holy Prophet S.A.W II, Introduction To Sunnah, Selected Study from Text of Hadith, Introduction To Islamic Law & Jurisprudence, Islamic Culture & Civilization, Islamic Economic System, Political System of Islam, Islamic History, and Social System of Islam

Reference Materials:
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 Jurisprudence 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)

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: **Pakistan Studies**
Credit Hours: 2
Prerequisites: None

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 Outcome:
- Ability to know historical perspective, politics, contemporary Pakistan and ideological background of Pakistan
- Understanding about process of governance, national development, issues arising in modern age and posing challenges to Pakistan

Course Outline:
Historical Perspective, Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah, Indus Civilization, Muslim advent, Location and geo-physical features, Government and Politics in Pakistan, Political and constitutional phases, Contemporary Pakistan

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

University of Swat

Course Name: **Professional Practices**
Credit Hours: 3
Prerequisites: None

Objectives: To learn the professional approach of software development using latest technologies, security and copyright issues etc. The role of ethics in software development.

Learning Outcome: At the completion of this course, students will be able to:
- Work proficiently and effectively in small teams;
- Understand the need for lifelong learning for continuous professional development;
- Present technical material in an interesting manner for a non-technical audience;
- Explain in basic terms the ethical responsibilities of professional engineers and apply this knowledge in simple scenarios.

Course Outline:
Computing Profession, Computing Ethics, Philosophy of Ethics. The Structure of Organizations, Finance and Accounting, Anatomy of a Software House, Computer Contracts, Intellectual Property Rights, The Framework of Employee Relations Law and Changing Management Practices, Human Resource Management and IT, Health and Safety at Work, Software Liability, Liability and Practice, Computer Misuse and the Criminal Law, Regulation and Control of Personal Information. Overview of the British Computer Society Code of Conduct, IEEE Code of Ethics, ACM Code of Ethics and Professional Conduct, ACM/IEEE Software Engineering Code of Ethics and Professional Practice. Accountability and Auditing, Social Application of Ethics.

Reference Materials:
1. Professional Issues in Software Engineering by Frank Bott, Allison Coleman, Jack Eaton and Diane Rowland, CRC Press; 3rd Edition 2000). ISBN-10: 0748409513
2. Computer Ethics by Deborah G. Johnson, Pearson; 4th Edition January 3, 2009). ISBN-10: 0131112414
3. 3.A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet 3 rd Edition) by Sara Baase, Prentice Hall; 3rd Edition 2008). ISBN-10: 0136008488
4. 4.Applied Professional Ethics by Gregory R. Beabout, University Press of America 1993). ISBN -10: 0819193747.
5. 5.The Dark Side of Software Engineering: Evil on Computing Projects by Johann Rost and Robert L. Glass, Wiley-IEEE Computer Society Pr; 1st Edition (2011. ISBN -10: 0470597178

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: Introduction to Information and Communication Technologies
Credit Hours: 3 (2+1)
Prerequisites: None

Objectives: To learn the basic concepts of Computer system and its types, about hardware and its types, operating system and its types, application software and its types especially MS Office.

Learning Outcome: At the completion of this course, students will be able to know:
- The basic concepts of Computer system and its types
- Hardware and its types,
- Operating system and its types,
- Application software and its types especially MS Office
- Work practically in MS office

Course Outline:
Basic Definitions & Concepts, Hardware: Computer Systems & Components. Storage Devices, Number Systems, Software: Operating Systems, Programming and Application Software, Introduction to Programming, Databases and Information Systems, Networks, Data Communication, The Internet, Browsers and Search Engines, The Internet: Email, Collaborative Computing and Social Networking, The Internet: E-Commerce, IT Security and other issues, Project Week, Review Week

Reference Materials:
1. *Introduction to Computers* 6th International Edition, Peter, N. McGraw-Hill
2. *Using Information Technology: A Practical Introduction to Computer & Communications,* 6th Edition. Williams, S. McGraw-Hills.
3. *Computers, Communications & information: A user's introduction*, Sarah, E. Hutchinson. Stacey, C. Swayer.
4. *Fundamentals of Information Technology*, Alexis L Mathewsleon Leon Press.

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Computer Science – Core Courses

Course Name: **Micro Processor and Assemble Language**
Credit Hours: 3 (2+1)
Prerequisites: Digital Logic and Design

Objectives:
To learn the basic building blocks of computer system, their functions and the way these components interacts.

Learning Outcome: At the completion of this course, students will be able to know about:
- Microprocessor Bus Structure
- Addressing, Data and Control
- Arithmetic and Logic, Programmed Control, Stack and its operation
- Peripheral Control Interrupts, Assembler and Debugger
- Manipulate and translate machine and assembly code, Describe actions inside the processing chip.

Course Outline:
Microprocessor Bus Structure: Addressing, Data and Control, Introduction to Registers and Flags. Addressing Modes, Instruction sets including Data Movement, Arithmetic and Logic, Programmed Control, Stack and its operation. Peripheral Control Interrupts. Introduction to the Assembler and Debugger, Manipulate and translate machine and assembly code, Describe actions inside the processing chip.

Reference Materials:
1. *The Intel Microprocessor 8th ed*, Barry B Brey.
2. *Assembly Language for Intel-based Computers, 6th Ed* Irvine, http:// vig.prenhall.com/catalog/academic/product/0,1144,0132383101,00
*The 8086/8088 Microprocessor 4th Edition b*y Avtar Singh.

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: Theory of Automata
Credit Hours: 3
Prerequisites: None

Objectives:
To enable the students to understand the problem solving techniques using state machine, theoretical models and logic machines, language parsing mechanisms etc.

Learning Outcomes: At the completion of this course, students will be able to:
- Understand the problem solving techniques using state machine,
- Theoretical models and logic machines,
- Language parsing mechanisms and
- Computations

Course Outline:
Finite State Models: Language definitions preliminaries, Regular expressions/Regular languages, Finite automata FAs, Transition graphs TGs), NFAs, Kleene's theorem, Transducers automata with output), Pumping lemma and non regular language Grammars and PDA: Context free grammars, Derivations, derivation trees and ambiguity, Simplifying CFLs , Normal form grammars and parsing, Decidability, Context sensitive languages, grammars and linear bounded automata LBA), Chomsky's hierarchy of grammars Turing Machines Theory: Turing machines, Post machine, Variations on TM, TM encoding, Universal Turing Machine, Defining Computers by TMs.

Reference Materials:

1. *Introduction to computer theory,* Daniel I. A. Cohen, 2nd Edition 2. *Automata, Computability and Complexity: Theory and Applications,* by Elaine Rich, 2011 3.
2. *An Introduction to Formal Languages and Automata,* By Peter Linz, 4th edition, Jones & Bartlett Publishers, 2006
3. *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.
4. *Introduction to Automata Theory, Languages, and Computation*, John Hopcroft and Jeffrey Ullman, 2nd edition, 2001, Addison-Wesley.

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: **Design and Analysis of Algorithms**
Credit Hours: 3
Prerequisites: Data Structure and Algorithms

Objectives:
Introduces to students asymptotic performance of algorithm, methods of analysis, important paradigms for designing and analysis of algorithms, and synthesize efficient algorithms.

Learning Outcomes: At the completion of this course, students will be able to:
- Basic of algorithms and its analysis parameters
- Asymptotic performance of algorithm,
- Methods of analysis, important paradigms for designing and analysis of algorithms, and
- Synthesize efficient algorithms.

Course Outline:
Introduction; Asymptotic notations; Recursion and recurrence relations; Divide-and-conquer approach; Sorting; Search trees; Heaps; Hashing; Greedy approach; Dynamic programming; Graph algorithms; Shortest paths; Network flow; Disjoint Sets; Polynomial and matrix calculations; String matching; NP complete problems; Approximation algorithms.

Reference Materials:
1. *Introduction to Algorithms,* T. H. Cormen, C. E. Leiserson, and R. L. Rivest, MIT Press, McGraw-Hill, 3rd Edition, New York, NY, 2010.
2. *Algorithms in C++;* Robert Sedgewick

University of Swat

Course Name: Artificial Intelligence
Credit Hours: 3 (2+1)
Prerequisites: Data Structure and Algorithms

Objective: Explain the basic knowledge representation, problem solving, and learning methods of Artificial Intelligence. Understand the role of knowledge representation, problem solving, and learning in intelligent-system engineering.

Learning Outcomes: At the completion of this course, students will be able to learn:
- The basic concepts
- Knowledge representation and problem solving techniques
- Learning methods of Artificial Intelligence
- Understand the role of knowledge representation, problem solving, and learning in intelligent-system engineering.

Course Outline:
Artificial Intelligence: Introduction, AI Paradigms and Hypothesis, Intelligent Agents. Difference between Cybernetic Intelligence and Artificial Intelligence, Objectives and Scope of Weak AI and Strong AI, Problem-solving: Solving Problems by Searching, Informed Search and Exploration, Constraint Satisfaction Problems, Adversarial Search. Knowledge and reasoning: Logical Agents, First-Order Logic, Inference in First-Order Logic, Knowledge Representation. Planning and Acting in the Real World. Uncertain knowledge and reasoning: Uncertainty, Probabilistic Reasoning, Probabilistic Reasoning over Time, Making Simple Decisions, Making Complex Decisions. Learning: Learning from Observations, Knowledge in Learning; Learning Methods, Reinforcement Learning. Communicating, perceiving, and acting: Communication, Probabilistic Language Processing, Perception and Robotics. Introduction to LISP/PROLOG and Expert Systems ES) and Applications; Artificial General Intelligence, Issues in Safe AI, Introduction to Cognitive and Conscious Systems.

Reference Materials:
1. *Artificial Intelligence: Structures and Strategies for Complex Problem Solving:* International Edition by George F. Luger, 6th edition: Pearson Education, 2008.
2. *Artificial Intelligence: A Modern Approach,* by Stuart Jonathan Russell, Peter Norvig, John F. Canny, 3nd Edition, Prentice Hall.
3. *Prolog Programming for Artificial Intelligence*, Ivan Bratko, 3rd Edition, Addison Wesley, 2001.

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: **Computer Architecture and Organization**
Credit Hours: 3
Prerequisites: Digital Logic and Design

Objective: To have a thorough understanding of the basic structure and operation of a digital Computer. To discuss in detail the operation of the arithmetic unit including the algorithms & Implementation of fixed-point and floating-point addition, subtraction, multiplication & division, communicating with I/O devices and standard I/O Interfaces and the hierarchical memory system.

Learning Outcomes: At the completion of this course, students will be able to learn:
- The basic structure and operation of a digital Computer
- The details of the operation of the arithmetic unit including the algorithms & Implementation of fixed-point and floating-point
- Addition, subtraction, multiplication & division, communicating with I/O devices and
- Standard I/O Interfaces and the hierarchical memory system.

Course Outline:
The design of computer systems and components. Processor design, instruction set design, and addressing; control structures and microprogramming; memory management, caches, and memory hierarchies; and interrupts and I/O structures. Pipelining of processor Issues and Hurdles, exception handling, Parallelism, Multiprocessor Systems.

Reference Materials:
1. *Computer Architecture: A Quantitative Approach* by Hennessy & Patterson, Morgan & Kauffman Series 2006) 4 th Edition.
2. *Computer Organization & Design*: *The Hardware/Software Interface* By Patterson & Hennessy, Morgan & Kauffman Series (2008) 4th Edition.

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: **Compiler Construction**
Credit Hours: 3
Prerequisites: Theory of Automata

Objective: Explain the basic techniques that underlie the practice of Compiler Construction. The course will introduce the theory and tools that can be standarly employed in order to perform syntax-directed translation of a high-level Programming language into an executable code.

Learning Outcomes: At the completion of this course, students will be able to learn:
- The basic techniques that underlie the practice of Compiler Construction
- The course will introduce the theory and tools
- The tools that can be employed in order to perform syntax-directed translation of a high-level Programming language into an executable code.

Course Outline:

Introduction to interpreter and compiler. Compiler techniques and methodology; Organization of compilers; Lexical and syntax analysis; Parsing techniques. Types of parsers, top-down parsing, bottom-up parsing, Type checking, Semantic analyser, Object code generation and optimization, detection and recovery from errors.

Reference Materials:
1. *Compilers: Principles, Techniques, and Tools* By Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Contributor Jeffrey D. Ullman, Addison-Wesley Pub. Co., 2nd edition, 2006 Original from the University of Michigan
2. *Modern Compiler Design, b*y Dick Grune, Henri E. Bal, Ceriel J. H. Jacobs, Koen G. Langendoen, John Wiley, 2000.
3. *Modern Compiler Implementation in C,* by Andrew W. Appel, Maia Ginsburg, Contributor Maia Ginsburg, Cambridge University Press, 2004.
4. *Modern Compiler Design* by Dick Grune, Henri E. Bal, Ceriel J. H. Jacobs, Koen G. Langendoen, 2003, John Wiley & Sons.

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: Information Security
Credit Hours: 3
Prerequisites: Data Communications and Computer Networks

Objective: Explain the basic techniques that underlie the practice of Information Security. To strengthen internal control and prevent unauthorized and improper access to data, thereby ensuring the appropriate protection of information assets. To appropriately protect the confidentiality and integrity of information assets.

Learning Outcomes: At the completion of this course, students will be able to learn:
- The basic techniques that underlie the practice of Information Security
- The strengthen internal control and prevent unauthorized and improper access to data
- Thereby ensuring the appropriate protection of information assets
- To appropriately protect the confidentiality and integrity of information assets

Course Outline:
Basic notions of confidentiality, integrity, availability; authentication models; protection models; security kernels; Encryption, Hashing and Digital Signatures; audit; intrusion detection and response; database security, host-based and network-based security issues operational security issues; physical security issues; personnel security; policy formation and enforcement; access controls; information flow; legal and social issues; identification and authentication in local and distributed systems; classification and trust modeling; risk assessment.

Reference Materials:
1. *Computer Security: Art and Science*, Matthew Bishop
2. *Cryptography and Network Security* by William Stalling 6th Edition, 2012
3. *Principles of Information Security* 3rd E by Michael E. Whitman and Herbert J. Mattord

Computer Science – Supporting Courses

Course Name: **Numerical Computing**
Credit Hours: 3 (2+1)
Prerequisites: Calculus and Analytical Geometry

Objective: Numerical analysis is the study of algorithms that use numerical approximation for the problems of mathematical analysis. Numerical methods, based upon sound computational mathematics, are the basic algorithms underpinning computer predictions in modern systems science.

Learning Outcomes: At the completion of this course, students will be able to learn:
- Numerical analysis is the study of algorithms that use numerical approximation
- The problems of mathematical analysis
- Numerical methods, based upon sound computational mathematics
- The basic algorithms underpinning computer predictions in modern systems science

Course Outline:
The concepts of efficiency, reliability and accuracy of a method; Minimising computational errors; Theory of Differences, Difference Operators, Difference Tables, Forward Differences, Backward Differences and Central Differences. Mathematical Preliminaries, Solution of Equations in one variable, Interpolation and Polynomial Approximation, Numerical Differentiation and Numerical Integration, Initial Value Problems for Ordinary Differential Equations, Direct Methods for Solving Linear Systems, Iterative Techniques in Matrix Algebra, Solution of non-linear equations.

Reference Materials:
1. *Numerical Methods in Scientific Computing b*y Germund, D. Åke, B.
2. *Numerical Methods for Scientific Computing* by J. H. Heinbockel.
3. *Numerical Analysis* by I. A. Khubaza.
4. *Numerical Analysis and Programming* by Shan S Kuo.
5. *Numerical Analysis* by Berden, F.
6. *Numerical Analysis by* Gerald.

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: **Multivariate Calculus**
Credit Hours: 3
Prerequisites: Calculus and Analytical Geometry

Objective: Explain a clear understanding of the fundamental concepts of multivariable calculus and a range of skills allowing the students to work effectively with the concepts like Derivatives as rates of change, computed as a limit of ratios and Integrals as a 'sum,' computed as a limit of Riemann sums.

Learning Outcomes: At the completion of this course, students will be able to learn:
- The fundamental concepts of multivariable calculus
- Range of skills allowing the students to work effectively with the concepts like
    - Derivatives as rates of change,
    - Computed as a limit of ratios and
    - Integrals as a sum, computed as a limit of Riemann sums

Course Outline:
Functions of Several Variables and Partial Differentiation. Multiple Integrals, Line and Surface Integrals. Green's and Stoke's Theorem. Fourier Series: periodic functions, Functions of any period P-2L, Even & odd functions, Half Range expansions, Fourier Transform; Laplace Transform, Z-Transform.

Reference Materials:
1. Multivariable Calculus, 6th edition James, Stewart 2007 Cengage Learning publishers.
2. Calculus and Analytical Geometry, 6th edition. Swokowski, Olinick and Pence.1994.Thomson Learning EMEA, Ltd.
3. Multivariable Calculus, 5th edition Howard, A. Albert, H. 1995, John Wiley.

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: **Differential Equations**
Credit Hours: 3
Prerequisites: Calculus and Analytical Geometry

Objective: To explain how differential equations appear in real life and physical phenomena, and teach them the main three methods, namely analytic, geometric and numerical methods, for studying differential equations.

Learning Outcomes: At the completion of this course, students will be able to learn:
- Differential equations appear in real life
- Physical phenomena
- Teach them the main three methods, namely
    o Analytic,
    o Geometric and
    o Numerical methods, for studying differential equations.

Course Outline:
Ordinary Differential Equations of the First Order: Geometrical Considerations, Isoclines, Separable Equations, Equations Reducible to Separable Form, Exact Differential Equations, Integrating Factors, Linear First-Order Differential Equations, variation of Parameters. Ordinary Linear Differential Equations; Homogeneous Linear Equations of the Second Order, Homogeneous Second-Order Equations with Constant Coefficients, General Solution, Real Roots, Complex Roots, Double Root of the Characteristic Equation, Differential Operators, Cauchy Equation, Homogeneous Linear Equations of Arbitrary Order, Homogeneous Linear Equations of Arbitrary Order with Constant Coefficients, Non-homogeneous Linear Equations. Modelling of Electrical Circuits. Systems of Differential Equations. Series Solutions of Differential Equations. Partial Differential Equations: Method of Separation of variables, wave, Heat & Laplace equations and their solutions by Fourier series method.

Reference Materials:
1. Advanced Engineering Mathematics Michael, G.1996, Prentice Hall Publishers.
2. Advanced Engineering Mathematics, 7th edition, Erwin, K. 1993, John Wiley & Sons Inc.
3. A First Course in Differential Equation Zill. Prindle. Weber. Schmidt.1996. Brooks/Cole Publishing.
4. Differential Equations with Boundary-Value Problems, Dennis. G. Zill, Michael, R. Cullen. 1996, Brooks/Cole Publishing
5. Elementary Differential Equations with Applications C. H. Edwards. David, E. 1993. Penney, Prentice Hall.

Computer Science - Elective Courses and University Elective Courses

Course Name: Principles of Accounting
Credit Hours: 3
Prerequisites: None

Objectives: This is a basic course in financial accounting that covers the fundamental concepts and techniques of introductory accounting. Its focus includes a study of balance sheet accounting and the preparation and analysis of financial statements.

Learning Outcome:
- Apply basic computational techniques to solve quantitative financial accounting problems.
- Draw from financial information to construct a debit/credit transaction in good form
- Demonstrate knowledge of the business accounting cycle for the corporate form of business
- Identify and describe terms associated with financial accounting
- Prepare and interpret a multiple-step income statement, retained earnings statement, and classified balance sheet for a merchandising firm organized as a corporation
- Demonstrate knowledge of accounting for short-term liquid assets, long-term assets, current liabilities, long term liabilities and stock holders' equity.

Course Outline:
Introduction to Accounting, Accounting Principles, Book Keeping, Basics of Financial Statements, Adjustments to Financial Statements, The Cash Book, Bank Reconciliation, Control Accounts, Statement of Cash Flows, Financial Activities, Property, Plant and Equipment PPE), Accounting Errors, Accounting for Partnerships, Balance Sheet.

Reference Materials:
1. Fundamental Accounting Principles with Connect Plus by John Wild, Ken Shaw, and Barbara Chiappetta, McGraw-Hill/Irwin; 20th Edition December 27, 2010). ISBN-10: 0077505980
2. Financial & Managerial Accounting by Jan Williams, Sue Haka, Mark Bettner and Joseph Carcello, McGraw-Hill/Irwin; 16th Edition 2011). ISBN - 10: 0078111048
3. Principles of Managerial Finance by Lawrence J. Gitman and Chad J. Zutter, Prentice Hall; 13th Edition (2011). ISBN-10: 0136119468
4. Fundamentals of Financial Management by J. Van Horne and John M Wachowicz, Prentice Hall; 13th Edition (2008). ISBN-10: 0273713639.

University of Swat

Course Name: **Principles of Philosophy**
Credit Hours: 3
Prerequisites: None

Objectives: Students will obtain knowledge of the main philosophical terms and categories and the ways of philosophical thinking for better interpretation of recognized reality.

Learning Outcome:
- Be able to read philosophy; that is, to identify the thesis of a piece of philosophical writing and the arguments or evidence adduced in support of that thesis.
- Be able to write philosophy; that is, to present a claim in clear terms and to defend it in a logically coherent manner.
- Be able to reconstruct and debate some foundational issues in the Western philosophical tradition.

Course Outline:
The Nature of Philosophy, Philosophical Theories: History and Back Ground, Realism and Idealism, Monism and Dualism, Rationalism, Empiricism, Criticism, and Empiricism, The Start of Modern Philosophy, Perception and Reality, Knowledge, Belief and Logic. Space, Time, Causality and Substance, Mind & Body. Knowledge, Language. Science, Morality, Politics, Law, Metaphysics.

Reference Materials:
1. An Introduction to Philosophy by Jon Nuttall, Polity; 1st Edition July 29, 2002). ISBN-10: 0745616631
2. An Introduction To Philosophy by George Stuart Fullerton, CreateSpace Independent Publishing Platform (July 18, 2011). ISBN-10: 1463688881
3. Philosophy: An Introduction to the Art of Wondering by James L. Christian, Wadsworth Publishing; 11th Edition January 26, 2011). ISBN -10: 1111298084
4. Pleasures of Philosophy by Durant, Touchstone; Revised Edition December 31, 1999. ISBN -13: 978-0671581107
5. Philosophy Basics: A Jargon-Free Guide for Beginners by Doug Erlandson, Doug Erlandson (September 15, 2011). ASIN: B005NJRTUW

Course Name: **Principles of Psychology**
Credit Hours: 3
Prerequisites: None

Objectives: Students acquire the knowledge and skills to enable them to take up professional activity as a psychologist. In addition to academic psychological research, students engage in diagnostic, advisory, evaluative and psychotherapeutic tasks in the health and social care sectors, education, administration, business and industry. Students acquire a scientifically based academic aptitude for choosing or independently developing theories and methodologies for analysis, verification and assessment of psychological activities. They acquire the basis of a vocational profession and an identity as a psychologist.

Learning Outcome:
- Describe key concepts, principles, and overarching themes in psychology.
- Describe applications of psychology.
- Use scientific reasoning to interpret psychological phenomena.
- Demonstrate effective writing for different purposes

Course Outline:
Basics concepts of Psychology and Research Methods. Brain and Behaviour. Human Development. Sensation and Perception. States of Consciousness. Conditioning and Learning. Memory. Cognition, Language, Creativity, and Intelligence. Motivation and Emotion. Sex, Gender, and Sexuality. Personality. Health, Stress, and Coping. Social Behaviour

Reference Materials:
1. Psychology: Modules for Active Learning by Dennis Coon and John O. Mitterer, Wadsworth Publishing; 12th Edition January 1, 2011. ISBN -10: 1111342849
2. Introduction to Psychology by James W. Kalat, Wadsworth Publishing; 9th Edition (January 1, 2010). ISBN-10: 0495810762
3. Introduction to Psychology by Rod Plotnik and Haig Kouyoumdjian, Wadsworth Publishing; 9th Edition February 25, 2010. ISBN -10: 0495903442
4. Psychology by David G. Myers, Worth Publishers; 9th Edition January 10, 2009). ISBN-10: 1429215976

University of Swat

Course Name: **Network Security**
Credit Hours: 3
Prerequisites: System and Network Administration

Objective: To explain the policies adopted to prevent and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources. Network security involves the authorization of access to data in a network.

Learning Outcome:
- Define information security and outline its major components.
- Identify the major types of threats to information security and the associated attacks.
- Develop strategies to protect organization information assets from common attacks.
- Understand how security policies, standards and practices are developed.
- Understand the role of management in enforcing security policies, standards and practices.
- Identify the major techniques, approaches and tools used to discover network and system vulnerabilities.
- Apply foot printing, scanning, enumeration and similar techniques to discover network and system vulnerabilities.

Course Outline:
Security Concepts, Such as Confidentiality, Integrity, Authenticity, Availability etc. Symmetric and Asymmetric Cryptography and Their Uses; Key Distribution and Digital Signatures; Discretionary and Mandatory Access Control Policies for Confidentiality and Integrity. Communication Protocols for Authentication, Confidentiality and Message Integrity. Network Security; System Security, Intrusion Detection and Malicious Code. Security Models and Security Evaluation. Administration of Security. Legal Aspects of Computer Security.

Reference Materials:
1. Security in Computing by Charles P. Pfleeger and Shari Lawrence Pfleeger, Prentice Hall; 4th Edition (2006. ISBN -10: 0132390779
2. Network Security Fundamentals by Gert DeLaet and Gert Schauwers, Cisco Press; 1st Edition (September 18, 2004). ISBN-10: 1587051672
3. Network Security Bible by Eric Cole, Wiley; 2nd Edition (September 8, 2009). ISBN-10: 0470502495
4. Network Security Essentials: Applications and Standards by William Stallings, Prentice Hall; 4th Edition (March 22, 2010). ISBN-10: 0136108059

Course Name: Cloud Computing
Credit Hours: 3
Prerequisites: Internet Architecture and Protocols

Objectives: After completing this seminar, participants will be able to: Discuss, with confidence, what is cloud computing and what are key security and control considerations within cloud computing environments. Identify various cloud services. Assess cloud characteristics and service attributes, for compliance with enterprise objectives. Explain the four primary cloud category "types". Evaluate various cloud delivery models.

Learning Outcome: Students will be able to:

- Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
- Discuss system virtualization and outline its role in enabling the cloud computing system model.
- Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS.
- Analyze various cloud programming models and apply them to solve problems on the cloud.

Course Outline:
Overview of Distributed Computing, Emergence of Cloud Computing, Global Nature of the Cloud, Cloud-Based Service Offerings, Grid Computing, Reliability of Cloud Model, Benefits of Cloud Model, Legal Issues, Key Characteristics of Cloud Computing, Challenges for the Cloud. The Evolution of Cloud Computing. Web Services Delivered from the Cloud: Communication-as-a- Service CaaS), Infrastructure -as-a-Service, Monitoring-as-a-Service MaaS), Platform -as-a-Service PaaS), Software -as-a -Service SaaS), Infrastructure as a Service IaaS), Platform as a Service PaaS), Software as a Service SaaS). Building Cloud Networks. Virtualization. Federation, Presence, Identity, and Privacy in the Cloud. Security in the Cloud. Common Standards in Cloud Computing. End-User Access to Cloud Computing. Mobile Internet Devices and the Cloud.

Reference Materials:
1. Cloud Computing Implementation, Management, and Security by John W. Rittinghouse and James F. Ransome, Taylor & Francis Group, LLC 2010). ISBN 978 -1-4398-0680-7.
2. Cloud Computing Explained: Implementation Handbook for Enterprises by John Rhoton, Recursive Press (2009). ISBN-10: 0956355609.
3. Cloud Computing Bible by Barrie Sosinsky, Wiley; 1st Edition 2011). ISBN-10: 0470903562.

University of Swat

Course Name: **Object-Oriented Analysis and Design**
Credit Hours: 3
Prerequisites: Programming Fundamentals

Objectives: After the course, students should be able, To use an object-oriented method for analysis and design, To know techniques aimed to achieve the objective and expected results of a systems development process, To know different types of prototyping, To know how to use UML for notation

Learning Outcome: The students should be able:
- Be able to analyse information systems in real-world settings and to conduct methods such as interviews and observations
- Have a general understanding of a variety of approaches and perspectives of systems development, and to evaluate other IS development methods and techniques

Course Outline:
Principles of Object Technology. OOP Review. Principles of Modeling. OOA&D Overview. OO Development Process. Requirements Engineering, Analysis, and Specification: Requirements Engineering, Use Cases, Prototyping, Class Models. Interaction Diagrams. Verification and Validation. Architectural and Detailed Design. Class Diagrams. Interaction Diagrams. State Machines and Diagrams. Implementation, Package Diagrams. Activity Diagrams. OO Patterns, Verification and Validation. Note: Students may also be introduced to Object Diagram, Component Diagram, Package Diagram, Deployment Diagram, Network Diagram.

Reference Materials:
1. Applying UML and patterns: An introduction to Object-Oriented Analysis and Design and Iterative Development by Craig Larman, Prentice Hall; 3rd
   Edition (October 30, 2004). ISBN-10: 0131489062
2. Using UML: Software Engineering with Objects and Components by Perdita Stevens, Addison-Wesley; 2nd Edition February 13, 2006). ISBN -10:0321269675
3. Fundamental of Object-Oriented Design in UML by Meiler Page-Jones, Addison Wesley, 2000. ISBN: 020169946X.
4. The Unified Modeling Language User Guide by G. Booch, J. Rambaugh and I. Jakobson, Addison-Wesley Professional; 2nd Edition 2005). ISBN - 10:0321267974.
5. The Unified Modeling Language Reference Manual by James Rumbaugh, Ivar Jacobson and Grady Booch, Addison-Wesley Professional; 2nd Edition (2004. ISBN -10: 032171895X.

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: Database Administration
Credit Hours: 3
Prerequisites: Database Systems

Objectives: At the completion of this course, students should be able to do the following: Construct simple and moderately advanced database queries using Structured Query Language (SQL). Understand and successfully apply logical database design principles, including E-R diagrams and database normalization. Design and implement a small database project using Microsoft Access. Understand the concept of a database transaction and related database facilities, including concurrency control, journaling, backup and recovery, and data object locking and protocols. describe and discuss selected advanced database topics, such as distributed database systems and the data warehouse.

Learning Outcome:
- Understand the role of a database management system in an organization.
- Understand basic database concepts, including the structure and operation of the relational data model.
- Understand the role of the database administrator.

Course Outline:
Installation of DBMS; SQL* Plus; DBA Tools. DBMS Physical Structure & Architectural Components: Server, Instance, SGA, Shared Pool, Library Cache, Data Dictionary Cache, Large Pool, Processes. Startup and Shutdown Database. Managing Instances. Managing Files. Creating Database and Data dictionary. Managing Tablespaces. Operations with Tablespaces. Data File Management, Segments, Block. Managing Undo Data, Undo Data Statistics: Managing Tables and Users. Indexes Management, Maintaining Data Integrity, Constraints. Managing Privileges. Server Side Configuration. Client Side Configuration. Usage and Configuration of Oracle Shared Server. Backup and Recovery. Sizing Shared Pool, Sizing Buffer Cache, I/O Issues. Tuning Rollback Segments. Tuning Shared Servers, Types of Locks, Block Efficiency, Storage hierarchy, Avoiding Dynamic allocation, Statistics, PCTFREE and PCTUSED, Monitoring Index Usage.

Reference Materials:
1.Database Administration: The Complete Guide to DBA Practices and Procedures by Craig S. Mullins, Addison-Wesley Professional; 2nd Edition October 21, 2012). ISBN -10: 0321822943
2.Database Systems: A Practical Approach to Design, Implementation and Management by Thomas M. Connolly and Carolyn E. Begg, Addison-Wesley; 5th Edition (2009). ISBN-10: 0321523067

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: **Computer Game Development**
Credit Hours: 3
Prerequisites: Data Structures & Algorithms

Objectives: at the completion of this course, you will be able to: Discuss the history of electronic game development. Distinguish between the different game platforms and player modes. Distinguish between the different game goals and genres. Discuss various aspects of gameplay that can be used to design game interaction. Discuss the design and use of levels. Evaluate the game industry and market. Discuss the future of game design.

Learning Outcome:
- Define elements related to game strategy, theory, and gameplay.
- Apply story and character development to games. Discuss the use of the interface for game design. Use audio to enrich the game atmosphere.
- Identify the distinct roles and responsibilities of game development team members.
- Discuss the production and management of the game design process.
- Analyze games. Use game design software.
- Develop game design documentation. Design games.

Course Outline:
Introduction to Game Development, Platform and Player Modes, What Is The Framework? Goals And Genres? What Are The Possibilities? Player Elements, Player Motivation, Geographic, Psychographics. Demographics, Gender, Generation, Rating, Applying Player Market to Platform. Story and Character Development: Classic Charters, Traditional Story Structure, Story Element. Plot, Game Story Devices, Game Characters. Character Development Element, Point-of-view, Visual Character Development, Verbal Character Development, Movement. Visual Character Development, Verbal Character Development, Movements, Character Description, Game Storytelling and Documentation. Gameplay: Rules to Play, Interactivity Modes, Game theory, Challenges, Balance. Levels: Level Design, Structure, Time, Space. Interface: Playe-Centerd Design, Interface & Game Feature, Interface Types, Usability. Audio: Importance of Game Audio, Sound Effect, Voiceover, Music. Company Role, Team Roles, Tools, Business Side of Game Development. Production and Management, Development Phases, Game Documentation.

Reference Materials:
1. Game Development Essentials by Jeannie Novak, Delmar Cengage Learning; 3rd Edition (August 17, 2011). ISBN-10: 1111307652
2. Game Development Essentials: An Introduction by Jeannie Novak, Delmar Cengage Learning; 3rd Edition (2011). ISBN-10: 1111307652
3. Game Development Essentials: Mobile Game Development by Kimberly Unger and Jeannie Novak, Delmar Cengage Learning; 1st Edition (2011). ISBN-10: 1418052655
4. Game Development Essentials: Game Interface Design by Kevin Saunders and Jeannie Novak, Delmar Cengage Learning; 2nd Edition 2012). ISBN-10: 1111642885

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: **Mobile Computing**
Credit Hours: 3
Prerequisites: None

Objectives: This course introduces the basic concepts and principles in mobile computing. This includes the major techniques involved, and networks & systems issues for the design and implementation of mobile computing systems and applications.

Learning Outcome:
To understand the key components and technologies involved and to gain hands-on experiences in building mobile applications.

Course Outline:
Introduction to Mobile Computing, Architecture of Mobile Software Applications, Mobile Development Frameworks and Tools. Creating Consumable Web Services for Mobile Devices. Memory Management. Mobile Applications. Mobile User-Interface Design. Dynamic Linking. Concurrency. Managing Resources. Introduction to Mobile Application Development with Android. Introduction to Mobile Application Development with IOS. Introduction to Mobile Application Development with Windows Phone. Introduction to Mobile Application Development with Blackberry.

Reference Materials:
1. Programming Mobile Devices: An Introduction for Practitioners by Tommi Mikkonen, Wiley; 1st Edition (March 19, 2007). ISBN-10: 0470057386.
2. Professional Mobile Application Development by Jeff McWherter & Scott Gowell, Wrox; 1st Edition (September 4, 2012). ISBN-10: 1118203909
3. Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML by Reza B'Far and Roy T. Fielding, Cambridge University Press (2004). ISBN-10: 0521817331.
4. Fundamentals of Mobile and Pervasive Computing by Frank Adelstein, Sandeep KS Gupta, Golden Richard III and Loren Schwiebert, McGraw-Hill Professional; 1st Edition (2004 . ISBN-10: 0071412379.

University of Swat

Department of Computer and Software Technology
BOS Minutes (BS Computer Science)

Course Name: E-Commerce
Credit Hours: 3
Prerequisites: Web Technologies

Objectives: Develop, deploy, and maintain electronic commerce (e-commerce) applications.

Learning Outcome:
• Understand the process of setting up an interactive web site, displaying product catalogue, deploying
• shopping carts, handling credit card transaction
• Identify e-business models.
• Describe issues of concern in the design and development of an e-commerce.
• Discuss the techniques and technologies used to process online payments.
• Understand the process of maintaining security on the E-commerce site.
• Have knowledge in XML technology related to Business-to-Business E-commerce.
• Discuss the issues facing businesses that are considering worldwide marketing of their products and services.
• Discuss how the "digital divide" is impacting on our society and impact of the Internet on education.

Course Outline:
An overview of e-Commerce & Models, Planning an e-Commerce Framework, Managing Products and Categories, Product Variations and User Uploads, Enhancing the User Experience, The Shopping Basket, The Checkout and Order Process, Shipping and Tax, Discounts, Vouchers, and Referrals, Checkout, Taking Payment for Orders, User Account Management, Administration: Dashboard, Managing Products and Categories, Managing Orders, Customers, Refunds, Voucher Codes, Shipping, Deploying, Security, and Maintenance, SEO.

Reference Materials:
1. PHP 5 E-commerce Development by Michael Peacock, Packt Publishing January 20, 2010). ISBN -10: 184719964X
2. Introduction to E-Commerce by Jeffrey F. Rayport, McGraw-Hill, 2nd Edition (2007. ISBN -10: 0071232664
3. E-Commerce by Kenneth Laudon and Carol Guercio Traver, Prentice Hall; 8th Edition (2011). ISBN-10: 0138018812
4. e-Business and e-Commerce How to Program by Harvey M. Deitel, Paul J. Deitel and Tem R. Nieto, Prentice Hall; 1st Edition 2000). ISBN -10: 013028419X
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