## University of Science & Technology, Bannu, Khyber Pakhtunkhwa, Pakistan



**Program Bachelor of Science in Computer Science BS(CS)** 

Department of Computer Science, University of Science & Technology, Bannu, KPK, Pakistan

> BS (Computer Science) 4 Years Program For Session 2016-2020 Onwards

Semester-I (Credit Hours = 15)								
Course	Course Title	Credit	Marks Distribution					
Code		Hours	Theory	Internal	Practical	Total		
CGE-1	Information and Communication Technologies	3(2+1)	65	20	15	100		
CCC-1	Programming Fundamentals	4(3+1)	65	20	15	100		
CSC-1	Basic Electronics	3	65	20	15	100		
CSC-2	Calculus and Analytical Geometry	3	80	20		100		
CGE-2	Islamic Studies	2	48	12		60		

Semester-II (Credit Hours = 15)							
Course	Course Title	Credit	Marks Distribution				
Code		Hours	Theory	Internal	Practical	Total	
CCC-2	Object Oriented Programming	4(3+1)	65	20	15	100	
CSSC-1	Differential and Integral Calculus	3	80	20		100	
CCC-3	Discrete Structures	3	80	20		100	
CGE-3	English Comprehension	3	80	20		100	
CGE-4	Pakistan Studies	2	32	08		40	

#### Semester-III (Credit Hours = 19)

Course	Course Title	Credit	Marks Distribution			
Code		Hours	Theory	Internal	Practical	Total
CSC-3	Statistics and Probability	3	80	20		100
CGE-5	Communication Skills	3	80	20		100
CSC-4	Linear Algebra	3	80	20		100
CCC-4	Digital Logic and Design	3	65	20	15	100
CCC-5	Data Base Systems	4(3+1)	65	20	15	100
CSUE-1	Introduction to Marketing	3	80	20		100

#### Semester-IV (Credit Hours = 17)

Course	Course Title	Credit	Marks Distribution			
Code		Hours	Theory	Internal	Practical	Total
CCC-6	Operating Systems	4(3+1)	65	20	15	100
CSCC-1	Theory of Automata	3	80	20		100
CSEC-1	Web Technologies	4(3+1)	65	20	15	100
CCC-7	Data Structures and Algorithms	3(2+1)	65	20	15	100
CSSC-2	Differential Equations	3	80	20		100

Semester-V (Credit Hours = 18)

Course	Course Title	Credit	Marks Distribution					
Code		Hours	Theory	Internal	Practical	Total		
CCC-8	Software Engineering	3	65	20	15	100		
CSCC-2	Compiler Construction	3	80	20		100		
CSCC-3	Microprocessors and Assembly language	3	65	20	15	100		
CCC-9	Data Communication	3(2+1)	65	20	15	100		
CSCC-4	Design and Analysis of Algorithms	3	65	20	15	100		
CSUE-2	Fundamentals of Economics	3	80	20		100		

Semester-VI (Credit Hours = 19)								
Course	Course Title	Credit	Marks Distribution					
Code		Hours	Theory	Internal	Practical	Total		
CSEC-2	Object Oriented Software Engineering	3 (2+1)	65	20	15	100		
CSEC-3	Computer Networks	3 (2+1)	65	20	15	100		
CGE-6	Technical and Business Writing	3	80	20		100		
CSUE-3	Fundamentals of Management	3	80	20		100		
CSEC-4	Visual Programming	4 (3+1)	65	20	15	100		
CSUE-4	Data Science	3	80	20		100		

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#### Semester-VII (Credit Hours = 18)

Course	Course Title	Credit	Marks Distribution			
Code		Hours	Theory	Internal	Practical	Total
CCC-10	Human Computer Interaction	3	65	20	15	100
CSEC-5	Data warehousing	3	65	20	15	100
CSCC-5	Artificial Intelligence	3	65	20	15	100
CGE-7	Professional Practices	3	80	20		100
CSUE-5	Human Resource Management	3	80	20		100
CSSC-4	Software Project Management	3	65	20	15	100
CCC-11	*Project					

\* The Marks of Project/Thesis will be awarded after Project/Thesis evaluation in 8th Semester

#### Semester-VIII (Credit Hours = 15)

Course	Course Title	Credit	Marks Distribution			
Code		Hours	Theory	Internal	Practical	Total
CSEC-6	Introduction to Data mining	3	65	20	15	100
CSCC-6	Computer Architecture	3	65	20	15	100
CSCC-7	Information Security	3	65	20	15	100
CCC-11	Project	6				200

#### Explanation of Course Codes:

CCC = Computing Core Course

CSC = Computing Supporting Core Course

CGE = Computing General Education Course

CSCC = Computer Science Core Course CSSC = Computer Science Supporting Course

CSUE = Computer Science University Elective Course

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Total Credit Hours: 133 Nomenclature: Bachelor of Science in Computer Science (BSCS) This Program is equivalent to MCS/M.Sc. Computer Science. Eligibility Criteria: F.A (With Mathematics) / F.Sc. Pre Engineering / Equivalent

## **SEMESTER-I** (Course#1)

#### CGE-1: INFORMATION AND COMMUNICATION TECHNOLOGIES Credit Hours: 3

#### **Total Marks: 100**

Basic definitions and concepts, Brief history of computers and their applications, Hardware: Computer Systems and components, Primary and secondary storage, Input and Output devices, Software: System Software and Application Software, Various categories of application software and their usage, programming languages, Data communication and networking, internet and world wide web, Internet searching techniques, E-learning, Introduction to Free Lancering.

- Introduction to Computer by Peter Norton.
- Fundamental of Electronic data processing By S.Jaiswal
- Using Information Technology By Brian K. Williams.

## **SEMESTER-I** (Course#2)

#### CCC-1: PROGRAMMING FUNDAMENTALS Credit hours: 4 (3+1)

#### **Total Marks: 100**

Introduction to computer Programming and problem analysis. Translation of algorithms into programs, introduction to programming with C Elements of Language: Standard I/O Statements and functions, Data Types (Primary and Secondary Data Types),Operators, Expression, Selection Structure Repetition structure, Arrays, One and Two dimensional arrays, Functions, Parameter passing, return statement, Recursion, Storage classes, Pointers, array and pointers, functions and pointers, Structures, Declaration, initialization, array of structures, Files, reading and writing of data into Text files.

#### **Reference Material:**

• *C* Programming By Robert Lafore. C++ Programming By Robert Lafore.

## **SEMESTER-I** (Course#3)

#### CSC-1: BASIC ELECTRONICS Credit hours: 3

#### **Total Marks: 100**

Fundamentals of Semiconductor physics: Band theory, semiconductors (intrinsic and extrinsic), pn junction, pn junctions as a rectifier, clipper and clamper circuits, zener diode and voltage regulator, LED and LCD etc., *Transistors:* Bipolar Junction transistors, BJT biasing circuits, Q-point, BJT as a switch, BJT amplifiers, classes of amplifiers, power amplifiers, Metal oxide transistors, nMOS, pMOS and CMOS inverters circuits. Introduction to A/D and D/A conversion circuits.

- Freedman and Young, University Physics, (10<sup>th</sup> and higher editions).
- *Resnick, Halliday and Krane, College Physics* (6<sup>th</sup> and higher edition).

## **SEMESTER-I** (Course#4)

## CSC-2: CALCULUS AND ANALYTICAL GEOMETRY Credit hours: 3

#### Total Marks: 100

Real and Complex Numbers, Functions and Graphs, Sequences, Differentiation. Chain Rule.

Implicit Differentiation and its Applications. Rolls and Mean value theorems.

Approximations. Newton's and picard's Methods. Maxima/Minima. Graph sketching.

L'Hospitals Rule. Integration as limit of sum. and its applications.

#### **Reference Material:**

• Calculus and Analytic Geometry by SwoKowski, Olinick and Pence

### **SEMESTER-I** (Course#5)

#### CGE-2: ISLAMIC STUDIES Credit Hours: 2

#### **Total Marks: 60**

Introduction to Quranic studies, Basic concepts and history of Quran, Uloom-ul-Quran, verses of surah Al-Baqra related to Faith(Verse no 284-286), verses of surah Al-Hujrat related to Adab al-Nabi (Verse no 1-18), verses of surah Al-Mumanoon related to characteristics of Faithful (Verse no 1-11)

**Seerat of Holy Prophet (S.A.W):**Life of Muhammad Bin Abdullah (Before Prophet hood), Life of Holy Prophet (S.A.W) in Makkah and Madina, Important lessons delivered from the life of Holy Prophet (S.A.W) in Makkah and Madina.

**Introduction to Suunah:**Basic concepts of Hadith, History and kinds of Hadith, Uloom-ul-Hadith, Sunnah and Hadith, Legal position of sunnah

**Introduction to Islamic Law and Jurisprudence:**Introduction to Islamic Law and Jurisprudence, History and importance of Islamic law and Jurisprudence, sources of Islamic law and Jurisprudence, Nature of differences in Islamic law, Islam and Sectarianism.

**Islamic Culture and Civilization:** Basic concepts of Islamic Culture and Civilization, historical development of Islamic Culture and Civilization, characteristics, Islamic Culture and Civilization and contemporary issues.

**Islam and Science:**Basic concept of Islam and science, Contributions of muslims in the development of science, Quranic and Science.

**Islamic Economics System:** Basic concepts of Islamic economic system, Means of distribution of wealth in Islamic economics, Islamic concept of riba, Islamic ways of trade and commerce

**Political System of Islam:** Basic concepts of Islamic Political system, Islamic concept of Sovereignty, Basic institutions of govt. in Islam

Islamic History: Period of Khilafat-e-Rashida, Period of Ummayyads, Period of Abbasids

**Social System of Islam:** Basic concepts of social system of Islam, elements of family, ethical values of Islam

- Hameed Ullah Muhammad, "Emergence of Islam", IRI, Islamabad
- Hameed Ullah Muhammad, "Muslim Conducts of State", IRI, Islamabad Hameed Ullah Muhammad, "Introduction to Islam", IRI, Islamabad

## **SEMESTER-II** (Course#1)

#### CCC-2: OBJECTED ORIENTED PROGRAMMING Credit hours: 4 (3+1)

#### **Total Marks: 100**

Object Oriented Technology: Design programming concepts, Objects and classes; procedure and loop, Data abstraction and classes, class constructors and destructors, Automatic Conversion and type casts for classes, conversion functions, Dynamic money and classes, Class Inheritance, Deriving a class, inheritance, virtual functions, Multiple inheritance with polymorphism, Defining and driving C++ classes overloading operator. Streams and Files. Function and class templates.

- *C*++: *How to Programme, Deitel and Deitel, 4/e, Pearson.*
- *C++ Programming By Robert Lafore.*

## **SEMESTER-II (Course#2)**

## CSSC-1: DIFFERENTIAL AND INTEGRAL CALCULUS Credit Hours : 3

#### Total Marks: 100

Infinite series. Vectors. Functions of several variables. Limits and continuity. Directional and Partial derivatives. Vector Analysis: Vector Functions and derivatives. Line Integral. Multiple Integral: Double and Triple Integrals. Areas and Volumes.

- Thomas and Finney : Calculus and Analytics Geometry, Addison Wisky
- Schaum's Easy Outline: Differential and Integral Calculus By : Ayres, Franks: Mendelson, Elliott
- The Differential and Integral Calculus by Augustus De Morgan Anton Howard: Calculus with Analytics Geometry, Wiley

## **SEMESTER-II** (Course#3)

#### CCC-3: DISCRETE STRUCTURES Credit Hours: 3

#### Total Marks: 100

Introduction to discrete structure, logic, propositional equivalences, predicates and quantifiers, Sets, set operations, functions, sequences and summations, methods of proves, mathematical induction, recursive definitions, the basics of counting, the pigeon principle, permutation and combinations, binomial coefficients, recurrence relation, inclusion exclusion, relations and their properties, representing relations, equivalence relations.

- Discrete Mathematics By Seymour Lipschutz, Mark Lipson
- Discrete Mathematics and Its Applications, 5th edition; by Rosen; McGraw-Hill; 0-07-242434-6.

## **SEMESTER-II (Course#4)**

#### CGE-3: ENGLISH COMPREHENSION Credit hours: 3

#### **Total Marks: 100**

Grammar, Parts of Speech (Noun, Pronoun, Adjective verb, adverb, conjunction, interjection), Sentence Construction, Sentence: Kinds simple, compound complex, negative, interrogative clauses. Punctuation: Capitalization, signs of punctuation. Voice: Active, Passive. Narration: Direct, Indirect composition. Letter writing (social and business letters), Comprehension and précis writing.

#### **Reference Material:**

Warriner's English Grammar and Composition, John E. Warriner

## **SEMESTER-II (Course#5)**

### CGE-4: PAKISTAN STUDIES Credit Hours:2

#### **Total Marks: 40**

#### **Historical Perspective**

Ideology rationale with special reference to Sir Syed Ahmad Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah Factors leading to Muslim separatism,

**People and Land**, Indus civilization, Muslim advent, Location and geo-physical features.

#### **Government and Politics in Pakistan**

Political and constitutional phases:

1947-58, 1958-71, 1971-77, 1877-88, 1988-99, 1999 onward

#### **Contemporary Pakistan**

Economics institutions and Issues, Society and social structure, Ethnicity, foreign policy and challenges, Futuristic outlook of Pakistan

#### **Reference Material:**

Burki, Shahid Javed, State and Society in Pakistan, the Macmillan press LTd 1980. Akbar, S. Zaidi. Issues in Pakistan's Economy. Karachi: Oxford University Press,2000. Mehmood, safdar. Pakistan Political Roots and development. Lahore, 1994.

## **SEMESTER-III (Course#1)**

#### CSC-3: STATISTICS AND PROBABILITY Credit Hours: 3

#### **Total Marks: 100**

Measures of central tendency and dispersion. Moments and Kurtosis. Sampling and Probability. Random variables. Chebychev inequality. Binomial, Poisson and normal distributions. Correlation and Regression (simple), Shannon entropy, Dining cryptographic algorithm.

- Introduction to Statistics by Wallpole
- Elements of Statistics by Sher Muhamamd Chaudry

## **SEMESTER-III (Course#2)**

#### CGE-5: COMMUNICATION SKILLS Credit Hours:3

#### **Total Marks: 100**

Levels of communication: Interpersonal, Interpersonal, Mass Communication Internal communication: Top-down, bottom-up. Horizontal, vertical, verbal non-verbal.

Process of writing (Seven Cs), Observing, audience collecting, composing, drafting and revising. Listening skills. Mechanism of Business letter writing and memo. Various types of business letter and job applications. Proposal writing. Conducting meetings and small group communication and presentation skill. Developing an outline, facts and opinions.

#### **Reference Material:**

• Business English, Vawdrey, Stoddard, Bell.

## **SEMESTER-III (Course#3)**

#### CSC-4: LINEAR ALGEBRA Credit hours:3

#### Total Marks: 100

Vectors, Vector Spaces, Matrices & DeSemesterinants, Cofactor and Inverse, Rank, Linear Independence, Solution of system of Linear systems, Positive Definite matrix, Linear Transformations, Operations on matrices, Inner products, orthgonality and least squares, Eigenvalue & Eigenvectors. Applications to Systems of Equations and to Geometry, Singular Value Decomposition

- Bernard Kolman, David Hill, Elementary Linear Algebra with Applications, 9<sup>th</sup> edition, Prentice Hall PTR, 2007.
- Gilbert Strang, Strang, Brett Coonley, Andy Bulman-Fleming, Andrew Bulman-Fleming, Strang's Linear Algebra And Its Applications, 4<sup>th</sup> edition, Brooks/Cole, 2005
- Howard Anton, Chris Rorres, Elementary Linear Algebra: Applications Version, 9<sup>th</sup> edition, Wiley, 2005.
- David C. Lay, Linear Algebra and Its Applications, 2<sup>nd</sup> edition, Addison-Wesley, 2000.

## **SEMESTER-III (Course#4)**

#### CCC-4: DIGITAL LOGIC AND DESIGN Credit hours:3

#### **Total Marks: 100**

Number Systems, Boolean algebra, logic gates simplification. Algebraic manipulations, k-map method, combinational circuits. Half adders, full adders, decoders, encoders, multiplexers and demultiplexers. Applications of combinational circuits, sequential circuits. Flip flop, registers ,counters.

#### **Reference Material:**

• Digital Logic and Design by ,M. Morris Mano.

## **SEMESTER-III (Course#5)**

#### CCC-5: DATABASE SYSTEMS Credit hours: 4(3+1)

#### **Total Marks: 100**

Basic Concepts and Definitions. Data versus Information. Traditional File Processing System: Disadvantages. Database approach: Advantages. Components of Database environment.

Database Development Process:Three-schema Architecture. Conceptual Database Design. Logical Database Design. Physical Database Design.

Database Design:Hierarchical Database Design. Network Database Design. Introduction to Relational Model.

Relational Database Model: Entity. Attributes. Relationships. Degree of Relationships. Relational Database Model: Definitions, History. Integrity Constraints. Domain Constraints. Entity Integrity. Referential Integrity. Creating Relational Tables.

Relational Algebra:Introduction. Syntax. Semantics. Union. Intersection. Difference. Product. Selection. Projection. Join.

Relational Calculus: Introduction. Domain calculus. Tuple calculus. Algebra Vs Calculus.

Normalization:Primary Key. Foreign Key. Candidate Key. Dependencies. Functional Dependency. Partial Dependency. Transitive Dependency. Normalization: 1NF, 2NF, 3NF.

SQL: DML Statements. DDL Statements. DCL Statements. Joins: Equi-Join, Inner Join, Outer Join, Left Outer Join, Right Outer Join. Stored Functions. Stored Procedures. Database Triggers. Cursors, Database security and integrity, introduction to concurrency and recovery.

- Database Systems, C.J.Date, Addison Wesley Pub. Co. (2004).
- Database Systems: A Practical Approach to Design, Implementation and Management,
- R.Connolly and P.Begg, Addison-Wesley Pub. Co (2003).

## **<u>SEMESTER-III (Course#6)</u>**

CSUE-1: Credit Hours:3

## INTRODUCTION TO MARKETING

**Total Marks: 100** 

## **SEMESTER-IV** (Course#1)

#### CCC-6: OPERATING SYSTEMS Credit Hours: 4 (3+1)

#### **Total Marks: 100**

Introduction to operating systems, purpose and function of operating system. Batch, time sharing, real time operating system. Process and threads management. Concurrent process, synchronization and mutual exclusion.. resource allocation and deadlock detection and prevention. Scheduling, memory management. Real storage organization management and strategies. Virtual storage organization (Segmentation and pagging).

#### **Reference Material:**

- Operating Systems; Internals and Design Principles By William Stallings.
- Applied Operating Systems Concepts, 6<sup>th</sup> Edition, Silberschatz A.,

Peterson, J.L., & Galvin P.C. 1998.

• *Modern Operating Systems*, 2<sup>nd</sup> Edition, Tanenmaum A.S., 2001

## **SEMESTER-IV** (Course#2)

#### CSCC-1: THEORY OF AUTOMATA Credit Hours: 3

#### **Total Marks: 100**

Language definitions preliminaries, Regular expressions, Regular languages, Finite automata (FAs), NFAs, DFA's, Conversion of NFA to DFA using C-clouser and Sub set methods, non-regular language Grammars: Context free grammars, Derivations, derivation trees and ambiguity, Associativity, left recursion, Left factoring, first and follow sets, Parsing, top down and bottom up parsing, Recursive decent parsing, non-recursive descent parsing, shift reduce parsing, construction of predictive parse table, push down automata and Turing machines.

- Introduction to Computer Theory, Denial Cohen, John Wiley & Sons, Inc.
- K.L.P Mishra, Theory of Computation.

## **SEMESTER-IV** (Course#3)

#### CSEC-1: WEB TECHNOLOGIES Credit Hours:4

#### **Total Marks: 100**

Overview of protocols (HTTP, HTTPS, TCP/IP), Overview of 3-tier Architecture, Web Based Applications Architecture, Developing Front End Applications: Front End Development Tools, HTML, CSS, DHTML, Server and Client side scripting (emphasizing implementations in PhP), Introduction to Event Driven Programming, Interactive Development Environments (IDE's), Object-oriented design, reuse, the user interface, Database interfacing: introduction to Database Application Development. Java Script

#### **Reference Material:**

• PHP Bible 2nd Edition by Tim Converse (Author), Joyce Park (Author) HTML AND CSS: DESIGN AND BUILD WEBSITES, BY JON DUCKETT

• JavaScript: A Beginner's Guide, Third Edition (by John Pollock)

## **SEMESTER-IV** (Course#4)

#### CCC-7: DATA STRUCTURES AND ALGORITHMS Credit Hours:3

#### **Total Marks: 100**

Introduction to data structures, Linear and Non Linear Data structures, Static and dynamic data structures, Abstraction and Abstract Data Types, Introduction to algorithm, Basic notation and basic algorithm, algorithms for various data structures, arrays their storage and retrieval techniques, stack, Queue, Operations on stack and queue, related algorithms, Linked lists, One way and two way Linked Lists and their related algorithms, trees, general and binary trees, tree Semesterinologies, Tree construction and traversing techniques, Polish Notation, Heaps and Heap sort, Hashing.

- Data Structures and Algorithms By Mark Allen Weise.
- Data Abstraction and Problem solving with C++, Frank M. Carrano

### **SEMESTER-IV** (Course#5)

#### CSSC-2: DIFFERENTIAL EQUATIONS Credit Hours: 3

#### **Total Marks: 100**

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.

- Advanced Engineering Mathematics Michael, G.1996, Prentice Hall Publishers.
- Advanced Engineering Mathematics, 7th edition, Erwin, K. 1993, John Wiley & Sons Inc. A First Course in Differential Equation Zill. Prindle. Weber. Schmidt.1996., Brooks/Cole Publishing

## **SEMESTER-V** (Course#1)

#### CCC-8: SOFTWARE ENGINEERING Credit hours: 3

#### **Total Marks: 100**

Introduction to software engineering, phases in software development, software development process models. Software requirement specification, planning and scheduling, software requirement specification, COCOMO model, project scheduling, system design, configuration management. System analysis and design concepts and principles, coding and testing fundamentals.

- Software Engineering, Pankaj Jalot
- Software Engineering: A Practioner's Approach, Roger Pressman, McGraw-Hill, 2001.

## **SEMESTER-V** (Course#2)

#### CSCC-2: COMPILER CONSTRUCTION Credit hours: 3

#### **Total Marks: 100**

Introduction to programming language ideas and Semesterinology introduction to compiling, lexical analysis, symbol tables, parsing, syntax directed translation, type checking, run-time organization, inSemesterediate code generation, code generation, code optimization.

#### **Reference Material:**

 Compiler Design and Construction, by Alfred V. Aho, Ravi Sethi, Hardcover 2nd edition, 1987, Van Nostrand Reinhold; ISBN: 0317636367

## **SEMESTER-V** (Course#3)

#### CSCC-3: MICROPROCESSORS AND ASSEMBLY LANGUAGE Credit Hours: 3

#### **Total Marks: 100**

Intel based Microprocessor (8086) Architecture: Bus Structure, Addressing, Data and Control, Memory Organization and Structure (Static RAM, Dynamic RAM), Introduction to Registers and Flags, Data Movement, Arithmetic and Logic, Programme Control, Subroutines. Objectives and Perspectives of Assembly Language, Addressing Modes, Introduction to the Assembler and Debugger, Manipulate and translate assembly code, Minimum mode, maximum mode, Interrupts, DMA

- Irvine, Assembly Language for Intel-based Computers, 5th ed, Prentice Hall, 2007. Computer Organization and Design, The Hardware/Software Interface, 4th ed, by David A. Patterson and John L. Hennessy, 2008. Elsevier Publishers.
- Microprocessors.... By Douglas V.Hall

## **SEMESTER-V** (Course#4)

#### CCC-9: DATA COMMUNICATIONS Credit hours: 3

#### **Total Marks: 100**

Introduction: An introduction to communications. Modes of communication. Basic concepts: Line configuration, topology, transmission mode, category of networks. OSI model: Introduction, layered architecture, function of the layers. Signals: Analog and digital signals, Periodic and A periodic signals, Time and frequency domains. Encoding and Modulation: Digital-to-digital conversion, Analog-to-digital conversion, Digital-to-analog and Analog-toanalog conversion. Transmission media: Guided and unguided media, transmission impairment, performance. Multiplexing: Introduction, Space-division, Frequency-division, Time-division and wave-division multiplexing. Error detection and correction: Types of errors, detection, VRC, LRC, CRC, Checksum, Error correction ( single-bit, Hamming code). Data Link Control: Line discipline, Flow control, and Error control. TCP/IP protocol suit.

- Data Communication and Networking; 4<sup>th</sup> edition, By Behrouz A. Forouzan
- Data and Computer Communications; William Stallings, Prentice-Hall Sixth Edition.

## **SEMESTER-V** (Course#5)

#### CSCC-4: DESIGN AND ANALYSIS OF ALGORITHMS Credit hours:3

#### **Total Marks: 100**

Introduction to algorithms, time and space trade off, Efficiency of algorithms, Rate of growth, Asymptotic notation, Complexity of algorithms,  $O,\Omega$ ,  $\theta$  notations, sorting and searching algorithms and their complexities, fundamental algorithmic strategies: divide and Conquer, Greedy Approaches, Dynamic programming, Graph algorithms, Graph representation and traversing, Spanning trees, Minimum spanning trees, Shortest paths.

#### **Reference Material:**

• Introduction to Algorithms by Thomas H. Coreman.

## **SEMESTER-V** (Course#6)

#### CSUE-2: FUNDAMENTALS OF ECONOMICS Credit Hours: 3

#### Introduction

Definition of Economics, Scope of Economics, Micro and Macro Economics, Importance of study of Economics.

#### **Demand Analysis**

Meaning and types of demand, Law of demand, Demand Shifters, Change in demand and change in quantity demanded, Elasticity of demand, its types and measurement of price elasticity of demand.

#### Supply

Meaning of supply, Law of supply, Supply shifters, Elasticity of supply.

#### Market

Meaning of market, Classification of market, DeSemesterinants of market, Perfect and imperfect competition.

#### **National Income**

Meaning of national income, concepts of national income, methods to measure national income, difficulties in measuring national income

#### Inflation

Meaning of inflation, types and causes of inflation, methods to control inflation.

#### **International Trade**

Meaning of international trade and home trade, Theories of trade, Advantages and disadvantages of international trade.

#### **Reference Material:**

- Priciples of Economics by Saeed Nasir
- Principles of Micro Economics by Gregory Ruffin
- Elements of Economics by Akbar Adil

## Total Marks: 100

## **SEMESTER-VI (Course#1)**

## CSEC-2: OBJECT ORIENTED SOFTWRE ENGINEERING Credit Hours:3

#### **Total Marks: 100**

Object oriented software engineering(Object oriented concepts & principles, Object Identification, Object oriented design), User interface design, Software configuration management, Software quality assurance, Software reuse, Client/Server Software Eng. ,Computer Aided Software Engineering.

### **Reference Material:**

• Software Engineering 9<sup>th</sup> Edition by Sommervillel

## **SEMESTER-VI (Course#2)**

#### CSEC-3: COMPUTER NETWORKS USING APPLICATION, TRASPORT AND NETWORKS LAYERS PROTOCOL Credit Hours: 3

#### **Total Marks: 100**

Introduction to computer networks, network requirements and layered architectures. ISO reference model. Data encoding/framing, Ethernet and FDDI. Network layers and WANs. IP and Routing, cell switching and ATM, bridges, Internetworking-the global internet. End to End protocols, UDP, TCP, and RPC. Application layer, Routing and routed protocol: RIP, OSPF, IGRPand EIGRP, DHCP, the domain name system(DNS), and the WWW protocols.

- Computer Networks; 3<sup>rd</sup> Edition By Andrew S.Tanenbaum
- *Computer networks: a systems approach*, Larry Peterson, Bruce Davie, Princeton Univ., Princeton.
- Computer Networking: A Top-Down Approach Featuring the Internet, 2/e, James F Kurose, Keith W Ross, Addison Wesley 2003. ISBN: 0-201-97699-4

## **SEMESTER-VI (Course#3)**

### CGE-6: TECHNICAL AND BUSINESS WRITING Credit Hours : 3

#### **Total Marks: 100**

Writing technical reports, research reports, research papers, and memos. Drafting, revising and editing compositions derived from science and technology to develop skills in narration, persuasion, analysis and documentation.

#### **Reference Material:**

• Greenfield, T., Research Methods, Guidance for Postgraduates, Arnold, 1996, 034064629.

## **SEMESTER-VI** (Course#4)

#### CSUE-3: FUNDAMENTALS OF MANAGEMENT Credit Hours:3

#### **Total Marks: 100**

Introduction Definition- Importance (Role of Management) - Management as a Science or as an Art – Historical Evaluation – Principles of Management – Characteristics of Management, School of Management: Management by Custom School – Scientific Management School – Human Behavior School of management – The Social System School – Management Process School.

Planning: Nature and purpose of planning – Vital aspect of planning – steps in planning – Major types of management plans – M.B.O. Management by objectives – Merits and demerits of planning,Organizing: Nature and purpose of organizing – Line and Staff Authority and its relationship- Basic Departmentation, Staffing: Nature and Importance of Staffing – Recruitment and Selection of manager, Controlling: Introduction – Types of controlling – Social Controlling Techniques.

#### **Recommended Books:**

- Terry/Franklin. Principles of Management 8<sup>th</sup> Edition
- *R Satya Raju and A Parthasarthy (2003) Management Text and Cases.*

## **SEMESTER-VI (Course#5)**

#### **CSEC-4: VISUAL PROGRAMMING**

#### **Credit Hours: 4**

#### **Total Marks: 100**

.net framework, components of .net framework, Visual basic.net basics, Integrated development environment, programming fundamentals, procedures, console applications, windows applications, windows forms, MDI forms, Basic ActiveX controls, Advanced Controls, exception handling, file handling and Graphics, ADO.net, Data access with ADO.Net, user control creation, web forms, introduction to object oriented programming in visual basic.net.

- Visual Basic.Net Programming; Black Book By Steven Holzner.
- Microsoft Visual Basic.Net Step by Step; Michael Halvorson.
- Visual Basic.Net By Deitel & Deitel.

## **SEMESTER-VI (Course#6)**

## CSUE-4 Data Science

#### Credit Hours: 3

#### **Total Marks: 100**

### 1. Introduction: What is Data Science?

- Big Data and Data Science hype and getting past the hype
- Why now? Datafication
- Current landscape of perspectives
- Skill sets needed

## 2. Statistical Inference

- Populations and samples
- Statistical modeling, probability distributions, fitting a model
- Intro to R

## 3. Exploratory Data Analysis and the Data Science Process

- Basic tools (plots, graphs and summary statistics) of EDA
- Philosophy of EDA
- The Data Science Process
- Case Study: RealDirect (online real estate firm)

## 4. Three Basic Machine Learning Algorithms

- Linear Regression
- k-Nearest Neighbors (k-NN)
- k-means

## 5. One More Machine Learning Algorithm and Usage in Applications

- Motivating application: Filtering Spam
- Why Linear Regression and k-NN are poor choices for Filtering Spam
- Naive Bayes and why it works for Filtering Spam
- Data Wrangling: APIs and other tools for scrapping the Web

## 6. Feature Generation and Feature Selection (Extracting Meaning From Data)

- Motivating application: user (customer) retention
- Feature Generation (brainstorming, role of domain expertise, and place for imagination)
- Feature Selection algorithms
- Filters; Wrappers; Decision Trees; Random Forests

## 7. Recommendation Systems: Building a User-Facing Data Product

- Algorithmic ingredients of a Recommendation Engine
- Dimensionality Reduction
- Singular Value Decomposition
- Principal Component Analysis
- Exercise: build your own recommendation system

## 8. Mining Social-Network Graphs

- Social networks as graphs
- Clustering of graphs
- Direct discovery of communities in graphs

- Partitioning of graphs
- Neighborhood properties in graphs

## 9. Data Visualization

- Basic principles, ideas and tools for data visualization
- Examples of inspiring (industry) projects
- Exercise: create your own visualization of a complex dataset

## **10. Data Science and Ethical Issues**

- Discussions on privacy, security, ethics
- A look back at Data Science
- Next-generation data scientists

## **Recommended** books

- Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline.O'Reilly. 2014.
- Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
- Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
- Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
- Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online)
- Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science.(Note: this is a book currently being written by the three authors. The authors have made the first draft of their notes for the book available online. The material is intended for a modern theoretical course in computer science.)
- Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014.
- Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.

### **SEMESTER-VII (Course#1)**

#### CCC-10: HUMAN COMPUTER INTERACTION Credit hours: 3

#### **Total Marks: 100**

HCI- Introduction, Evolution of HCI, HCI under Cognitive Psychology, Human Processor Models, Human Input Output Channels, Perception, Vision, Visual Perception, Color Theory, Hearing Perception, Haptic Perception Movement and its Perception, Memory Thinking, Computer Input Output Channel (Devices), Input Devices, Text Entry Devices, Hand Writing Recognition (Recognizing the Pen), Speech Recognition, Positioning and Pointing Devices, Display Devices, Physical Controls, Environment and Bio Sensing, Interaction Frameworks, Norman's Interaction Model, Abowd and Beale Model, Interaction Styles (WIMP, Command-line etc), Usability Norman's Design Principles for Usability, Usability and its related aspects, Ergonomics/Human Factor, User Experience, User Engagement, Accessibility, Human/User Centered Design, HCI in Software Development Life Cycle, Human Centered Design Process, Evaluation Techniques, Heuristic Evaluation, Cognitive Walkthroughs, Pluralistic walkthroughs, Formal Usability Inspections, Feature Inspections, Videotaped User Testing

- HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science by John Carroll.
- Usability Engineering: Scenario-Based Development of Human Computer Interaction by Mary Rosson, John Carroll, Mary Beth Rosson
- Human-Computer Interaction 3rd Edition by Alan Dix, Janet E. Finlay, Gregory D. Abowd, Russell Beale.

## **SEMESTER-VII (Course#2)**

#### CSEC-5: DATA WAREHOUSING Credit Hours:3

#### Total Marks: 100

Introduction to the business context for data warehousing and decision support systems. Features & Architecture of data warehouses & data marts: comparison with operational application database design.Data warehouses & OLTP; OLAP, ROLAP, MOLAP. Modelling of data warehousing & data marts: star and snowflake schema; cubes, fact tables and dimensional tables. Role of metadata. ETL. ETL and Analysis tools in enterprise data warehousing packages

- > Data Warehousing Fundamentals by Paulraj Ponniah
- > The Data Warehouse Toolkit by Ralph Kimball

## **SEMESTER-VII (Course#3)**

#### CSCC-5: ARTIFICIAL INTELLIGENCE Credit hours: 3

#### **Total Marks: 100**

Human Intelligence and Artificial Intelligence. Tuning test, branches of A.I. Robotics: components, laws, types, (Intelligent vs. Non Intelligent) and applications. Natural language processing: natural and computer languages, natural language understanding, syntax, semantics, methodology, pragmatics, discourse analysis, cohesion and coherence, resolution of anaphora and anaphora, ambiguity, ellipses, communication, monolingual dictionary design, prepositional logic, predicate logic .Natural language generation, expert systems, characteristics of expert systems, uses and usefulness of expert systems, structure of expert systems, Speech recognition and generation: How speech recognition systems work, speaker dependent and speaker independent system, Types of speeches: IWR, CWR, CSR, Applications of speech recognition. Introduction to computer vision and Neural Network.

#### **Reference Material:**

• Expert Systems and its Applications Understanding Artificial Intelligence

## **SEMESTER-VII (Course#4)**

#### CGE-7: PROFESSIONAL PRACTICES Credit hours: 3

#### **Total Marks: 100**

Historical, social, and economic context of Computing (software engineering, Computer Science, Information Technology); Definitions of Computing (software engineering, Computer Science, Information Technology) subject areas and professional activities; professional societies; professional ethics; ethical hacking, professional competency and life-long learning; uses, misuses, and risks of software; information security and privacy; business practices and the economics of software; intellectual property and software law (cyber Law); social responsibilities, software related contracts, Software house organization. Introduction to certificate authorities (IC square, EC concept and OSWP). Introduction to Software Process Improvement (SPI).

#### **Reference Material:**

• Professional Issues in Software Engineering M.F. Bott et al.

## **<u>SEMESTER-VII (Course#5)</u>**

CSUE-5: HUMAN RESOURCE MANAGEMENT Credit hours: 3

**Total Marks: 100** 

## SEMESTER-VII (Course#6)

## CSSC-4 Software Project Management

#### **Credit Hours: 3**

**Total Marks: 100** 

#### **Introduction to Software Project Management:**

- Role of management in software development
- Measuring your software organization
- Software planning guidelines.
- Project tracking and configuration

#### **Software Development Problems:**

- Basic Problems
- Risk Analysis

#### Software Development under contract:

- Cost plus Fixed price dilemma
- Request for proposal
- Unsolicited proposal
- Solicited proposal
- Statement of work

#### **Software Development Cycle:**

- Concept phase
- Requirement phase
- Design phase
- Implementation phase
- Integration and test phase
- Maintenance phase

#### Managing software Engineers and handling large projects:

- Team leader
- Democratic teams
- Chief engineer team
- Expert teams
- Stepwise requirement
- WBS
- Handling large projects

#### **Project support Functions:**

- Software quality assurance
- Software testing

#### **Project scheduling and estimates:**

- Scheduling activities and milestones
- GANT chart
- PERT chart

**Introduction to Project Management Professional (PMP) Introduction Hubstaff tool for tracking** 

#### **Recommended Books:**

- SPM by EM Bennatan
- Quality Software Management: Systems thinking Book by Gerald Weinberg

## **SEMESTER-VII**

#### CCC-11: PROJECT Credit hours:

Note: Marks of software Project/Thesis will be awarded after the Evaluation of Project/Thesis in 8<sup>th</sup> Semester.

## **SEMESTER-VIII** (Course#1)

#### CSEC-6: INTRODUCTION TO DATA MINING Credit Hours: 3

#### **Total Marks: 100**

Concepts of Data mining, data pre-processing (noisy and missing data, data normalization and discretization), outlier detection, Data mining learning methods, association rule mining, clustering, classification, fundamental of other algorithms to data mining, decision trees, rules, patterns and trends. Introduction to data mining tools.

- Data Mining: Concepts and Techniques, 3rd Edition Jiawei Han, Micheline Kamber, Jian Pei; 2011
- Data Mning: Concepts, Models, Methods, and Algorithms, 2nd Edition, Mehmed Kantatardzic, 2011.

## **SEMESTER-VIII** (Course#2)

#### CSCC-6: COMPUTER ARCHITECTURE Credit Hours: 3

#### **Total Marks: 100**

Fundamentals of Computer Design including performance measurements & quantitative principles. Principles of Instruction Set Design, Operands, addressing modes. RISC and CISC architectures. Pipelining Overview. Memory Hierarchy Design, Cache Design, Main Memory, Storage Systems, Parallelism.

- Computer Organization and Architecture; Designing for Performance 7<sup>th</sup> Edition By Willaim Stallings
- John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach, 3rd Edition, Morgan Kaufmann Publishers, 2002.

## **SEMESTER-VIII** (Course#3)

#### CSCC-7: INFORMATION SECURITY Credit Hours:3

#### **Total Marks: 100**

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. Socket programing and introduction to privacy.

#### **Reference Materials:**

- Computer Security: Art and Science, Matthew Bishop
- Internet sources.
- Cryptography and Network Security by William Stalling 6th Edition,
  2012 Principles of Information Security 3rd E by Michael E.
  Whitman and Herbert J. Mattord

## **SEMESTER-VIII (Final Year Project)**

#### CCC-10: PROJECT Credit Hours: 6

#### **Total Marks: 200**

The project will be started in Semester 7<sup>th</sup> but marks will be awarded in Semester 8<sup>th</sup>

## **Recommendations**

## **Total Number of Credit Hours: 136**

# Total Marks : 4300

Nomenclature: Bachelor of Science in Computer Science (BSCS)

This Program is equivalent to MCS/M.Sc. Computer Science. This Nomenclature is applicable to all Sessions (2007-2011, 2008-2012, 2009-2013, 2010-2014, 2016-2020 onwards.

Eligibility Criteria: F.A (With Mathematics) / F.Sc. Pre Engg: / Equivalent