Department of Computer Science
Government College University Faisalabad

Road Map for Affiliated Colleges under Semester System

BS (Computer Science) Session 2017-21

Semester 1

Course Code	Course Title	Credit Hours
CSI-303	Introduction to ICT	3(3-0)
CSI-301	Programming Fundamentals	4(3-1)
ENG-322	English Composition & Comprehension	3(3-0)
MTH-323	Calculus and Analytical Geometry	3(3-0)
LNG-321	Chinese Language	3(3-0)
	Total	**16**

Semester 2

Course Code	Course Title	Credit Hours
CSI-304	Digital Logic and Design	3(3-0)
CSI-302	Object Oriented Programming	4(3-1)
ENG-421	Communication & Presentation Skills	3(3-0)
STA-324	Probability and Statistics	3(3-0)
PHY-323	Applied Physics	3(3-0)
ECO-408	Issues in Pakistan Economy	3(3-0)
	Total	**19**

Semester 3

Course Code	Course Title	Credit Hours
CSI-403	Computer Organization & Assembly Language	3(3-0)
CSI-401	Data Structure and Algorithms	3(2-1)
CSI-405	Discrete Structures	3(3-0)
CSI-411	Professional Practices	3(3-0)
MTH-423	Differential Equations	3(3-0)
MTH-424	Linear Algebra	3(3-0)
	Total	**18**

Semester 4

Course Code	Course Title	Credit Hours
CSI-406	Design & Analysis of Algorithms	3(3-0)
CSI-402	Operating Systems	4(3-1)
CSI-404	Theory of Automata	3(3-0)
CSI-408	Numerical Computing	3(3-0)
BBA-506	Human Resource Management	3(3-0)
	Total	**16**

Semester 5

Course Code	Course Title	Credit Hours
CSI-505	Compiler Construction	3(3-0)
CSI-503	Database Systems	4(3-1)
SWE-503	Software Engineering-I	3(3-0)
MTH-324	Multivariable Calculus	3(3-0)
SOC-555	Psychology	3(3-0)
	Total	**16**

Semester 6

Course Code	Course Title	Credit Hours
CSI-508	Artificial Intelligence	3(3-0)
CSI-512	Computer Networks	4(3-1)
CSI-506	Web Design and Development	3(2-1)
CSI-504	Distributed Database Systems	3(2-1)
ENG-510	Technical & Business Writing	3(3-0)
	Total	**16**

Semester 7

Course Code	Course Title	Credit Hours
CSI-615	Mobile and Application Development	3(2-1)
SWE-603	Software Engineering-II	3(3-0)
CSI-621	Parallel & Distributed Computing	3(3-0)
CSI-619	Information Security	3(3-0)
PST-321	Pakistan Studies	3(3-0)
	Total	**15**

Semester 8

Course Code	Course Title	Credit Hours
CSI-616	Fundamental of Data Mining	3(3-0)
CSI-604	Computer Graphics	3(2-1)
CSI-630	Final Year Project	6(0-6)
ISL-321	Islamic Studies/Ethics	3(3-0)
	Total	**15**

Grand Total= 131

Semester-1

Course Name: Programming Fundamentals

Course Structure: Lectures: 3, Labs: 1 **Credit Hours: 4**

Prerequisites: None

Objectives: The course is designed to familiarize students with the basic structured programming skills. It emphasizes upon problem analysis, algorithm designing, and program development and testing.

Course Outline: Overview of computers and programming. Overview of language for e.g. C language C. Basics of structured and Modular programming. Basic Algorithms and problem solving, development of basic algorithms, analyzing problem, designing solution, testing designed solution. Fundamental programming constructs, translation of algorithms to programs, data types, control structures, functions, arrays, records, files, testing programs.

Reference Material:

1. Problem Solving and Program Design in C / 6E
   Hanly & Koffman
   Addison-Wesley | Published: 02/06/2009
   ISBN-10: 0321535421 | ISBN-13: 9780321535429
2. C How to Program, 5/E
   (Harvey & Paul) Deitel & Deitel, ISBN-10: 0132404168 ISBN-13: 9780132404167 Publisher: Prentice Hall Copyright: 2007

Course Name: Introduction to ICT

Course Structure: Lectures: 3, Labs: 0   **Credit Hours: 3**

Prerequisites: None (first semester course)

Objectives:

This course focuses on a breadth-first coverage of the use of computing and communication technologies to solve real life problems; including computing environments, general application software like word processing, visual presentation applications, tabular data manipulation, DBMS, WWW, Email management systems, Virus, Anti-Virus and Spam Protection; Introduction to the basic computing hardware (main building blocks), operating systems, data networks; software engineering and communication technology along with social and ethical issues. An introduction of the program of study in computing for which this course is being taught (CS, IT, SE etc.). The course attempts to provide every student a set of productivity tools that they will be able to use for the rest of their lives.

Course Outline:

Number Systems, Binary numbers, Boolean logic, History computer system, basic machine organization, Von Neumann Architecture, Algorithm definition, design, and implementation, Programming paradigms and languages, Graphical programming, Overview of Software Engineering and Information Communication Technology, Operating system, Compiler, DBMS, Computer networks and internet, WWW, web mail applications, Computer graphics, AI, Viruses and Anti-Viruses, Use of office productivity tools, such as word processors, spreadsheets, presentation applications, etc., Social, Ethical, Professional and Legal Issues, and overview of the complete program of studies in computing and its structure.

Suggested Text Book:

1. Introduction to Computers by Peter Norton, 6th Edition, McGraw-Hill SiE, ISBN 0-07-059374-4.

Reference Material:

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

Course Name: English Comprehension and Composition
Course Structure: Lectures: 3, Labs: 0, Credit Hours: 3.
Objectives: Enhance language skills and develop critical thinking.
Course Contents:
Reading and Study skills, Note –taking on reading, Precis writing, Critical thinking skills, Dictionary Skills, Develop your own study reading system (detective novels), enhancing vocabulary,

For EAP & EFF if they are part of required degree
(Technical writing, Report writing (formal + informal report), writing of research proposal, writing of research paper, Interviews, Job interviews (face to face)and Telephonic Interviews)

- READING: Topic sentence, identify main idea, distinguish between Fact & Opinion, Skimming & Scanning, SQ3R, Notes taking techniques, Analyzing techniques in paragraph structure, identify writer's intent (cause effect, reasons, comparison & contrast), making notes by using different techniques (tables, mind maps, lists, graphs etc), comprehension paragraph
- WRITING: Self-expression in writing. Difference between Paragraph and Essay writing Descriptive, narrative, discursive, argumentative. Comprehension paragraphs
- ACADEMIC WRITING: How to write a proposal for research paper/term paper. Difference between Summary & Review writing (Paragraphing optional). How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency)
- REPORT WRITING: technical, progressive etc.

Note: Extensive reading is required for vocabulary building (Newspapers, story books, daily writing, learning, movies, magazines and Detective novels).
Recommended Books:
a) Essay Writing and Academic Writing
　　1. Writing. Advanced by Ron White. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 435407 3 (particularly suitable for discursive, descriptive, argumentative and report writing).
　　2. College Writing Skills by John Langan. Mc=Graw-Hill Higher Education. 2004.
　　3. Patterns of College Writing (4th edition) by Laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press.
b) Presentation Skills
c) Reading
　　1. The Mercury Reader. A Custom Publication. Compiled by norther Illinois University. General Editiors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and Maurice Scharton. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students).
　　2. Reading and Study Skills by John Langan
　　3. Study Skills by Riachard Yorky

Course Name: Calculus and Analytic Geometry

Course Structure: Lectures: 3, Labs: 0   **Credit Hours:** 3

Prerequisites: None

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

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

Reference Material:

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

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Course Name: **Chinese language**
Course Structure: lectures: 3　　　　**Credit Hours:** 3
Objectives: This course is designed for students who have little or no prior knowledge of Mandarin Chinese. The main focus of this course is to develop the Student's oral communication skills in Mandarin. This course aims to help Students acquire basic tools to enable them to further in future, such as by mastering the Pinyin system, and by introducing them to basic Mandarin sentence patterns. Students will also learn how to read and Write several Chinese characters. By the end of the course, students should be able to engage in simple conversations in Mandarin.

Course Outline: Introduction to Mandarin Chinese ,Chinese Basic Language phonetic transcription (Pinyin), Strokes of Chinese characters, Common Greetings and Every day Expressions ,Making Introductions ,Numbers ,Talking about Your Family, Pointing Objects Out, Saying Where, how ,why and what ,Focus on Verbs ,Time Expressions, about weather, countries and nationalities ,Making Appointments ,name of body parts, Talking about Plans, part of speech ,likes and dislike sports ,fruits name color names ,seasons ,directions, eatery things, Hobbies, and Habits ,Shopping & Talking about Prices ,Sentence patterns, writing paragraph(related to daily conversation) buy things, buying ticket(train ticket, aero plane ticket ,cinema ticket) letter writing technique, Speak simple sentences Chinese Grammar & Simple conversations in different language situations , 50 characters(counting, date etc) ,the correct pronunciation and intonation Chinese language skills of listening, speaking, reading and writing and some of the culture.

Reference Material:
1. HSK Standard course 1, LEAD AUTHOR Jiang Liping other AUTHORS Wang Fang, Wang Feng, Liu liping.
2. Lets learn Chinese together,MS. Nuzhat Farooq.
3. HSK 1 vocabulary.

Semester-2

Course Name: Object Oriented Programming

Course Structure: Lectures: 3, Labs: 1   **Credit Hours:** 4

Prerequisites: Programming Fundamentals

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

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

Reference Material:
1. C++ How to Program, 6/E
   (Harvey & Paul) Deitel & Deitel ISBN-10: 0136152503
   ISBN-13: 9780136152507 Publisher: Prentice Hall
2. Java How to Program, 7/E
   (Harvey & Paul) Deitel & Deitel ISBN-10: 0132222205 ISBN-13:
   9780132222204 Publisher: Prentice Hall

Course Name: Digital Logic and Design
Course Structure: Lectures: 3 / Labs: 0 **Credit Hours:** 3
Prerequisites: Discrete Structures, Introduction to Computing
Objectives: This course introduces the concept of digital logic, gates and the digital circuits. Further, it focuses on the design and analysis combinational and sequential circuits. It also serves to familiarize the student with the logic design of basic computer hardware components.
Course Outline:
Overview of Binary Numbers, Boolean Algebra, switching algebra, and logic gates, Karnaugh Map and Quin-McCluskey methods, simplification of Boolean functions, Combinational Design; two level NAND/NOR implementation, Tabular Minimization, Combinational Logic Design: adders, subtracters, code converters, parity checkers, multilevel NAND/NOR/XOR circuits, MSI Components, design and use of encoders, decoders, multiplexers, BCD adders, and comparators, Latches and flip-flops, Synchronous sequential circuit design and analysis, Registers, synchronous and asynchronous counters, and memories, Control Logic Design, Wired logic and characteristics of logic gate families, ROMs, PLDs, and PLAs, State Reduction and good State Variable Assignments, Algorithmic State Machine (ASM) Charts, Asynchronous circuits, Memory systems, Functional organization, Multiprocessor and alternative architectures: Introduction to SIMD, MIMD, VLIW, EPIC; systolic architecture; interconnection networks; shared memory systems; cache coherence; memory models and memory consistency, Performance enhancements, Contemporary architectures.
Reference Material:
Digital Design, 2nd Ed., M. Morris Mano, Prentice Hall, 1991.
Practical Digital Logic Design and Testing, P K Lala, Prentice Hall, 1996.

Course Name: Communication and Presentation Skills
Course Structure: lectures: 3, Labs: 0, credit hours: 3.
Objectives: Enable the students to meet their real life communication needs.
Course contents: The seven C's of communication, Levels of communication, The process of communication, Types of communication (in detail), Flow of communication, Communication Networks in an organization, Formal Network, Informal Network, Principals of effective communication and barriers to communication, Basic Skills (Writing, Listening, Speaking, Reading..).

- **LISTENING SKILLS:** What is listening? Types of listening, Objectives & Barriers to listening, Note taking tips. Improved by AV aids used & recommended by the teacher.
- **ORAL/SPEAKING SKILLS:**
  - PRESENTATION SKILLS: Personality development (emphasis on content, style and pronunciation). Successful persuasive public speaking, Importance of oral communication, Effective Presentative strategies, organizing & preparing outline, visual aids.
  - INTERVIEWS: Types of interviews, tips for successful interview.
- **WRITING**: Paragraph, Essay with different types, Letters & its types, memo writing, Reports, Proposal, Research paper, Term paper, Thesis, Review writing, minutes of meetings.
- **READING SKILLS:** Definition & Importance of reading, levels & requirements, how to improve reading skills & study skills as below.
  - STUDY SKILLS: Skimming and Scanning, Intensive and extensive, Speed reading, Summary, main idea and critical summary.

RCOMMENDED BOOKS:

a) Grammar
1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6
b) Writing
1. Intermediate by Marie-Chrisitine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).
2. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).
3. Mecnakshi Raman & Sangeeta Technical Communication.
4. Murphy, Effective Business Communication, 7th edition.
c) Reading
1. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0
2. Reading and Study Skills by John Langan
3. Study Skills by Riachard Yorky

Course Name: Probability and Statistics

Course Structure: Lectures: 3, Labs: 0   **Credit Hours:** 3

Prerequisites: None

Objectives: To introduce the concepts of data analysis, presentation, counting techniques, probability and decision making.

Course Outline: Introduction to Statistics, Descriptive Statistics, Statistics in decision making, Graphical representation of Data Stem-and Lead plot, Box-Cox plots, measures of central tendencies and dispersion, moments of frequency distribution; Counting techniques, introduction to probability, sample space, events, laws of probability, Conditional probability and Baye's theorem with application to random variable (Discrete and continuous) Binomial, Poisson, Geometric, Negative Binomial Distributions; Exponential Gamma and Normal distributions. Regression and Correlation, Estimation and testing of hypotheses, use of elementary statistical packages for explanatory Data analysis.

Reference Material:

1. Ronald Walpole, Myers, Myers, Ye, "Probability & Statistics for Engineers & Scientists", 8th edition, 2008, **Prentice Hall** Publisher.
2. Lay L. Devore, Probability and Statistics for Engineering and the Sciences, 2003, Duxbury Publishers.
3. G. Cowan, *Statistical Data Analysis*, 1998, Clarendon, Oxford.

Course Name: **Applied Physics**

Course Structure: Lectures: 3, Labs: 0   **Credit Hours:** 3

Course Outline

Vector, Properties of vectors, Position, Velocity and acceleration vectors, Motion with constant acceleration, Motion in three dimensions with constant acceleration, Newton's laws in three dimensional vectors form, Projectile motion, Drag forces and the motion of projectiles, Momentum, Linear and angular momentum, Impulse and momentum, Conservation of momentum, Two body collision, Center of mass, Two particles system, Many particles system, Rotational motion and variables, Rotation with constant angular acceleration, relation between linear and angular variables, energy, Kinetic and potential energy, Work, Energy and work done by a constant force, Fluid flow, Streamlines and equation of continuity, Oscillator, Simple harmonic oscillator, Simple harmonic motion, Energy and applications, Damped harmonic oscillation, Mechanical waves and Types, Wave speed on stretched string, Energy in wave motion, Interference of waves, Standing waves and resonance, Properties of sound waves, Traveling sound waves, Power and intensity of sound waves, Beats, Doppler effect,

1. To Study the damping features of an oscillation system using simple pendulum of variable mass.
2. To determine the value of 'g' be compound pendulum.
3. To determine the modulus of rigidity of a flat spiral spring.
4. To determine the modulus of rigidity of a wire by solid cylindrical rod.

Recommended Books:

1. Halliday, Resnick and Walker, 2011, Fundamental Physics, 9th Ed. Ed, John Wiley and Sons Inc. New York.
2. Halliday, Resnick and Krane, 2002. Physics Vol. I & II, 5th Ed, John Wiley and Sons Inc. New York.
3. Sears, Zemansky and Young, 2000, University Physics, 8th Ed, Addison-Wesley. Reading (MA) USA.

Course Name: Issues in Pakistan Economy

Course Structure: Lectures: 3, Labs: 0   Credit Hours: 3

Course Contents

Overview of Pakistan Economy

Development Experience, Approaches, Policies and Outcomes. Identification of Issues: The era of 1950's, 1960's, 1970's, 1980's 1990's and 2000's. Structural Change and Sources of Growth. Emergence of Economic Issues, Human Resource Development, Unemployment, Poverty, Income Distribution, Debt, Deficit etc. Growth with limited development in Pakistan.

Development Planning and Resource Mobilization

Agricultural Development Policies and Priorities, Major Targets of Develop Plans and Emerging Issues; Neglects and Successes: Mobilization of Domestic Resources; Shortages, Deficits and Role of Foreign Aid. Agricultural Vs. Industrial Development Debate. Agricultural Adequacy.

Agriculture and Industrial Development: Emerging Issues

Pattern of Agricultural and Industrial Development, Land Reforms and Its Impacts, the Role of Green Revolution and its Impacts: Present Status. Agricultural Price Policy and Income Tax. Sectoral Terms of Trade. Industrial Development Policies and Strategies. Development of Large and Small Industries. Value Added: Manufacturing Goods Vs. Primary Goods Production. Agriculture Vs. Industry: Development Debate.

Sectoral Development, Employment Pattern and Unemployment

Sectoral Priorities and Development Issues. Human Resource Development and Emerging Issues: Population Growth, Labor Force Participation Rate and Employment Pattern, Unemployment and Underemployment, Forecasting Manpower Needs and Employment. Strategies to combat unemployment. Criteria to Measure Unemployment / Underemployment: Time Criterion, Productivity Criterion and New Index of Unemployment: Application to Pakistan and Empirical Evidences. Good Governance, Social Action Plan and its Impact. Role of Institution in Development. Social Sectors development Vs. High Return Sectors: Growth trade off.

International Debt and Dependency

Concepts of Foreign Aid and Debt. Borrowing Vs. Domestic Reserve Mobilization (failure). Size of Foreign Debt, Debt Saving and its Impacts. Strategies to combat with High Debt: Saving Policy, Foreign Trade Promotion, Cutting non-development Expenditures, Rescheduling and its Impacts. Debt Management in Pakistan and Its Impacts. Debt Modeling and Future Implications.

Poverty and Income Distribution

Pattern of Income Distribution: Rural and Urban. Definitions and Approaches to Measure Poverty: Income Approach, Expenditure Approach, Basic Needs Approach, Poverty of Participatory Index (POPI). How to Combat Poverty; Growth Strategy, Basic Needs, Labor Intensive Investment: Education / Training etc. and Social Action Plan (SAP) , its Role and Critical Review, Evasion of Policies / Strategies to Combat Poverty and Improving Income Distribution: Critical Evaluation. Neglect of Human Resource Development. Child Labor. Factors Productivity Issues.

Inflation, Foreign Trade Deficit and Emerging Issues

Sources of Inflation in Pakistan. Policies to Combat Inflation and their Impacts. Trade Performance, Instability and its Impacts. Policies to Combat Deficit and Trade Instability. WTO and Its Impacts. Reforms and Further Needs. Expected Impacts of WTO and Challenges. Terms of Trade Issues, Market Access and Health Related Rates.

Recommended Books

- Aslam M., Perspective on Development Planning In Pakistan, Allied Book Centre, Lahore, 2001-2002.
- Chaudhary M. Aslam and Ahmad Eatzaz: Globalization, WTO and Trade Liberalization in Pakistan, FerozSons, Lahore (2004).
- Chaudhary M. Aslam, Human Resource Development and Management in Pakistan, Ferozsons, Lahore (1989).
- Khan, Shahrukh R., 50 Years of Pakistan's Economy – Traditional Topics and Contemporary Concerns. Oxford Univ. Press, Karachi (2000).
- Mahbool-ul-Haq Centre for Human Development (MHCHD), Poverty Profile of Pakistan, (1989) Oxford University Press.
- Human Development In South Asia, Annual Report.
- Saeed, Khawaja Amjad, The Economy of Pakistan, Karachi: Oxford University Press, 2004.
- Zaidi, Akbar, (1999), Issues in Pakistan Economy, Oxford Univ., Press, Karachi.
- World Development Reports, World Bank.

Semester-3

Course Name: Data Structures and Algorithms
Course Structure: Lectures: 2 / Labs: 1 **Credit Hours:** 3
Prerequisites: Object Oriented Paradigms
Objectives: The course is designed to teach students structures and schemes, which allow them to write programs to efficiently manipulate, store, and retrieve data. Students are exposed to the concepts of time and space complexity of computer programs.

Course Outline: Introduction to data structures; Arrays, Stacks, Queues, Priority Queues, Linked Lists, Trees, and Graphs. Recursion, sorting and searching algorithms, Hashing, Storage and retrieval properties and techniques for the various data structures. Algorithm Complexity, Polynomial and Intractable Algorithms, Classes of Efficient Algorithms, Divide and Conquer, Dynamic, Greedy

Reference Material:
Data Abstraction and Problem Solving with C++, 2nd ed, Frank M. Carrano, Paul Helman, Robert Veroff, Addison-Wesley, 1998.
Data Structures and Algorithms (SAMS teach yourself), Lafore, Sams Publishing, 1999.
Fundamentals of Data Structures in C++, Horowitz, Sahni, and Mehta, Computer Science Press, 1995.
Data Structures in JAVA, Standish, Addison Wesley, 2000

Course Name: **Professional Practices**

Course Structure: Lectures: 3 / Labs: 0   **Credit Hours:** 3

Prerequisites: None

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

Course Outline: Introduction, Computing Ethics, Philosophy of Ethics, Ethics and the Internet. Intellectual Copy Right, Accountability and Auditing, Social Application of Ethics.

Resources:
1. Deborah G. Johnson, "Computer Ethics", Pearson Education (2001) 3rd edition.
2. *Professional Issues in Software Engineering*, M.F. Bott et. al.

Course Name: Computer Organization and Assembly Language

Course Structure: Lectures: 3, Labs: 0   **Credit Hours: 3**

Prerequisites: Digital Logic Design

Objectives: The main objective of this course is to introduce the organization of computer systems and usage of assembly language for optimization and control. Emphasis should be given to expose the low-level logic employed for problem solving while using assembly language as a tool. At the end of the course the students should be capable of writing moderately complex assembly language subroutines and interfacing them to any high level language.

Course Outline: Microprocessor Bus Structure: Addressing, Data and Control, Memory Organization and Structure (Segmented and Linear Models), Introduction to Registers and Flags, Data Movement, Arithmetic and Logic, Programme Control, Subroutines, Stack and its operation, Peripheral Control Interrupts, Interfacing with high level languages, Real-time application.
Objectives and Perspectives of Assembly Language, Addressing Modes, Introduction to the Assembler and Debugger, Manipulate and translate machine and assembly code, Describe actions inside the processing chip, Discuss operations performed by an instruction set, Write a fully documented program, Using an assembler of choice.

Reference Material:
1. Stallings, "Computer Organization & Architecture", 7th ed, Prentice HALL, 2006.
2. Irvine, Assembly Language for Intel-based Computers, 5th ed, Prentice Hall, 2007.
3. Computer Organization and Design, The Hardware/Software Interface, 4th ed, by David A. Patterson and John L. Hennessy, 2008. Elsevier Publishers.

Course Name: Discrete Structures

Course Structure: Lectures: 3 / Labs: 0   **Credit Hours:** 3

Prerequisites: None

Objectives: Introduces the foundations of discrete mathematics as they apply to Computer Science, focusing on providing a solid theoretical foundation for further work. Further, this course aims to develop understanding and appreciation of the finite nature inherent in most Computer Science problems and structures through study of combinatorial reasoning, abstract algebra, iterative procedures, predicate calculus, tree and graph structures. In this course more emphasis shall be given to statistical and probabilistic formulation with respect to computing aspects.

Course Outline: Introduction to logic and proofs: Direct proofs; proof by contradiction, Sets, Combinatorics, Sequences, Formal logic, Prepositional and predicate calculus, Methods of Proof, Mathematical Induction and Recursion, loop invariants, Relations and functions, Pigeonwhole principle, Trees and Graphs, Elementary number theory, Optimization and matching. Fundamental structures: Functions; relations (more specifically recursions); pigeonhole principle; cardinality and countability, probabilistic methods.

Reference Material:

1. Kenneth H. Rosen, *Discrete Mathematics and Its Applications*, 6TH edition, 2006, Mcgraw Hill Book Co.
2. Richard Johnsonbaugh, *Discrete Mathematics,* 7TH edition, 2008, Prentice Hall Publishers.
3. Kolman, Busby & Ross, *Discrete Mathematical Structures*, 4th edition, 2000, Prentice-Hall Publishers.
4. Ralph P. Grimaldi, *Discrete and Combinatorial Mathematics: An Applied Introduction*, Addison-Wesley Pub. Co., 1985.

Course Name: Differential Equations

Course Structure: Lectures: 3 / Labs: 0   **Credit Hours:** 3

Prerequisites: Calculus and Analytical Geometry

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

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 Material:

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

Course Name: Linear Algebra

Course Structure: Lectures: 3, Labs: 0   **Credit Hours:** 3

Prerequisites: None

Objectives: To provide fundamentals of solution for system of linear equations, operations on system of equations, matrix properties, solutions and study of their properties.

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

Reference Material:

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

<u>Semester-4</u>

Course Name: **Design &Analysis of Algorithms**

Course Structure: Lectures: 3 / Labs: 0   **Credit Hours:** 3

Prerequisites: Discrete Structure, Data Structures and Algorithms

Objectives: Detailed study of the basic notions of the design of algorithms and the underlying data structures. Several measures of complexity are introduced. Emphasis on the structure, complexity, and efficiency of algorithms.

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 Material:

1. *Introduction to Algorithms /2E,* T. H. Cormen, C. E. Leiserson, and R. L. Rivest, MIT Press, McGraw-Hill, New York, NY, 2001.
2. Algorithms in C++; Robert Sedgewick

Course Name: Operating Systems

Course Structure: Lectures: 3, Labs: 1   **Credit Hours: 4**

Prerequisites: None

Objectives: To help students gain a general understanding of the principles and concepts governing the functions of operating systems and acquaint students with the layered approach that makes design, implementation and operation of the complex OS possible.

Course Outline: History and Goals, Evolution of multi-user systems, Process and CPU management, Multithreading, Kernel and User Modes, Protection, Problems of cooperative processes, Synchronization, Deadlocks, Memory management and virtual memory, Relocation, External Fragmentation, Paging and Demand Paging, Secondary storage, Security and Protection, File systems, I/O systems, Introduction to distributed operating systems. Scheduling and dispatch, Introduction to concurrency.

Lab assignments involving different single and multithreaded OS algorithms.

Reference Material:
1. *Applied Operating Systems Concepts,* 7th Edition, Silberschatz A., Peterson, J.L., & Galvin P.C. 2004.
2. *Modern Operating Systems,* 3rd Edition, Tanenmaum A.S., 2008.

Course Name: Theory of Automata

Course Structure: Lectures: 3 Labs: 0   **Credit Hours:** 3

Prerequisites: Discrete Structures

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

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

Text Books/Reference Books:
1. An Introduction to Formal Languages and Automata, By Peter Linz, 4th edition, Jones & Bartlett Publishers, 2006
2. Theory of Automata, Formal Languages and Computation, By S. P. Eugene, Kavier, 2005, New Age Publishers, ISBN (10): 81-224-2334-5, ISBN (13) : 978-81-224-2334-1.
3. John Hopcroft and Jeffrey Ullman, *Introduction to Automata Theory, Languages, and Computation*, 2nd edition, 2001, Addison-Wesley.
4. Introduction to Languages and the Theory of Computation, By John C. Martin3rd edition, 2002, McGraw-Hill Professional.

Course Name: Numerical Computing

Course Structure: Lectures: 3 / Labs: 0   **Credit Hours:** 3

Prerequisites: Calculus and Analytical Geometry

Objectives: On completion of this unit, students will be able to demonstrate programming proficiency using structured programming techniques to implement numerical methods for solutions using computer-based programming techniques .using Matlab for all methods. The course must serve the purpose of scientific software development for science and engineering problems.

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 Material:

1. Numerical Methods in Scientific Computing Germund Dahlquist and Åke Björck .

2. Numerical Methods for Scientific Computing : J.H. Heinbockel
3. Numerical Analysis: I.A. Khubaza
4. Numerical Analysis and Programming : Shan S Kuo

5. Numerical Analysis by Berden Fairs
6. Numerical Analysis by Gerald

Course Name: **Human Resource Management**

Course Structure: Lectures: 3 / Labs: 0 **Credit Hours:** 3

Prerequisites: None

Course Outline: An overview of Human Resource Management and Human Resource Manager. The Environment of Human Resource Management, external and Internal Environment. Equal Employment Opportunity and Affirmative Action. Job Analysis: A Basic Human Resource Tool. Human Resource Planning, Recruitment, and Selection. Organization Change and Human Resource Development. Corporate Culture and Organization Development. Career Planning Development. Performance Appraisal.

Reference Material:

Managing Human Resource by Wayne F. Cascio

Semester-5

Course Name: Compiler Construction

Course Structure: Lectures: 3 / Labs: 0   **Credit Hours:** 3

Prerequisites: Theory of Automata and Formal Languages

Objectives: At the end of the course students should understand the overall structure of a compiler, and will know significant details of a number of important techniques commonly used. They will be aware of the way in which language features raise challenges for compiler builders.

Course Outline: Compiler techniques and methodology. Organization of compilers. Lexical and syntax analysis. Parsing techniques. Object code generation and optimization, detection and recovery from errors. Contrast between compilers and interpreters.

Reference Material:

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,1987 Original from the University of Michigan
2. Modern Compiler Design, By 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.

Course Name: Database Systems

Course Structure: Lectures: 3, Labs: 1   **Credit Hours: 4**

Prerequisites: Data Structures and Algorithms

Objectives: The course aims to introduce basic database concepts, different data models, data storage and retrieval techniques and database design techniques. The course primarily focuses on relational data model and DBMS concepts.

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

Reference Material:
1. *Database Systems 8E,* C.J.Date, Addison Wesley Pub. Co. (2004).
2. *Database Systems: A Practical Approach to Design, Implementation and Management 5E,* R.Connolly and P.Begg, Addison-Wesley Pub. Co (2009).
3. Fundamentals of Database Systems, 5/E, Elmasri and Navathe, Addison-Wesley, ISBN: 0-201-74153-9.

Course Name: Software Engineering-I

Course Structure: Lectures: 3, Labs: 0   **Credit Hours: 3**

Prerequisites: Object Oriented Paradigm/Programming

Objectives: To study various software development models and phases of software development life cycle. The concepts of project management, change control, process management, software development and testing are introduced through hands-on Team Projects.

Course Outline: Introduction to Computer-based System Engineering; Project Management; Software Specification; Requirements Engineering, System Modelling; Requirements Specifications; Software Prototyping; Software Design: Architectural Design, Object-Oriented Design, UML modelling, Function-Oriented Design, User Interface Design; Quality Assurance; Processes & Configuration Management; Introduction to advanced issues: Reusability, Patterns; Assignments and projects on various stages and deliverables of SDLC.

Reference Material:
1. *Software Engineering 8E by Sommerville Addison Wesley, 2006*
2. *Software Engineering: A Practitioner's Approach /7E,* Roger Pressman, McGraw-Hill, 2009

Course Name: **Multivariable Calculus**

Course Structure: Lectures: 3 / Labs: 0   **Credit Hours:** 3

Prerequisites: Calculus and Analytical Geometry

Objectives: The goals are to develop the skills to have ground knowledge of multivariate calculus and appreciation for their further computer science courses.

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 Material:

1. James Stewart, Multivariable Calculus, 6th edition, 2007, Cengage Learning publishers.
2. Swokowski, Olinick and Pence, *Calculus and Analytical Geometry*, 6th edition, 1994, Thomson Learning EMEA, Ltd.
3. Bernard Kolman, William F. Trench, Elementary Multivariable Calculus, 1971, Academic Press.
4. Howard Anton, Albert Herr, Multivariable Calculus, 5th edition, 1995, John Wiley.

Course Name: **Psychology**

Course Structure: Lectures: 3 / Labs: 0   **Credit Hours:** 3

Prerequisites: None

Objectives

• To develop understanding of the breadth of different approaches to Psychology.

• To gain awareness of the principles and perspectives of Psychology through the study of psychological theories, concepts and research.

• To develop the ability to identify ethical concerns, and apply Psychology to cultural, social and contemporary issues.

• To understand how to critically appraise concepts, theories and empirical evidence.

• To be familiar with a range of research methods.

Course Overview:

Psychology is "the study of the mind and behaviour" and the aim of the course is to familiarize students with a wide range of theories and research investigating human behaviour. The course has been developed to be as interesting and challenging as possible. The objective is to explore how Psychology has contributed to an understanding of individual, social and cultural diversity.

In addition, a substantial portion of the course focuses on psychological testing and measuring learning outcomes.

Required Text:

1. Santrock, J., Woloshyn, V., Gallagher, T., Di Petta, T., & Marini, Z. (2004). Educational Psychology (1st Canadian Edition). Toronto: McGraw Hill Ryerson.

2. Bernstein, D. A., Penner, L. A., Clarke-Stewart, A., & Roy, E. J. (2003). Psychology (6th ed.). Houghton Mifflin Company: Boston, MA.

3. Atkinson, R. et al. (1999) Hilgard's Introduction to Psychology. Harcourt Publishers Ltd. ISBN: 9780155068384

4. Malim, T. & Birch, A. (1998) Introductory Psychology Palgrave ISBN: 9780333668528

5. Zimbardo, P., McDermott, M., Jansz, J. & Metaal, N. (1995). Psychology: A European Text. London: Harper Collins ISBN: 0004990021

6. Eysenck, M (Ed) (2008) Fundamentals of Psychology: ISBN: 1841693723

7. Eysenck, M (2005) Psychology: The Science of Mind and Behaviour. Hodder and Stoughton ISBN: 0340900989

8. Banyard, P. & Grayson, A. (2000) Introducing Psychological Research. Palgrave ISBN: 9780333912515

9. Coolican, H (1996) Introduction to Research Methods and Statistics in Psychology (2nd edition) Hodder & Stoughton ISBN: 9780340679371

10. Gross, R (2001) Psychology: The Science of Mind and Behaviour. Hodder and Stoughton

Semester-6

Course Name: Distributed Database Systems

Course Structure: Lectures: 2/Labs: 1   **Credit Hours:** 3

Prerequisites: Introduction to Database Systems

Objectives:
Students will learn the usage of different design strategies for distributed databases, and will study query processing techniques as well as transaction management and concurrency control concepts used in such systems

Course Outline:
Introduction to Distributed Data Processing; Distributed DBMS Architecture; Distributed Database Design: Issues, Fragmentation and Allocation; Integrity Constraints, Distributed Query Processing; Query Decomposition and Data Localization; Query Optimization; Distributed Transaction Management and Concurrency Control; Distributed DBMS Reliability and Replication Techniques; Multidatabase Systems.

Reference Material:
1. M.T. Ozsu, P. Valduriez (eds.): Principles of Distributed Database Systems (2nd Edition), Prentice Hall, 1999
2. P. Bernstein and E. Newcomer, Principles of Transaction Processing. Morgan Kaufmann, 1997
3. M. Buretta, Data Replication. Wiley, 1997
4. R. Elmasri and S. Navathe. Fundamentals of Database Systems, Benjamin/Cummings.

Course Name: Artificial Intelligence

Course Structure: Lectures: 3 / Labs: 0   **Credit Hours:** 3

Prerequisites: Data Structures

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

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

Reference Material:

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

Course Name: Computer Networks

Course Structure: Lectures: 3, Labs: 1   **Credit Hours:** 4

Prerequisites: None

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

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

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

Course Name: **Web Design and Development**

Course Structure: Lectures: 2 Lab:1   **Credit Hours:**   3

Prerequisites: Fundamentals of Information Technology (required)

Objectives:

This course will extend the WWW Technologies and Web Based Applications architecture, development, deployment and management concepts studied in the course of Fundamentals of Information Technology. The instructor is expected to cover an in-depth treatment of the web technology and applications related topics including web standards, protocols, web applications architecture, web services, search engine architectures, content management, web2, and semantic web, to explore some of the technologies used for display, data access and processing, and to give the students practice in integrating these to produce a functional web-based system.

Course Outline:

In-depth study of World Wide Web architectures, protocols and standards (HTTP, HTML, xHTML, CGI, XML, WML, cHTML, etc.), Web Technologies and Tools (such as scripting tools) for web application development and deployment (web servers, application servers, etc.), Web Based Applications including search engines and content management, management of large scale web based information systems, Web Services, Web2, Semantic Web, and Web3, principles of web site design, practical exercise in web site development.

Suggested Text Books:

1. Nuckles, Craig, Web Applications: Concepts and Real World Design, Wiley 2006
2. Programming the World Wide Web (4th Edition) (Paperback), by Robert W. Sebesta (Author), Paperback: 752 pages, Publisher: Addison Wesley; 4th edition (August 17, 2007), ISBN-10: 0321489691

Reference Material:

1. Gosselin, Dan, et. al., The Web Warrior Guide to Web Design Technologies, Cengage Learning, 2003
2. Zak, Diane, et. al., The Web Warrior Guide to Web Programming, Cengage Learning, 2003
3. Leasure, T., Bob Leasure and James Leasure, The Web Warrior Guide to Web Database Technologies, Cengage Learning, 2003
4. Morrison, Mike and Joline Morrison, Database Driven Websites, 2/e, Cengage Learning, 2002
5. Web Wizard series for various technologies, Addison-Wesley
6. Jackson, J. C., Web Technologies: A Computer Science Perspective, Pearson (LPE), 2008
7. Web Application Architecture: Principles, Protocols and Practices by Leon Shklar and Richard Rosen (Paperback - Oct 31, 2008), Paperback: 420 pages, Publisher: Wiley; 2 edition (October 31, 2008), ISBN-10: 047051860X
8. Web Engineering: The Discipline of Systematic Development of Web Applications by Gerti Kappel, Birgit Prýýll, Siegfried Reich, and Werner Retschitzegger (Paperback - Jul 5, 2006)

Course Name: Technical and Business Writing

Credit Hours: 3   **Prerequisites:** None

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.
Presentation skills: Speaking Effectively. Interviews , telephonic, face to face, different kinds of interviews. Techniques and strategies for making and delivering a presentation, use of AV aids
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, Technical report, short and long report, progressive report.
Business letters of different kinds, good news, bad news, invitations, adjustments, resignation, letter for joining. Cover letter. CV and Resume with different types.
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, proposal for a research, 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.
4. Mecnakshi Raman & Sangeeta Technical Communication.

<u>Semester-7</u>

Course Name: Software Engineering-II
Course Structure: Lectures: 3 / Labs: 0 **Credit Hours:** 3
Prerequisites: Data Structures, Software Engineering–I
Objectives: The students will study techniques for software verification,
validation and testing. They would also study reliability and performance issues in software design and development.

Course Outline: Software verification and validation: Techniques are introduced to evaluate software correctness, efficiency, performance and reliability, integration of these techniques into a verification and validation plan. Technical reviews, software testing, programme verification, prototyping, and requirement tracing. Attitude of industry toward reliability and performance.

Reference Material:
Software Engineering: A Practioner's Approach, Roger Pressman, McGraw-Hill, 2001.
Software Engineering, Ian Sommerville, Addison-Wesley 2001,

Course Title: Mobile and Application Development
Credit Hours: 3(2-1)
Prerequisites: Web Technologies

Course Outline:

What is Android? Installing and Configuring the Android SDK Manager, Creating Android Application, Anatomy of an Android Application. Eclipse. Fragments, Calling Built-In Applications Using Intents, Displaying Notifications. Components of a Screen, Adapting to Display Orientation, Managing Changes to Screen Orientation, Utilizing the Action Bar, Creating the User Interface. Listening for UI Notifications. Views, User Preferences. Presisting Data. Sharing Data. Sending SMS Messages. Getting Feedback. Sending E-mail. Displaying Maps, Consuming Web Services Using HTTP, Accessing Web Services. Creating Services. Threading. Android games Development, Publishing Android Applications. Handling Telephone Calls, Fonts.

Reference Materials:

1. *Beginning Android 4 Application Development* by Wei-Menge Lee, John Wiley & Sons, 2012
2. *Beginning Android 4* by Grant Allen, Apress, (2011), ISBN: *1430239840.*
3. *Beginning Android games* by Mario Zechner, Apress, (2011), ISBN: 1430230428
4. *Pro Android 4* by Satya Komatineni and Dave MacLean, (2012), ISBN:1430239301 Apress
5. *Professional Android 4 Application Development* by Reto Meier, Wiley, (2012), ISBN:1118237226

Course Name: Parallel and Distributed Computing
Credit Hours: 3(3-0)
Prerequisites: Data Communications and Computer Networks

Course Outlines:

Why use parallel and distributed systems? Why not use them? Speedup and Amdahl's Law, Hardware architectures: multiprocessors (shared memory), networks of workstations (distributed memory), clusters (latest variation). Software architectures: threads and shared memory, processes and message passing, distributed shared memory (DSM), distributed shared data (DSD). Possible research and project topics, Parallel Algorithms, Concurrency and synchronization, Data and work partitioning, Common parallelization strategies, Granularity, Load balancing, Examples: parallel search, parallel sorting, etc. Shared-Memory Programming: Threads, Pthreads, Locks and semaphores, Distributed-Memory Programming: Message Passing, MPI, PVM. Other Parallel Programming Systems, Distributed shared memory, Aurora: Scoped behaviour and abstract data types, Enterprise: Process templates. Research Topics.

Reference Materials:

1. B. Wilkinson and M. Allen, *Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, 1/e,* Prentice Hall, 1999.
2. W. Stevens, *Advanced Programming in the Unix Environment,* Addison **Wesley, 1993**

Course Name: Information Security
Credit Hours: 3(3-0)
Prerequisites: Data Communication and Computer Networks
Course Outline:
Basic notions of confidentiality, integrity, availability; authentication models; protection models; security kernels; Encryption, Hashing and Digital 33 Signatures; audit; intrusion detection and response; database security, hostbased 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

Pakistan Studies
Credit Hour:
Introduction/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.
Course Outline:
1. **Historical Perspective**
a. Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah.
b. Factors leading to Muslim separatism
c. People and Land
i. Indus Civilization
ii. Muslim advent
iii. Location and geo-physical features.
2. **Government and Politics in Pakistan**
Political and constitutional phases:
a. 1947-58
b. 1958-71
c. 1971-77
d. 1977-88
e. 1988-99
f. 1999 onward
3. **Contemporary Pakistan**
a. Economic institutions and issues
b. Society and social structure
c. Ethnicity
d. Foreign policy of Pakistan and challenges
e. Futuristic outlook of Pakistan
Recommended Books:
1. Burki, Shahid Javed. *State & Society in Pakistan,* The Macmillan Press Ltd 1980.
2. Akbar, S. Zaidi. *Issue in Pakistan's Economy.* Karachi: Oxford University Press, 2000.
3. S.M. Burke and Lawrence Ziring. Pakistan's Foreign policy: An Historical analysis. Karachi: Oxford University Press, 1993.
4. Mehmood, Safdar. *Pakistan Political Roots & Development.* Lahore, 1994.
5. Wilcox, Wayne.*The Emergence of Bangladesh.,* Washington: American Enterprise, Institute of Public Policy Research, 1972.
6. Mehmood, Safdar. *Pakistan Kayyun Toota,* Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.

Semester-8

Course Name: Fundamental of Data Mining
Credit Hours: 3(3-0)
Prerequisites: Database Systems
Course Outline:
Data-Mining Concepts, Preparing the Data, Data Reduction, Learning From Data, Statistical Methods, Decision Trees and Decision Rules, Artificial Neural Networks, Ensemble Learning, Cluster Analysis, Association Rules, Web Mining and Text Mining, Genetic Algorithms, Fuzzy Sets and Fuzzy Logic, Visualization Methods, Data Mining Tools: Weka, CBA and Yale, etc.
Reference Materials:
1. *Data Mining: Concepts, Models, Methods, and Algorithms* by Mehmed Kantardzic, Wiley-IEEE Press; 2nd Edition (August 16, 2011). ISBN-10: 0470890452
2. *Data Mining: Concepts and Techniques, Third Edition (The Morgan Kaufmann Series in Data Management Systems)* by Jiawei Han, Micheline Kamber and Jian Pei, Morgan Kaufmann; 3rd Edition (2011). ISBN-10: 0123814790
3. *Principles of Data Mining (Adaptive Computation and Machine Learning)* by David J. Hand, Heikki Mannila and Padhraic Smyth, A Bradford Book (August 1, 2001). ISBN-10: 026208290X

Course Name: **Computer Graphics**

Course Structure: Lectures: 2 / Labs: 1   **Credit Hours:** 3

Prerequisites: Object Oriented Programming , Visual Programming

Objectives: Study of various algorithms in computer graphics and their implementation in any programming language.

Course Outline: Graphics hardware. Fundamental algorithms. Applications of graphics. Interactive graphics programming — graph plotting, windows and clipping, and segmentation. Programming raster display systems, Differential Line Algorithm, panning and zooming. Raster algorithms and software — Scan-Converting lines, characters and circles. Scaling, Rotation, Translation, Region filling and clipping. Two and three dimensional imaging geometry (Perspective projection and Orthogonal projection) and transformations. Curve and surface design, rendering, shading, colour and animation.

Reference Material:

1. Computer Graphics, Principles and Practice, J. D. Foley, A. van Dam, S. K. Feiner and J. F. Hughes, Addison-Wesley ISBN: 0-201-12110-7.
2. *Computer Graphics,* F.S.Hill, Maxwell MacMillan ISBN: 0-02-354860-6.
3. Interactive Computer Graphics: Functional, Procedural and Device-level methods; Peter Burger and Duncan. F. Gillies; Addison-Wesley, (2003)

Course Name: Islamic Studies/ Ethics

Objectives:

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

Course Outlines

Introduction to Quranic Studies
1) Basic Concepts of Quran
2) History of Quran
3) Uloom-ul -Quran

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

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

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

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

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

Selected Study from Text of Hadith

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

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

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

Islamic Economic System
1) Basic Concepts of Islamic Economic System
2) Means of Distribution of wealth in Islamic Economics
3) Islamic Concept of Riba
4) Islamic Ways of Trade & Commerce

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

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

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

Reference Books:

1) Hameed ullah Muhammad, "Emergence of Islam" , IRI, Islamabad
2) Hameed ullah Muhammad, "Muslim Conduct of State"
3) Hameed ullah Muhammad, 'Introduction to Islam
4) Mulana Muhammad Yousaf Islahi,"
5) Hussain Hamid Hassan, "An Introduction to the Study of Islamic Law" leaf Publication Islamabad, Pakistan.
6) Ahmad Hasan, "Principles of Islamic Jurisprudence" Islamic Research Institute, International Islamic University, Islamabad (1993)
7) Mir Waliullah, "Muslim Jrisprudence and the Quranic Law of Crimes" Islamic Book Service (1982)
8) H.S. Bhatia, "Studies in Islamic Law, Religion and Society" Deep & Deep Publications New Delhi (1989)
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