পরীক্ষা নিয়ন্ত্রকের অফিস
ঢাকা বিশ্ববিদ্যালয়
ফোনঃ(অফিস)৮৬১৩২৮০
৯৬৬১৯০০-৫৯/৪০৮০
ফ্যাক্সঃ৮৮০-২-৯৬৬৭২২২
Email:co_letter@du.ac.bd

মেমো নং: ১০৬৪/শা-৫/প.

তারিখঃ ২৭ আগস্ট ২০২১
১৭ অগ্রহায়ণ ১৩৭৬

লামিসা কাইয়ূম শাম্মা
প্রভাষক
ইংরেজী বিভাগ
ঢাকা বিশ্ববিদ্যালয়
ঢাকা - ১০০০।

জনাব,

আপনাকে জানাইতেছি যে, ২০২১ সনের mid term পরীক্ষার se বিষয়ে কোর্স/পত্র নং 101 এর বাংলা ও ইংরেজি উভয় ভাষার প্রশ্নপত্র প্রণয়ন করার জন্য আপনাকে যুগ্ম প্রশ্নপত্র প্রণেতা ও পরীক্ষক নিয়োগ করা হইয়াছে।

বিশেষ নির্দেশনাবলীঃ

উল্লেখিত প্রশ্নপত্র প্রণয়ন প্রসঙ্গে আনুসাঙ্গিক তথ্যাবলী সম্বলিত নিম্নলিখিত কাগজপত্র এতদসঙ্গে গ্রথিত হইলঃ(১)প্রশ্নপত্র প্রণেতাদের প্রতি নির্দেশনাবলী (২) নির্ধারিত পাঠ্যসূচী (৩) সংশ্লিষ্ট পত্রের পূর্ববর্তী বৎসরের প্রশ্নপত্র (৪) প্রশ্নপত্র প্রণয়নের জন্য রেখাঙ্কিত কাগজ (৫) ঠিকানা যুক্ত ছোট বড় প্রয়োজনীয় খাম।

প্রনীত প্রশ্নপত্র গ্রথিত খামে সিলমোহর পূর্বক বীমাকৃত ডাকে অথবা ব্যক্তিগতভাবে ২০২১-০৯-১০ ইং তারিখের মধ্যে ঢাকা বিশ্ববিদ্যালয়ের সংশ্লিষ্ট বিষয়ের পরীক্ষা কমিটির চেয়ারম্যান প্রফেসর/ড/জনাবMr.a এর নিকট জমা দেয়ার জন্য আপনাকে সবিনয় অনুরোধ করিতেছি।সরবরাহকৃত ছোট খামের শূন্যস্থানগুলি যথাযথভাবে পূরন করা প্রয়োজনীয়।

আপনার প্রণীত প্রশ্নপত্র নির্ধারিত তারিখের মধ্যে পাওয়া না গেলে বিশ্ববিদ্যালয় করতিপক্ষ বিকল্প ব্যবস্থা গ্রহণ করিতে বাধ্য হইবে। নিযুক্তিপত্র গ্রহণে অপারগ হইলে অবশ্যই ইহার কারণ জানাইয়া সঙ্গে এতদসংলগ্ন কাগজপত্রাদিও ফেরত পাঠানোর জন্য আপনাকে অনুরোধ করতেছি।

প্রণয়নকৃত প্রশ্নপত্রের পান্ডুলিপি পরিষ্কার পরিচ্ছন্ন ও সুস্পষ্ট হওয়া একান্ত বাঞ্চনীয়। কোন ছক বা অন্য কোন তথ্যাদি প্রশ্নপত্রের সঙ্গে সরবরাহ করার প্রয়োজন হইলে তাহা পৃথকভাবে সংশ্লিষ্ট চেয়ারম্যানকে সঠিক নির্দেশিকা প্রদান করিতে অনুরোধ করিতেছি।

আপনার কোনো নিকট আত্মীয় যেমনঃ (১) ভাই (২) বোন (৩) স্ত্রী/স্বামীর (ক) ভাই/বোন (৪) ছেলে (৫) মেয়ে (৬) ভ্রাতৃবধূ (৭) ভগ্নিপতি (৮) স্ত্রী (৯) স্বামী (১০) ভাই ও বোনের সন্তানের (১১) পুত্রবধূ (১২) জামাতা (১৩) আপন চাচা-চাচী (১৪) আপন মামা-মামী (১৫) আপন ফুফা-ফুফু এবং (১৬) আপন খালা-খালু এই পরীক্ষায় যদি পরীক্ষার্থীর/পরীক্ষার্থিনী থাকে ,তবে তাহা নিয়োগপত্র গ্রহণের পূর্বে অত্র অফিসে জানানোর জন্য অনুরোধ করতেছি।

আপনি যদি শিক্ষা প্রতিষ্ঠান/বিভাগ ছাড়া অন্য কোন সরকারী দপ্তরের কর্মকর্তা হন,তবে আপনাকে এই কাজের পারিশ্রমিক গ্রহণের জন্য সরকারী অনুমোদন পত্র বিলের সহিত গ্রথিত করিয়া দিতে হইবে।সরকারী কর্মচারীদের নিযুক্ত গ্রহণের পূর্বে অবশ্যই কর্তৃপক্ষের অনুমতি নিতে হইবে।

উক্ত বিষয়ে আপনার সম্মতি যথাশীঘ্র জানাইবার জন্য অনুরোধ করিতেছি।

আপনার বিশ্বস্ত

পরীক্ষা নিয়ন্ত্রকের পক্ষে
পরীক্ষা উপ-নিয়ন্ত্রক
ঢাকা বিশ্ববিদ্যালয়।

INSTITUTE OF INFORMATION TECHN
UNIVERSITY OF DHAKA

http://www.iit.du.ac.bd/

BACHELOR OF SCIENCE IN SOFTWARE E
(BSSE)

[Session 2017 – 2018]

Institute of Information Technol
University of Dhaka

Syllabus for
Bachelor of Science in Software Enginee

Semester 1

Course Code	Course Title
CSE101	Structured Programming
CSE 102	Discrete Mathematics
STAT 103	Probability and Statistics for Engineers I
MATH 104	Calculus and Analytical Geometry
GE 105	Sociology
SE 106	Introduction to Software Engineering
6 Courses	

Semester 2

Course Code	Course Title
CSE 201	Data Structure and Algorithm
CSE 211	Computer Organization
STAT 203	Probability and Statistics for Engineers II
MATH 204	Ordinary Differential Equations
GE 212	Bangladesh Studies
SE 206	Object Oriented Concepts I
6 Courses	

Semester 3

Course Code	Course Title
CSE 301	Combinatorial Optimization
SE 312	Theory of Computing
CSE 311	Computer Networking
MATH 304	Numerical Analysis for Engineers
SE 305	Software Project Lab I
SE 306	Object Oriented Concepts II
6 Courses	

Semester 4

Course Code	Course Title
CSE 401	Operating System and System Programming
GE 402	Business Psychology
CSE 411	Information Security
CSE 404	Database Management System I
BUS 405	Business Studies for Engineers
SE 406	Software Requirements Specification and Analysis
6 Courses	

Semester 5

Course Code	Course Title
SE 511	Professional Ethics for Information Systems
CSE 502	Web Technology
BUS 503	Business Communications
CSE 504	Database Management System II
SE 505	Software Project Lab II
SE 506	Design Patterns
6 Courses	

Semester 6

Course Code	Course Title
CSE 601	Distributed Systems
SE 611	Software Metrics
SE 612	Software Security
CSE 604	Artificial Intelligence
SE 605	Software Testing and Quality Assurance
SE 606	Software Design and Analysis
6 Courses	

Semester 7

Course Code	Course Title
SE 701	Internship
1 Course	

Semester 8

Course Code	Course Title
SE 801	Project
SE 811	Software Maintenance
SE 803	Software Project Management
CSE / SE / BUS 8XX	Elective
CSE / SE / BUS 8XX	Elective
5 Courses	

Elective Courses

No.	Course Code	Course Title
1.	CSE 802	Computer Data and Network Security
2.	CSE 823	Embedded Systems
3.	BUS 824	Numeric Computation for Financial Mod
4.	CSE 825	Data Mining and Warehousing
5.	BUS 827	Enterprise Information Systems
6.	CSE 829	Pattern Recognition and Image Processin
7.	CSE 830	Mobile and Wireless Computing
8.	CSE 831	Computer Graphics and Multimedia
9.	CSE 837	Machine Learning
10.	CSE 839	Human Computer Interaction
11.	CSE 840	Information Retrieval
12.	BUS 842	Strategic Management
13.	CSE 844	Applied Data Science

Semester 1 (1st year 1st Semest

Course Title: Structured Programming
Code: CSE 101
Credit: 3 Credits (1 Credit Theory and 2 Credit Lab)

Course Outline: Fundamentals of C programming; Introducing C's Pro Data types, Variables and Expressions; Exploring Arrays and Strings; U Functions; Console and File I/O; Structures and Unions.

References:

1. Teach Yourself C, Herbert Schildt, McGraw Hill
2. C: The Complete Reference, Herbert Schildt, McGraw Hill
3. Schaum's Outline of programming with C, McGraw Hill

Course Title: Discrete Mathematics
Code: CSE 102
Credit: 3 Credits (3 Credit Theory)

Course Outline: The Foundations: Logic and Proofs: propositio propositional logic, propositional equivalences, predicates and quantifier of inference, introduction to proofs; **Basic Structures:** Sets, Functio Matrices; **Number Theory:** The division algorithm, divisibility and the e numbers, congruence, applications of congruence; **Induction and** Induction, Recursive Definitions and Structural Induction, Program Co addition and multiplication rules, The principle of Inclusion-Exclusion, permutations, combinations, Generalized Permutations and Combinations and Combinations; **Relations and Functions:** Symmetry, transitivity classes, congruence, closure of relations, partial orderings; **Graphs:** G Graph Terminology and Special Types of Graphs, Representing Graphs Connectivity, Euler and Hamilton Paths; **Trees:** Introduction to Trees, Trees.

References:

1. Discrete Mathematics and its Applications, Seventh Edition by Ke

Course Name: Probability and Statistics for Engineers I
Code: STAT 103
Credit: 3 Credits (3 Credit Theory)

Course Outline: Introduction to Statistics: Concept of Data and Varia Descriptive Statistics, Inferential Statistics, Populations and Samples Frequency Tables and Graphs, Relative Frequency Tables and Graphs, G Ogives, Stem and Leaf Plots, Sample Mean, Sample Median, Sample M Standard Deviation, Sample Percentiles and Box Plots, Chebyshev's Ine Paired Data Set and Sample Correlation Coefficient; **Elements of Probal**

in Probability, Sample Space and Events, Venn Diagrams and Algeb
Probability, Conditional Probability, Bayes' Theorem and Independent E
and Expectation: Random Variables, Types of Random Variables, Jo
Variables, Expectation, Property of Expected Values, Use of Expected V
Variance, Covariance and Variance of Sums of Random Variables
Functions; **Special Random Variables:** Binomial Random Variables, P
Uniform Random Variables, Normal Random Variables, Expone
Distribution, Chi-Square Distribution, t-Distribution and F-Distribution; **D**
Statistics: Central Limit Theorem, Sampling Distribution for Normal
from a Finite Population; **Parameter Estimation:** Maximum Likelil
Estimates, Estimating the difference in Means of Two Normal Population
Interval for the Mean, Confidence Interval of the Mean of the Exponentia
Estimator.

References:

1. Sheldon M. Ross, Introduction to Probability and Statistics for
   Elsevier/Academic Press, 3rd Ed.
2. M. Nurul Islam, An Introduction to Statistics and Probability, Boo
3. Lipschutz, Lipschutz Seymour, 2000 Solved Problems in Discret
   Hill, 1st Ed

Course Title: Calculus and Analytical Geometry
Code: MATH 104
Credit: 3 Credits (3 Credit Theory)

Course Outline: Basic Concepts: Real Numbers and Real Lines, Pola
Equations, Functions, Algebra of Functions, Inverse Functions, Quad
Graphs, Trigonometric Functions, Complex Numbers, Inequalities, Infin
Taylor Series, Rate of Change and Limit, Rules of Finding Limits, Fo
Extension of the Limit Concepts, L'Hospitals Rule, Continuity, Tan
Calculus: The Derivatives of a Function, Differentiation Rules, Rates
Trigonometric Functions, Chain Rule Differentiation, Implicit Diff
Exponents, Related Rates of Change, Extreme Values of Functions, M
Derivative and Second Derivative Tests for Extreme Values, Optimi
Differentials and Newton's Method; **Integral Calculus:** Indefinite
Substitution, Riemann Sums, Definite Integral, Fundamental Theorem
Theorem, Substitution in Definite Integrals, Areas between Curves, Fin
Volumes of Solids of Revolution, Cylindrical Shells, Lengths of Plane Cu
Revolution, Moments and Center of Mass, Fluid Pressures and Forc
Improper Integrals, Multiple Integrals and Line Integrals; **Linear Algeb**
Matrices, Operation on Matrices, Inverse of a Matrix, Rank of Matrix,
Solutions of System of Linear Equations, and Eigen value Problems.

References:

1. G.B. Thomas and R.L. Finney, *Calculus and Analytical Geometry*
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley

Course Title: Sociology
Code: GE 105
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Introducing Sociology: Definition, Nature, Subjec Common Sense, Importance of Sociological Study; The Development o Early Sociologists (Auguste Comte, Herbert Spencer, Karl Marx, Er Weber), Modern Developments and Industrial Revolution; Capitali Theoretical Perspectives: The Functionalist Perspective, The Confli Interactionist Perspective.
Sociological Research Methods: Scientific Methods and their Ap Research: Fact, Concept, Variables, Correlations, Control, Hypothesis, The Methods of Social Research: Historical, Comparative, Statistical, Ca The Research Process: Select the problem, Review the Literature, Formu a Research Design, Collect the Data, Analyze the Results, Draw a Concl Use of SPSS in Sociological Research;
Basic Social Institutions, Marriage: Concept, Forms, and Functions; Fa Functions, Changing Pattern of Marriage and Family in Modern In Society, and Socialization: Definition, Characteristics, Aspects and Ele Lag, Culture and Civilization, Stages in the Evolution of Human Socialization: Family, Schools, Peer Groups, Mass Media etc;
Social Change and Social Stratification: Concept of Social Change, Progress, and Social Development. Factors of Social Change and Its I Stratification: of Concept, Forms, Social Stratification and Social Mobi Applied Sociology: Concept of Social Problems; Major Social Pr Delinquency, Drug Addiction etc. Concept, Scope, Role of Sociologist in Policy and Planning: Objectives and prerequisites of Social Planning;
Globalization: Information and Communication Technology: Globalization, Impact of Globalization on Society, The Rise of Inform Technology. Dimensions of Globalization: Technological and I Technology and Society: Concept, Technological Innovation, and T Weinberg-1966), Technology and Society: Effects of technological f Influence of Technology on Social Institution.

References:

1. Fairchild, Henry Pratt. Dictionary of Sociology.
2. Kalam ,Abul .Globalization and Bangladesh-In the New Century
3. Koenig, Samuel. Sociology-An Introduction to the Science of So
4. Ogburn, William F. and Nimkoff, Meyer F. Sociology.
5. Robertson, Ian. Society-A Brief Introduction.
6. Rao, Shankor. Sociology.
7. Young,P.V. Scientific Social Survey and Research.

Course Title: Introduction to Software Engineering
Code: SE 106
Credit: 3 Credits (3 Credit Theory)

Course Outline: Overview of Software Engineering: history, natu engineering to other discipline, software development life cycle, **Software nature and qualities**: product qualities, project qualities, usability, maintainability, portability, quality measurements; **Software** requirement, design, development, testing, maintenance; Software devel agile, spiral, RDD, V model; **Software engineering principles**: modulari object oriented, component oriented, structured.; **Specification and** specification, descriptive specification, testing, analysis, debugging; **Mod** of modeling diagram, UI design. **Software Project Management**: c estimation, risks management.

References:

1. Fundamentals of Software Engineering, 2nd Edition, by Carlo Gh Education.
2. Software Engineering: A Practitioner's Approach, 7th Editio Education.

Semester 2 (1st year 2nd Semest

Course Title: Data Structure and Algorithm
Code: CSE 201
Credit: 3 Credits (1 Credit Theory and 2 Credit Lab)

Outline: Introduction - Data Structures and Complexity of Algorithm Searching Techniques: Linear and Binary Searching; Sorting and R Common Sorting Techniques: Insertion Sort, Selection Sort, Bubble Sor Radix Sort; Factorial and Tower of Hanoi Problem; Linked Lists - Abstra and Linked Lists: Singly, Two Way and Circular Linked Lists; Stacks Queues and their Implementation Strategies; Prefix, Infix and P Transformation and Evaluation Algorithms; Hashing - Hash Indices and Dynamic Hashing, Collisions in Hash Indices and Collision Resolving Concepts, Binary Tree, BST, Heaps, Heap Sort, Huffman Encoding Tech and B+ Tree; Graphs - Graph Terminologies, Representing Graphs, G DFS, Shortest Path Problems, Minimum Spanning Tree, Minimum Spann Topological Sorting; Problem Solving Strategy - Greedy Algorithms, Div Dynamic Programming and Backtracking.

References:

1. *Data Structures*. Schaum's Outline Series.
2. E. Horowitz and S. Sahni, *Fundamentals of Data Structures*, Lon
3. Robert L. Kruse, *Data Structures and Program Design*, Prentice

Course Title: Probability and Statistics for Engineers II
Code: STAT 203
Credit: 3 Credits (3 Credit Theory)

Course Outline: Hypothesis Testing: Tests Concerning the Mean of a N the Equality of Means of Two Normal Populations, Hypothesis Tests Co Normal Population, Hypothesis Tests in Bernoulli Populations and Tests Poisson Distribution. Regression and Correlation Analysis: Least S Regression Parameters, Distribution of the Estimators, Statistical Infere Parameters, Coefficient of Determination and Sample Correlation Residuals, Transforming to Linearity, Weighted Least Squares, Polyno Linear Regression, Logistic Regression Models for Binary Output Data Analysis of Variance: One-way Analysis of Variance, Two-Facto Introduction and Parameter Estimation, Testing Hypotheses and Two-w with Interaction Problems. Goodness of Fit Tests and Categorical Data Tests when All Parameters are Specified, Goodness of Fit Tests w Unspecified, Tests of Independence in Contingency Tables, Tests of Inde Tables Having Fixed Marginal Totals and Kolmogorov-Smirnov G Continuous Data. Nonparametric Hypothesis Tests: Sign Test, Signed R Problem and Runs Tests for Randomness. Quality Control: Control Chart X-Control Chart, S-Control Charts, and Control Charts for the Fraction for Number of Defects and Other Control Charts for Detecting Changes in

References:

1. Sheldon M. Ross, Introduction to Probability and Statistics for Eng

Elsevier/Academic Press, 3rd Ed.
2. Douglas C. Montgomery and George C. Runger, Applied Statistics
Engineers, John Wiley and Son, 4th Ed.
3. Murray R Spiegel, John J Schiller, R Alu Srinivasan, Schaum's Ou
Statistics, McGraw Hill, 3rd Ed.

Course Title: Ordinary Differential Equations
Code: MATH 204
Credit: 3 Credits (3 Credit Theory)

Course Outline: Differential Equations and Mathematical Modeling
Separable Differential Equations, Exact Differential Equations, Linea
Bernoulli Equation, Homogeneous Linear Equations of Second Order, Se
Equations with Constant Coefficients, Euler-Cauchy Equation, Existence
Non-homogeneous Equations, Solution by Undetermined Coefficients,
Parameters, Higher-Order Linear Differential Equations, Higher-Order
with Constant Coefficients, and Higher-Order Non-homogeneous Equatio
Eigenvalues, Homogeneous Systems with Constant Coefficients, Cri
Critical Points, Stability, Qualitative Methods for Nonlinear Systems,
Systems, Laplace Transform, Inverse Transform, Transforms of D
Differentiation and Integration of Transforms, Convolution, and Part
Differential Equations.

References:
1. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley
2. S.L. Ross, *Differential Equations.*
3. Earl A. Coddington, *An Introduction to Ordinary Differ*
Publications, Unabridged Ed.
4. Morris Tenenbaum and Harry Pollard, *Ordinary Differential E*
Publications, 1985 Ed.

Course Title: Object Oriented Concepts I
Code: SE 206
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Object Oriented Concepts - Introduction to Obj
Procedural vs Object Oriented (OO) Programming, What is an Object –
What is a Class – Attributes, Methods and Messages, Using UML to
Encapsulation and Data Hiding: Interfaces and Implementations, Inhe
Subclasses, Abstraction and Is-a Relationships; Polymorphism, Composit
a Relationships; How to think in terms of Objects – Interface vs Impleme
when designing Interfaces and Giving the user minimal Interface p
concepts in details – Constructors: Default constructor, When is a c
multiple constructors and The design of constructors, Error handling and
Anatomy of a Class – The Name, Comments, Attributes, Constructors, A
methods and Private implementation methods; Class Design Guidelines
Systems, Identifying Public Interfaces, Designing Robust Constructors,
to a Class, Documenting a Class and Using Comments, Designing w
Maintainability in Mind and Using Object Persistence; Designing with C
Statement of Work, Requirements Collection, Prototype of User Interfac

Determining the responsibilities of Each Class, Class Collaboration, Cla
System; Mastering Inheritance – Reusing Objects, Generalization
Inheritance weakens Encapsulation; Frameworks and Reuse – W
Frameworks, Contract: Abstract Classes and Interfaces. **Programming**
Java – Java Virtual Machine (JVM) and Java Runtime (JRE), Java
Integrated Development Environment (IDE) for Java, Java installation
compiling and running Java program, using Java classpath and JVM A
Package, Import, Class, Fields, Methods, Constructors, Primitive data
Wrapper class, Nonexistence type: null. Object Oriented Programming (
implement each of the object oriented concepts which are discussed in
support practical OOP – String Operations: String creations and operatio
of String, String comparison and searching, String buffers and builders;
and Output Stream, File, Path, Directory and tree; Exception handling
exception vs unchecked exceptions, throw and throws, Common exc
exceptions; Logger and Debugging: Logger, Log levels, Formatters and
and Manager, Configuration, Introduction to Debugging and Debugging W

References:

1. The Object Oriented Thought Process, Matt Weisfeld, Addison-W
2. Java How to Program, Paul Deitel and Harvey Deitel, McGraw Hi
3. Java: The Complete Reference, Herbert Schildt, McGraw Hill

Course Title: Computer Organization
Course Code: CSE 211
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Outline: Introduction: Function and structure of a computer, Fun
computer, Interconnection of components, Performance of a computer;
and arithmetic: Binary, octal, and hexadecimal numbers, One's and two
representations, Addition and subtraction; **Digital logic and integrated**
and truth tables, Boolean functions (Gates, Functions, Simplificatio
Combinational circuits - adders, shifters, decoders, multiplexers and ROM
circuits - registers, counters and RAM); **Representation of Instructio**
Operands, Addressing modes, Instruction formats, Instruction sets, Inst
CISC and RISC architectures; **Introduction to Assembly Language:** Pro
language, The assembly process, Linking and loading, Register-level debu
Processing Unit: Organization of a processor - Registers, ALU and Co
CPU, Instruction cycle, Organization of a control unit - Operations of
control unit, Micro-programmed control unit; **Memory Subsystem:**
Memory cells - SRAM and DRAM cells, Internal Organization of a memo
memory unit, Error correction memories, Interleaved memories, Cache
cache memory, Mapping methods, Organization of a cache memor
mechanisms, Memory management unit - Concept of virtual mem
Hardware support for memory management; **Input/Output Subsystem:**
ports, I/O control mechanisms - Program controlled I/O, Interrupt c
controlled I/O, I/O interfaces - Serial port, Parallel port, PCI bus, SCSI b
InfiniBand, I/O peripherals - Input devices, Output devices, Sec
Multiprocessing Systems: Shared memory multiprocessor, Messag
Hardware multithreading

References

1. D. A. Patterson and J. L. Hennessy, "Computer Organiza
   Hardware/Software Interface", Morgan Kaufmann, 1998.
2. C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization",
3. W. Stallings, "Computer Organization and Architecture - Des
   Prentice Hall of India, 2002.
4. J .P. Hayes, "Computer Architecture and Organization", McGraw-

Course Title: Bangladesh Studies
Course Code: GE 212
Credit: 3 Credits (3 Credit Theory)

Outline: Introduction to the course and its objectives, History and Soc
British rule and Pakistan rule: The impact of British and Pakistan ru
education of the people. Language Movement of 1952, Events Leading
1969, War of Independence and the Emergence of Bangladesh in 1971, **C**
Three branches of government- executive, legislative and judiciary, For
political parties in Bangladesh and Constitutional development of
Geography and Resources of Bangladesh: Location, Area, Boundary,
System, Climate, People and Resources of Bangladesh, **Social Structu**
society, Urban society, Family, household, and kinship, Women's ro
Bangladesh: Language, Literature, Art and Culture of Bangladesh, **E**
Major Economic Sectors, potentials of various sectors and their prospecti
and development, role of donor agencies, role of NGOs, **Achievement**
Bangladesh: Economy, Culture, Sports, etc., **Socio-economic prob**
Bangladesh: poverty, health issues, natural disaster, social stratification a

References

1. Islam, S. (2003). Banglapedia. National Encyclopedia, Asiatic
   Dhaka
2. Kibria, S. A. (1999). *Bangladesh at the Crossroads*. University Pr
3. Riaz, A. (2016). Bangladesh: A Political History since Independen

Semester 3 (2nd year 1st Semest

Course Name: Combinatorial Optimization
Code: CSE 301
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Introduction - Algorithms, Analyzing & Designing A Algorithms; Greedy Algorithms - Introduction to Greedy Algorithms, Greedy vs. Dynamic Programming, Fractional Knapsack Problem, Ac Huffman Encoding, Task Scheduling Problem, Coin Changing Proble Minimum Spanning Tree Algorithms; Divide and Conquer Algorithms - Conquer Design Technique, Quick Sort, Merge Sort, Proof of Correctnes Dynamic Programming - Introduction to Dynamic Programming Optimality, Optimal Substructure Property, Assembly Line Sch Multiplication, LCS, Viterbi Algorithm, Bitonic Euclidean Traveling Runtime Analysis; Graph Searching and Shortest Path Problems - Breadt Search, Flow Networks, Single Source and All Pair Shortest Path Algorit -Overview of Linear Programming, Formulating Problem as Linear Prog and Integer Linear Programming; Selected Topics - Computational Geo and String Matching Algorithms; NP Completeness and Approxin Completeness, Polynomial Time Verification, NP Completeness and R Problems and Approximation Algorithms.

References:

1. Thomas Corman, *Introduction to Algorithms*, Stein Pub MIT Press
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, *The Design a Algorithms*, Addison Wesley Series, 1974 Ed.

Course Title: Numerical Analysis for Engineers
Code: MATH 304
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Outline: Introductory concepts and calculus review, 'C' programming, th of errors, root finding for nonlinear equations, solution of system of line and approximation theory, numerical integration and differentiation.

References:

1. Numerical Methods, E Balagurusamy, Tata McGraw-Hill Publishi

Course Title: Software Project Lab I
Code: SE 305
Credit: 3 Credits (3 Credit Theory)

Course Outline: Each of the students should complete the software proje marked based on their individual software. Student will be encouraged t requires significant "problem solving" effort. The project should be suff of the project will mostly depend on "problem solving" effort. Besides, st skills they have acquired from their so far completed courses.

Course Title: Object Oriented Concepts II
Code: SE 306
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Object Oriented Concepts - Review of Object Orient
Object Behaviors, Class, Attributes, Methods, Encapsulation and Dat
Implementations, Inheritance: Super classes and Sub classes, Abstracti
Polymorphism, Compositions: Abstractions and Has-A Relationship; M
Building Objects – Representing Composition with UML, Composition
Phases, Types of Composition: Aggregation and Associations, Avo
Cardinality; Details of Creating Object Models with UML – Class
Methods, Access Designations, Inheritance, Interfaces, Composi
Associations, and Cardinality; Objects and Portable Data - Portable Dat
Language (XML), XML Versus HTML, XML and Object-Oriented L
Document with the Document Type Definition (DTD), Integrating
Document, and Using Cascading Style Sheets; Persistence objects – Bas
to a Flat File, Using XML in the Serialization Process and Writing
Objects and the Internet – Object-Based Scripting Languages, Obje
Distributed Objects and the Enterprise; Objects and Client/Server Ap
Approaches, Proprietary Approaches and Nonproprietary Approaches;
Principles - Single Responsibility Principle, Open/Close Principle, Lisk
Interface Segregation Principle and Dependency Inversion Principle; In
Based Design, Design Patterns and Code Smells. **Programming le**
Programming (OOP) - The students will implement each of the object or
discussed in the class. Java features to support practical OOP – Generics
definitions, Generic method definitions, Using generics; Collection
interfaces, List and SortedList, Map and SortedMap, Navigable Map, Set
Set, Queue and DeQueue, Stack, hashCode() and equals(), Comp
Reflection: The *Class* Class, reflect package, Fields and Methods,
Reflections and Dynamic Programming; Multi-Threaded Programming:
Thread Model, Creating and Running Thread, Thread Pools, Thread S
notify, join and sleep and The concurrency API; User Interface: Swing
Events, Layouts and SwingWorker; Serialization: Serializable interface,
Object, Handling Exceptions, Customized Serialization and Controll
Programming: Clients and Servers, Ports, Addresses and Protocols, C
Servers, The ServerSocket Class, The URL lass and URLConnct
Programming: Introduction To Servlet, Servlet Life cycle, HttpServlet, H
RequestDispatcher, HttpSession and ServletContext, Servlet Configuratio
and Http Headers and MIME types; The Java Beans AOI: Introspe
EventSetDescriptor and MethodDescriptor.

References:

1. The Object Oriented Thought Process, Matt Weisfeld, Addison-W
2. Java How to Program, Paul Deitel and Harvey Deitel, McGraw Hi
3. Java: The Complete Reference, Herbert Schildt, McGraw Hill
4. Head First Java by Kathy Sierra and Bert Bates, O Reilly

Course Title: Computer Networking
Code: CSE 311
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Introduction: Overview of the Internet, Overview Network Edge, Network Core, Protocol Layers / Service Model, Gene Application Layer: Principles of Networking Applications, Web and H Transport Layer: Transport Layer Services, Multiplexing and De mu Transport: UDP, Principles of Reliable Data Transport, Connection-O Principles of Congestion Control, TCP Congestion Control; Network La Inside a Router, Details of the Internet Protocol (IP), IP Sub netting, I State, Distance Vector), Routing in the Internet (Routing Information Prot Path First (OSPF), Border Gateway Protocol (BGP)).

References:

1. Data Communications and Networking, B. A. Forouzan, 5/e

Course Title: Theory of Computing
Code: SE 312
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Brief Review of mathematical background: Binary languages, proofs, inductive definitions; Finite automata and regular expr non-deterministic finite automata, regular expressions and regular Properties of regular sets: pumping lemma, closure properties, decision grammar and languages: Context-free grammars, regular grammars; Sim forms: useful symbols, productions, unit productions, chomsky normal fo pushdown automaton, equivalence between pushdown automata and cont machine: introduction to Turing machines.

References:

1. Introduction to Automata Theory, Languages, and Computatio Rajeev Motwani, Jeffrey D. Ullman, Third Edition, Pearson Educa

Semester 4 (2nd year 2nd Semest

Course Title: Operating System and System Programming
Course Code: CSE 401
Course Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Introduction: What is operating system? History of op system concepts Operating system structure Processes and Threads Proce communication Scheduling Classical IPC problems Memory Managemer Virtual memory Page replacement algorithms Design issues for paging issues File Systems Files Directories File system management Input / hardware Principles of I/O software I/O software layers Disks Clock Resources Detection Recovery Avoidance Prevention Virtualization and C

Course Reference Books:

1. Operating System Concepts, 7th edition, by Silberschatz, Galvin, G
2. Modern Operating Systems, 4th edition, Tanenbum, Bos

Course Title: Business Psychology
Code: GE 402
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline:
Fundamentals: Definition of Psychology, Subfields of Psychology, Psychology, Psychology in Business; Job Analysis: Job-oriented A Approach, Purposes of Job Analysis, Methods of Job Analysis, Job Methods for Selection and Placement: Psychological Tests: Ability Intelligence Test, Vocational Interest Test; Training and Development: Training Designs, Training Methods, Evaluation of Training; Theories Need Theories, Reinforcement Theory, Expectancy Theory, Goal Setting Emotion: Nature of Job Satisfaction, Assessment of Job Satisfacti Satisfaction, Potential Effects of Job Satisfaction, Organizational Comm Productive and Counterproductive Employee Behavior: Productive Be Counterproductive Behavior, Withdrawal, Aggression, Mistreatment Occupational Health Psychology: Occupational Health and Safety, Worl Stress, Work-Family Conflict, Burnout, Hawthorne Studies; Leaders Understanding of Leadership Trait Approach, Leader Behavior Approa Path-Goal Theory, Leader-Member Exchange (LMX) Theory, Tra Theory; Organizational Development and Theory: Organizational Acceptance of Change, Management by Objectives, Survey Feedback, Effectiveness of Organizational Development: Organizational Theories, B Theory Y, Open System Theory, Socio-technical System Theory.

References:

1. Industrial and Organizational Psychology: Research and Practi Edition

Course Title: Database Management System I
Code: CSE 404
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Introduction to Database Systems: Evolution of file pr databases in organizations, core components of a database environment; I Relationship Diagram and its symbols and constructs; The Relational M relational model, normalization, transformation of an entity-relations relational model; SQL - A Standard Navigation Language for Relationa Object-Oriented Databases: object-oriented data model, implementation c relational databases.

References:

1. Database System Concepts by Avi Silberschatz, Henry F. Korth Edition

Course Title: Business Studies for Engineers
Code: CSE 405
Credit: 3 Credits (3 Credit Theory)

Course Outline: Managers and Entrepreneurs: Management Defin Small-Business Management, The Evolution of Management Thought, C Charts, Contrasting Theories of Organization, Organizational Effe Cultures, Change, Conflict, and Negotiation in Organization; The Strate Strategic Implementation and Control, Forecasting. **Accounting Ba** Organization, Types of Activities performed by Business Organization Business Organization, The Accounting Equation, The Account and Rule Journal: Recording of Transaction, Adjusting the Accounts, Closing Financial statements from the Work Sheet. **Analysis and Interpretation** Objectives of Financial Statement Analysis, Analysis of a Balance Sheet Income and Retained Earnings, Ratio Analysis: Liquidity Ratios, Equity Ratio, Profitability Test, Market Test.

References:

1. Stephen P. Robbins and Mary Coulter, *Management*, Prentice Hall
2. Jerry J. Weygandt, Donald E. Kieso, and Paul D. Kimmel, *Accoun* 8th Ed.

Course Title: Software Requirements Specification and Analysis
Code: SE 406
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Review of – The Nature of Software, Software En Process, Software Engineering Practices, Generic Software Process Mode Improvement, Prescriptive Process Models, Specialized Process Model Requirements Engineering, Establishing the ground work, Eliciting R Requirements, Validating Requirements, Requirements Analysis, Scenar Models, Data Modeling Concept, Class Based Modeling, Requirements M Oriented Model, Behavioral Model, Requirements Modeling for WebApp

Lab: One small real life system will be given to all the students for an
Three real life mid-scale systems will be distributed among groups (
students to analyze (one project per group). The output of both of the ana
reports.

References:

1. R. S. Pressman, Software Engineering. A Practitioner's Approach,
   Hill
2. Ian Sommerville. Software Engineering, 9th or higher Edition, Add

Course Title: Information Security
Code: CSE 411
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Overview: Network Security Concepts, Security
Mechanisms; Classical Encryption techniques: Symmetric Cipher
Permutation Ciphers, Steganography; Block Ciphers and Data Encr
principles and modes of operation; Public-key cryptography: Introductio
and Diffie-Hellman; Message Digest: Requirements for cryptographic h
Message authentication codes, digital signatures; Key Management and
Key Distribution using Symmetric Encryption, Symmetric Key Distri
Encryption, public key distribution, public key certificates, x.509 certifica
Security: Transport Layer Security, Wireless LAN security, e-mail securit

References:

1. Information Security: Principles and Practice by Mark Stamp 2nd E

Semester 5 (3rd year 1st Semester

Course Title: Web Technology
Code: CSE 502
Credit: 3 Credits (1 Credit Theory and 2 Credit Lab)

Course Outline: Introduction To Html, Java Script & CSS, Server S Server, Application Server, MVC Web Framework, Web Services, Relational Mapping, Lambda Expression, Language Integrated Query, I Security: Denial of Service, Buffer Overflow, Cross Site Scripting, A Control

References:

1. Deitel & Deitel, Goldberg, "Internet and world wide web – H Education Asia, 2001.
2. Rajkamal, "Web Technology", Tata McGraw-Hill, 2001.
3. Teach yourself web technologies part I & II- I. Bayross. BPB
4. Web Design in a Nutshell- J. Niederst, SPD

Course Title: Business Communications
Code: BUS 503
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Outline: Communication Concept: The Role of Communication in Communication Skills, Main Form of Business Communicatio Communication. **Fundamentals of Business Writing:** Adaptation and Construction of Clear Sentences and Paragraphs, Writing for Effect. **B Messages:** Directness in Good News and Neutral Situations, Indire Indirectness in Persuasion Message, Letter and Memorandum, Lette Variations in Memorandums and the Email, Job Search Activities: Str Process, Job search activities, Writing CV, Facing Interviews, Feedb **Fundamentals of Report Writing:** Basics of Report Writing, Report Str and Formal Report, Usages of Graphics. **Other Form of Business Comm** Communication, Technology-Enabled Communication.

References:

1. Raymond V. Lesikar, John D. Pettit, Maire E. Flatley, Lesikar's Ba Communication, Mc Graw Hill

Course Title: Database Management System II
Code: CSE 504
Credit: 3 Credits (1 Credit Theory and 2 Credit Lab)

Outline: Indexing and Hashing: Basic Concepts, Ordered Indices, B+- Index Files, Static Hashing, Dynamic Hashing, Comparison of Ordere Query Processing: Overview, Measures of Query Cost, Selection Operation, Evaluation of Expressions; Query Optimization: Introdu Relational Expressions, Catalog Information for Cost Estimation, Statis Estimation, Cost-based optimization; Transactions: Transaction Cor Concurrent Executions, Serializability; Concurrency Control: Lock-Bas Based Protocols; Recovery System: Failure Classification, Storage Atomicity, Log-Based Recovery, Recovery With Concurrent Transac Mining: Data Mining, Decision tree, Bayes theory, Randomize Architectures: Centralized and Client-Server Systems, Server Syste Systems, Distributed Systems, Network Types; Parallel Databases: Intr Interquery Parallelism, Intraquery Parallelism, Intraoperation Pa Parallelism; Distributed Databases: Heterogeneous and Homogeneous Da Storage, Distributed Transactions, Commit Protocols; Additional shou Design, Database Tuning Security and Authorization, Multidimensional q

References:

1. Ramez Elmasri and Shamkant B. Navathe Fundamentals of Databa Edition. Addison-Wesley Pub Co, 1999.
2. Database Systems: The Complete Book, Hector Garcia-Molina, Je Jennifer D. Widom Prentice Hall. (best supporting book)
3. Fundamentals of Database Systems, by Ramez Elmasri and Shamk Wesley.
4. Database System Concepts,Fifth Edition, Avi Silberschatz, Henry

Course Title: Software Project Lab II
Course Code: SE 505
Credit: 3 Credits (3 Credit Theory)

Course Outline: Students will create project teams of 3 members each. can be varied for special cases, decided by the assigned course manager. required to prepare their Software Requirements Specification (SRS) fi project accordingly.

Course Name: Design Patterns
Code: SE 506
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Revision of Concepts of OOP, Importance of learning Design Patterns - Structural, Behavioral and Creational Patterns, Creati Factory, Factory Method, Abstract Factory, Builder, Prototype and Object - Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Mer Template Method, Visitor and Null Object, Structural Patterns – Ada Decorator, Flyweight and Proxy, REFACTORING CODE SMELL, Diffe Inappropriate Naming, Comments, Dead Code, Duplicated code, Primitiv Lazy Class, Alternative Class with Different Interface, Long Method, Lo Statements, Speculative Generality, Oddball Solution, Feature Envy, Refu and Train Wreck, Design Principles (SOLID) - Single responsibilit Principle, Liskov substitution principle, Interface segregation principl principle.

References:

1. Gamma, Erich. *Design patterns: elements of reusable object-orien* Education, 1995.

Course Title: Professional Ethics for Information Systems
Code: SE 511
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Introduction to Ethics, Morals, Integrity, Ethical use of Ethics for IT Workers and IT Users - Trade secret, Whistle blowing, bribery, professional code of ethics, IT professional malpractice and Com users, Computer and Internet Crime - Exploit, Viruses, Phishing and Typ - Information privacy, fair information practices, EU data protection d anonymity issues, Freedom of Expression - Right to freedom of express speech, defamation, controlling access to information on the internet, a corporate blogging and pornography, Intellectual property - Copyright, software patents, trade secret and key intellectual property issues, Impac networking ethical issues, Ethics for IT organization.

References:

1. Ethics In Information Technology, George W. Reynolds

Semester 6 (3rd year 2nd Semester

Course Title: Distributed Systems
Code: CSE 601
Credit: 3 Credits (1 Credit Theory and 2 Credit Lab)

Course Outline: Foundations - Characterization of DS, System M Internetworking, Interprocess Communication, Remote Invocation, Ind Operating System Support **Middleware** - Dist. Objects and Components to-Peer Systems System services – Security, Distributed File Syste Distributed algorithms - Time and Global States, Coordination and Transactions and Concurrency Control, Distributed Transactions, and Rep Mobile and Ubiquitous Computing

Lab: Introduction to Message passing technology and its applications Remote Procedure Calls code implementation, Synchronizatio Communication code implementation, Distributed mutual exclusion assig Election Algorithms, Implementation of Distributed File system: MapRed Systems Design assignments: Cloud Services and Content Delivery Netwo

References:

1. Distributed Systems: Concepts and Design (5th Edition). Ge Jean Dollimore (Author), Tim Kindberg (Author), Gordon Bla

Course Title: Artificial Intelligence
Code: CSE 604
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Intelligent Agents and their Environments - The con Specifying the Task environment (PEAS description), Different charac (Fully vs Partially observable, Static vs Dynamic, Episodic vs Sequentia of agents (Reflex, Goal-based, Utility-based etc.),Search - Formula Uninformed Search strategies: BFS, DFS, DLS, ID-DFS, their working relative advantages and disadvantages, Informed (heuristic) Search str search, A* search: Working principle, Characteristics of heuristics (admi Proof of A*'s optimality, Local search: Hill Climbing, Searching with AND-OR search trees and Searching with partial observability: B Adversarial Search - Formulation of a Game tree, The minimax algorithm rationale, working principle and Additional techniques such as Move ord Probabilistic Reasoning - Bayes' rule and its uses, Bayesian Network: making inference from it, Markov Chains and Hidden Markov Model models, Building and HMM, applications of HMM, Inference in ter Prediction, Most Likely explanations (Viterbi algorithm) etc. and Partic principle, Making Decisions - Decision theory and Utility theory: I Maximum Expected Utility principle, Constraints of Utility (Orderabi Markov Decision Processes: Policies, Rewards, Optimal policies and th Iteration, Supervised Learning - Basic concepts of classification and sup set, Test set, Overfitting, Underfitting etc., Decision trees: Basic u Decision tree through entropy calculation, Nearest Neighbor classifier:

Relative advantages and disadvantages, Naive Bayes classifier: B
Calculating classification procedures, Relative advantages and disadva
Network: Basic working principle, Basic structure and calculation of
backpropagation algorithm and Support Vector Machines: Basic workin
Learning (Clustering) - Basic concepts and applications of Clustering, Dif
Partitional vs. Hierarchical, Exclusive vs Overlapping vs Fuzzy, Comp
Clustering: Basic working principle, characteristics, advantages, disad
Hierarchical Clustering: Basic concepts, Representations (Dendrogr
diagrams), Different techniques to define cluster proximity: Single lin
average, Centroid method, their relative advantages and disadvantag
principle and applications, Classification of points (Core, Border an
Learning - Understanding basics of Reinforcement Learning: MDPs, P
etc., Passive and Active Reinforcement Learning, Exploration and Exploi
Programming, Temporal Difference Learning and Q-Learning.

References:

1. Russell, Stuart, and Peter Norvig. "Artificial intelligence: a moder

Course Title: Software Testing and Quality Assurance
Course Code: SE 605
Course Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: The Psychology and Economics of Software Testing, So
(STLC), Software Testing Terminology and Methodology, V&V Mo
Testing – Boundary Value Analysis, Equivalence Partitioning, State
Decision Table based Testing, Cause-Effect Graphing based Testing and
White Box Testing – Basis Path Testing, Data Flow Testing and Muta
Walkthroughs, Technical Reviews, Unit Testing, Integration Testing,
Testing, Acceptance Testing, Regression Testing, Test Management – Te
Test Design and Specifications, Software Metrics, Software Quality, Qu
Assurance, Quality Management and Project Management, Software
Internet Applications - Security and Performance Testing, Debugging,
(TDD), Behavior Driven Development (BDD). **Tools and Project** - Th
into small groups having at most 3 members and a class project will be g
a system test case. They must validate the requirements and create Mock
of test cases. Besides, each of the students will relate their learni
performance and security testing, debugging, behavior driven developm
JUnit, Selenium, Apache JMeter, Sprajax, Sqlninja, Bugzilla, Cucumber

References:

1. Naresh Chauhan, Software Testing: Principles and Practices, 1st
   University Press.
2. Glenford J. Myers, Corey Sandler, and Tom Badgett. The Art o
   higher Edition, John Wiley & Sons.
3. Lisa Crispin and Janet Gregory. Agile Testing: A Practical Gu
   Teams, 1st or higher Edition, Pearson Education.

Course Title: Software Design and Analysis
Code: SE 606
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Design Concept - The Design Process, Design Conc Architectural Design: Software Architecture, Architectural Genre Architectural Design, Assessing, Alternative Architectural Designs, Arc Data Flow; Component-Level Design: What Is a Component, Designing Conducting Component-Level Design, Component-Level Design fo Traditional Components, Component-Based Development; User Interf Rules, User Interface Analysis and Design, Interface Analysis, Interface Interface Design, Design Evaluation.

References:

1. Software Engineering – A Practitioner's Approach. 7th Edition, R
2. Software Engineering. 9th Edition, Ian Sommerville

Course Title: Software Metrics
Course Code: SE 611
Course Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Overview of Software Metrics, The basics of M framework for software measurement, Empirical Investigation, Measuring Measuring Internal Attributes : Structure, Measuring Cost and Effort, M attributes : Quality, Measuring Software Reliability, Object Oriente experiences: Students will implement different software metrics calcu utilize existing industry related tools for measuring software metrics a implementations to gain concrete idea.

References:

1. Software metrics- A Rigorous and Practical Approach, (3rd Edit Jones Bieman.
2. Software Measurement and Estimation: A practical Approach (1s and M. Carol Brennan

Course Title: Software Security
Course Code: SE 612
Course Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Introduction: Security principles, concept of computer s and policies Security risks: Database security, operating systems Countermeasures: methodologies and tools for identifying and eliminati techniques to prove the absence of vulnerabilities, and ways to avo software. Secure software design: essential guidelines for building sec security standards.

Suggested Readings:

1. Security in Computing, 4th Edition, by Charles P. Pfleeger, Prenti

2. Computer security: principles and practices, William Stallings
Edition
3. Brian Chess and Jacob West, Secure Programming with Static Ana
4. David A. Wheeler, Secure Programming for Linux and Unix H
2004 (required)
5. Goertzel et al, Software Security Assurance State of the Art Repor
6. Aleph One, Smashing the Stack for Fun and Profit. Phrack Vol 7,
7. Tim Newsham, Format String Attacks, Guardent tech report, Sept

Semester 7 (4th year 1st Semest

Course Title: Internship
Code: SE 701
Credit: 18 Credits (18 Credit Lab)

Outline: The student will work full-time as an intern to particular cor
months. S/he will be evaluated based on the marks provided by the comp
of at least two presentations given at IIT.

Semester 8 (4th year 2nd Semest

Course Title: Project
Code: SE 801
Credit: 6 Credits (6 Credit Lab)

Outline: Each student can perform a software development or researc project a student has to submit a thesis. For software development projec documents having the following: Project proposal, Software Requiremen Design Specification, Software Test Plan and User Manual. Besides, ea give multiple intermediate presentations to report their project progress.

Course Title: Software Project Management
Code: SE 803
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Introduction to Project management: Historical ba Terminologies, Software project management objectives, Scope, focus an software project management: Basic PM Skills, SPM framework, boundaries, challenges of SPM Software Project planning: Planning variations, structure of SPM plan, project estimation, estimation meth process. PM organization and scheduling: WBS, types of WBS, funct cycles, phasing and purpose of phasing, building project schedule, netwo Bar charts, Gantt charts Software project management techniques: Use of risks and issues, Managing Quality, Configuration, Change, Crisis, Docun monitoring and control: Dimensions of monitoring and control, earned CV, SV, CPI, SPI), backlog management, dispute and error tracking, scenarios: Domain analysis, Business case analysis, Dynamicity, Succes studies

References:

1. Stellman, Andrew, and Jennifer Greene. *Applied software projec* Media, Inc.", 2005.
2. Phillips, Joseph. *IT project management: on track from start to* 2002.
3. Rubin, Kenneth S. *Essential Scrum: A practical guide to the mo* Addison-Wesley, 2012.

Course Title: Software Maintenance
Code: SE 811
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Lifecycle roadmap is presented and different types of e activities are placed on it. Status within industry and research is mappe discussed and analyses in different contexts (the traditional, component Pre delivery and transition maintenance models are studied and crite identified. Impact analysis is studied. Different ways to manage custom

both the critical (emergency) and non-critical ones. Retirement proc
Finally, the quality attribute "maintainability" is discussed and co
Techniques for evolutionary design in the small: refactoring. Te
evolutionary design, especially evolution of legacy systems. A
isolation/exposure of change.

References:

1. Effective Software Maintenance and Evolution: A Reuse-Base
   Jarzabek; Publisher Taylor & Francis
2. Software Maintenance: Concepts and Practice By Penny Grubb,
   edition World Scientific USA.

Elective Courses

Course Title: Computer, Data and Network Security
Code: CSE 802
Credit: 2 Credit Theory and 1 Credit Lab

Course Outline: Overview: Network Security Concepts, Security Mechanisms;
Classical Encryption techniques: Symmetric Cipher Model, Substitution Steganography; Block Ciphers and Data Encryption Standard: Design operation; Public-key cryptography: Introduction to number theory, R Message Digest: Requirements for cryptographic hash function authentication codes, digital signatures; Key Management and Distr Distribution using Symmetric Encryption, Symmetric Key Distrib Encryption, public key distribution, public key certificates, x.509 certifica Security: Transport Layer Security, Wireless LAN security, e-mail securit

References:

1. Data and Computer Communications By Stallings, 8th Edition, Pe

Course Title: Data Mining and Warehousing
Code: CSE 825
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Introduction to Data Mining, Knowing Data (Data dissimilarities, statistical descriptions and visualizations), Data Pre-proc and Online Analytical Processing, Data Cube technology, Mining freque and Cluster Analysis, Research trends in Data mining and warehousing.

References:

1. Data Mining: Concepts and Techniques. Jiawei Han, Micheline Book]

Course Title: Pattern Recognition and Image Processing
Course Code: CSE 829
Course Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Introduction to Image Processing; Digital Image Fun Visual Perception. Light and the Electromagnetic Spectrum. Image Sensi Sampling and Quantization. Some Basic Relationships between Pixe Operations; Image Enhancement in the Spatial Domain - Background. Transformations. Histogram Processing. Enhancement Using Arithmetic of Spatial Filtering. Smoothing Spatial Filters. Sharpening Spatial F Enhancement Methods; Image Enhancement in the Frequency Domain - to the Fourier Transform and the Frequency Domain. Smoothing F Sharpening Frequency Domain Filters. Homomorphic Filtering. Impleme - A Model of the Image Degradation/Restoration Process. Noise M Presence of Noise Only-Spatial Filtering. Periodic Noise Reduction

Filtering. Linear, Position-Invariant Degradations. Estimating the Degr
Filtering. Minimum Mean Square Error (Wiener) Filtering. Constrained
Geometric Mean Filter. Geometric Transformations; Color Image Process
Color Models. Pseudo color Image Processing. Basics of Full-Color
Transformations. Smoothing and Sharpening. Color Segmentation. Nois
Image Compression; Wavelets and Multiresolution Processing - Bac
Expansions. Wavelet Transforms in One Dimension. The Fast Wav
Transforms in Two Dimensions. Wavelet Packets; Image Compressio
Compression Models. Elements of Information Theory. Error-Fr
Compression. Image Compression Standards; Morphological Image Pr
Dilation and Erosion. Opening and Closing. The Hit-or-Miss Tran
Morphological Algorithms. Extensions to Gray-Scale Images; Image Se
Discontinuities. Edge Linking and Boundary Detection. Thresholding. Re
Segmentation by Morphological Watersheds. The Use of Motion in Seg
and Description - Representation. Boundary Descriptors. Regional Des
Components for Description. Relational Descriptors; Object Recognitio
Classes. Recognition Based on Decision-Theoretic Methods. Structural M

References:

1. Digital Image Processing - Rafael C Gonzalez and Richard E. Woo

Course Title: Computer Graphics and Multimedia
Course Code: CSE 831
Course Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Introduction: History of computer graphics, graphics a
imaging: pinhole camera, human vision, synthetic camera, modeling
architecture, displaying simple two-dimensional geometric objects, positi
a windowed environment Color: Color perception, color models (RGB
transformations. Color in OpenGL. RGB and Indexed color. Input
environment, client-server computing; input measure, event, sample
callbacks, picking. Geometric transformations: affine transformations (tra
and shear), homogeneous coordinates, concatenation, current transform
Three dimensional graphics: classical three dimensional viewing,
transformation in3D, projective transformations. Ray Tracing. Shading:
modeling, Phong shading model, polygon shading. Rasterization: line
algorithm, clipping, polygonal fill, BitBlt. Introduction to hidden su
Discrete Techniques: buffers, bitblt, reading and writing bitmaps and pix
compositing.

References:

1. Computer Graphics, Principle and Practices – James D. Foley, And
Feiner and John F. Hughes.

Course Title: Information Retrieval
Code: CSE 840
Credit: 3 Credits (2 Credit Theory and 1 Credit Lab)

Course Outline: Boolean Retrieval: Inverted Index, Processing boolean
retrieval; Term Vocabulary and Postings lists: Document delineation
decoding, Tokenization, Dropping common terms: stop words, Normaliza
of terms), Stemming and lemmatization, skip pointers, Biword ind
Dictionaries and tolerant retrieval: Search structures for dictionaries, Ge
gram indexes for wildcard queries, Spelling correction; Index Constru
indexing, Single-pass in-memory indexing, Distributed indexing, Dynan
Ranking: Parametric and zone indexes, Term frequency and weighting, T
scoring, variant tf-idf functions; Computing scores in a complete search
and ranking, Components of an information retrieval system; Evaluation
Evaluation of unranked retrieval sets, Evaluation of ranked retrieval res
Results snippets; Relevance feedback and query expansion: The Rocchi
feedback, Relevance feedback on the web, Evaluation of relevance fe
methods for query reformulation; Language models for informat
Information Retrieval: Explore the capacity of Apache Lucene as a text se

References:

1. An Introduction to Information Retrieval by Christopher D. Manni
   Hinrich Schütze, Online Edition, 2009, Cambridge University Pres
2. Lucene in Action by Michael McCandless, Erik Hatcher, and Otis
   Edition, Manning publications.

Course Title: Strategic Management
Code: BUS 842
Credit: 3 Credits (3 Credit Theory)

Course Outline: Strategic Management Concept: Strategic Leadership
Superior Performance, Performance in Nonprofit Enterprises, Strategic M
Process. **Industry analysis, External Environment and Internal Reso**
and Sector, market segments, Porter's Five Forces Model, , Strategic Gr
Analysis, Macroeconomic Forces, Competitive Advantage, Value C
Avoiding Failures and Sustaining Competitive Advantage. **Function**
Strategy: Achieving Superior Efficiency, Learning Effects, Materials M
Attaining superior Reliability, Responsiveness to Customers, Competitive
Level Strategy, Strategies in Fragmented Industries, Embryonic, Grow
Technological Support for Adopting Strategies and Global Strategy:
wining in Format War, Information System Strategy, Managing Inte
Capturing First-Mover Advantages, Technological Paradigm Shifts,
Profitability and Profit Growth through Global Expansion, Global
Strategic Software Engineering: Architecture-Centric Software Develo
Product Lines, Software Effort and Cost Estimation Strategies, Openness
Supply Chain, Software Economics.

References:

1. Theory of Strategic Management (Eighth Edition) By: Hill/Jones
2. Strategic Management (Concepts and Cases) Twelfth Edition By:

Course Title: Applied Data Science
Course Code: CSE 844
Course Credit: 2 Credits Theory and 1 Credit Lab

Course Outline:
Theory: Introduction to applied data science, Data cleaning/Data Publ techniques, Predictive analytics, Bayesian analytics, Building efficient m Regularization, Opportunities involving applied data science. The course collecting, storing, and analyzing data in varying formats. Scientific prog unsupervised analytics and data visualization techniques will be cove learning classifiers, Bayesian, maximum a posteriori, parameter estimat networks, support vector machines, bag of words classifiers, N-gram nearest neighbor classifiers, locally weighted regression, ensemble class models, k-means clustering, hierarchical clustering, distributional cluste in data mining, automated knowledge acquisition, pattern recognition, pr language processing, internet-based information systems, etc.

Lab: The course lab aims to provide an introduction to various topics Discovery, Data Visualization, along with a toolkit to use with data i.e., H

References:

1. Mount and Zumel (2014), Practical data science with R.
2. Cathy O'Neil and Rachel Schutt, *Doing Data Science, O'Reilly, 20*
3. Russell Jurney, *Agile Data Science, O'Reilly, 2013.*
4. Edward Tufte, *The Visual Display of Quantitative Information, C ed).*
5. Morgan Kaufmann, *Data Mining: Practical Machine Learning edition, 2011*
6. Matthew Russell, *Mining the Social Web: Data Mining Face Google+, GitHub, and More. O'Reilly, 2013*

UNIVERSITY OF DHAKA

INSTRUCTIONS FOR PAPER-SETTERS

(Approved under A.C.M. 3-12-37)

1. No question shall be set at any examination which may require and expression of religious belief on the part of candidates.

2. Examiners setting papers shall be guided, as to the scope of the subjects of examination, by the syllabus prescribed and as to the standard and extent of knowledge required, by the books, If any, recommended by the University from time to time for such purpose.

3. The paper set shall be such as candidates can reasonably be expected to answer within the time allotted. The question in each subject shall be fairly distributed over the whole course in that subject, and shall confirm to the regulation laid down for the particular examination. Examiners shall allow some choice questions to candidates.

4. Examiners shall as far as practicable, avoid any marked change of standard from year to year, but shall not be required to set the same type of questions every year.

5. Examiners shall set questions which are within the capacity of the candidates, but shall so frame them that there shall be no ambiguity as to their meaning and that they cannot be answered by unintelligent memorising.

The Paper-setter is particularly requested

1. To take special care in writing proper names and technical words

2. To set questions for Honours and Master's Degree Examinations in such a way that originality and individuality of the candidate may be encouraged.

3. To make sure that the manuscripts of questions are as clear and legible as possible so as to ensure accuracy in printing.

4. To give at the bottom of the question paper, in case of quotations and extracts, full reference to the text books or other books from which they are taken indicating the edition used and the page on which they occur.

5. To destroy any copy of the question papers framed by and all rough drafts and memoranda connected therewith.

6. To initial all corrections without exception.

7. To sign at the bottom of each sheet of his question paper in the place indicated.

Sd/-
Controller of Examinations
UNIVERSITY OF DHAKA

N B. 1—If any paper-Setter fails to send his question paper by the date fixed for the purpose, the University shall have the right to appoint another Examiner in his place without further notice.

DUP—550—11-2-19—50,000

বিলের ক্রমিক নং .....

ঢাকা বিশ্ববিদ্যালয়

(পরীক্ষার ফল প্রকাশের এক বৎসরের মধ্যে নির্দিষ্ট বিভাগীয় পরীক্ষা পরিষদের সভাপতির মাধ্যমে পরীক্ষা নিয়ন্ত্রকের অফিসে পারিশ্রমিকের বিল পেশ করিতে হইবে)।

পরীক্ষকের নাম : জনাব/ড: .....

পদবী সহকারে ঠিকানা .....

.....

২০.....সনের পরীক্ষা সমূহের প্রশ্নপত্র প্রণয়ন, সমন্বয় সাধন এবং উত্তরপত্র মূল্যায়ন ইত্যাদির জন্য আমার পারিশ্রমিক দাবীসমূহ নিম্নে সন্নিবেশিত হইল :-

		টাকা	পয়সা
(১)	প্রশ্নপত্র প্রণয়ন : (ক) একটি পূর্ণ/অর্ধপত্র .....পরীক্ষার.....বিষয়.....পত্র/কোর্স		
	(খ) ,, ,, ,, ,, ...,, ... ,, ... ,,		
	(গ) ,, ,, ,, ,, ...,, ... ,, ... ,,		
(২)	প্রশ্নপত্র সমন্বয় সাধন : .....পরীক্ষার.....বিষয় .....টা: প্রশ্নপত্র.....জন সদস্য.....		
(৩)	উত্তরপত্র মূল্যায়ন করা : (ক).....পূর্ণ/অর্ধ খাতা.....পরীক্ষার .....বিষয়.....পত্র/কোর্স		
	(খ)..... ,, ,, ,, ... ,, ... ,, ... ,,		
	(গ)..... ,, ,, ,, ... ,, ... ,, ... ,,		
(৪)	ব্যবহারিক পরীক্ষা : ২০.....সনের.....পরীক্ষার.....বিষয়ে .....কেন্দ্রের.....জন পরীক্ষার্থীর জন্য.....দিন		
(৫)	মৌখিক পরীক্ষা : ২০.....সনের.....পরীক্ষার.....বিষয়ে .....কেন্দ্রের.....জন পরীক্ষার্থীর জন্য.....		
(৬)	পরীক্ষার ফল সন্নিবেশকরণ : ২০.....সনের .....বিষয়ে..... পরীক্ষার.....জন পরীক্ষার্থীর জন্য		
(৭)	উত্তরপত্র নিরীক্ষা : ২০.....সনের.....পরীক্ষার.....বিষয়ের .....উত্তরপত্র নিরীক্ষা.....		
(৮)	ডাক মাশুল ও সংশ্লিষ্ট অন্যান্য বিবিধ খরচ :- (ডাক মাশুলের এবং সংশ্লিষ্ট অন্যান্য বিবিধ খরচের রশিদ বিলের সহিত সংযুক্ত না থাকিলে উহা পরিশোধযোগ্য বলিয়া গণ্য হইবে না)। বি: দ্র:-৮ নং ক্রমানুসারে বিবিধ খরচের ভাউচার (পোষ্টাল রশিদ ও ক্যাশমেমো) এর গায়ে পরীক্ষকের স্বাক্ষর থাকা প্রয়োজন।		
	মোট টাকা		

(৯) প্রত্যয়ন করা যাইতেছে যে অত্র বিলের টাকা পূর্বে গ্রহণ করা হয় নাই।

.....
প্রতি স্বাক্ষর
পরীক্ষা পরিষদের সভাপতি
.....বিভাগ

তারিখ.....

.....
পরীক্ষক/নিরীক্ষক/সন্নিবেশকের স্বাক্ষর

বর্তমান ঠিকানা .....

.....

ড:/জনাব.....কে (অংকে) টাকা.....

(কথায়).....পয়সা.....মাত্র দেওয়া যাইতে পারে।

.....
পরীক্ষক/নিরীক্ষক /সন্নিবেশকের স্বাক্ষর
তারিখ.....

(বিলে উল্লেখিত সমুদয় টাকা বুঝিয়া পাইলাম)

স্বাক্ষর

.....
পরীক্ষা উপ-নিয়ন্ত্রক
ঢাকা বিশ্ববিদ্যালয়।

বি: দ্র:-(ক) ২০০'০০ টাকার উর্ধে দাবী রাজস্ব টিকিট ব্যতীত পরিশোধ করা যাইবে না।
(খ) পরীক্ষক সরকারী চাকুরিয়া হইলে যথাযথ কর্মকর্তার অনুমতি ব্যতিরেকে দাবী পরিশোধ করা হইবে না।

ঢবপ—৬৪—২৫-০৭-১৯—৫০,০০০

প্রশ্নে কোন প্রকার উদ্ধৃতি ও বিবরণী থাকিলে উহা কোন্ গ্রন্থের কোন্ সংস্করণের কত পৃষ্ঠায় আছে দয়া করিয়া তাহা প্রশ্নের নিচে উল্লেখ করিবেন।

..... পরীক্ষা, ২০ ।

বিষয় .....

কোর্স/পত্র নং .....

কোর্স/পত্রের শিরোনাম .....

পূর্ণ নম্বর ..... সময় ..... ঘন্টা।

* পার্শ্বের সংখ্যা পূর্ণমান জ্ঞাপক।
সকল প্রশ্নের মান সমান। যে কোন ..... টি প্রশ্নের উত্তর দিবে।

বিশেষ নির্দেশ (যদি কিছু থাকে)।

	নম্বর

অপ্রয়োজনীয় অংশ কাটিয়া দিন।

প্রশ্নপত্র প্রণয়নকারীর স্বাক্ষর

ঢবপ–৭০৪–২৩-০৫-২০১৯–৫০,০০০ সেট

	নম্বর

প্রশ্নপত্র প্রণয়নকারীর স্বাক্ষর

	নম্বর

প্রশ্নপত্র প্রণয়নকারীর স্বাক্ষর