BTCOC501: Database Systems

[Unit 1] Introduction **[7 Hours]**

Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, Constraints, keys, E-R Diagrams, Mapping Cardinality, Concepts of Super Key, candidate key, primary key, weak entity sets, Codd's rules, Extended ER model, Generalization, Aggregation, , Reduction of an ER diagrams to tables.

[Unit 2] Relational Data Model, Relational Algebra and Calculus **[7 Hours]**

Structure of Relational Databases, Database Schema, Keys Relational algebra: Fundamental Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities.

[Unit 3] Introduction to SQL **[7 Hours]**

Overview of SQL, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operators, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of the Database Intermediate SQL : Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schema, Authorization, Advanced SQL : Assessing SQL from Programming Language, JDBC, ODBC, Embedded SQL, Functions and Procedures, Triggers,

[Unit 4] Relational Database Design and File Organization, Indexing & Hashing **[7 Hours]**

Normalization: Features of good relational designs, Functional dependencies, Normal forms, First, Second, Third normal forms, BCNF, Functional Dependency Theory, Multivalued Dependencies, Fourth Normal Form, Database Design Process.

File Organization, Ordered Indices, B+tree Index files, B Tree Index File, Static Hashing, Dynamic Hashing,

[Unit 5] Transaction Processing **[7 Hours]**

Transaction Concept, A simple Transaction Model, Transaction Atomicity and Durability, Transaction Isolation, ACID Properties, Serializability Concurrency Control Techniques: Lock based Protocols, Deadlock handling, Multiple Granularity, Time stamp-Based Protocols, Recovery System.

Text Book:

1. Henry Korth, Abraham Silberschatz & S. Sudarshan, Database System Concepts, McGraw-Hill Publication, 6th Edition, 2011.

Reference Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw-HillPublication, 3rd Edition, 2003.
2. Joel Murach, Murach's Oracle SQL and PL/SQL for Developers, Mike Murach & Associates, 2nd Edition, 2014.
3. Wiederhold, Database Design, McGraw-Hill Publication, 2nd Edition, 1983.
4. Navathe, Fundamentals of Database System, Addison-Wesley Publication, 6th Edition, 2012.
5. Mark L. Gillenson, Fundamentals of Database Management System, Wiley Publication, 2ndEdition, 2011.
6. Serge Abiteboul, Richard Hull, Victor Vianu, ―Foundations of Databases‖, Reprint by Addison-Wesley.

BTCOC502: Theory of Computation

[Unit 1] Finite Automata and Regular Expressions   **[7 Hours]**

Definition of deterministic finite automata, Non-deterministic finite automata, Moore and Mealy machines and their conversions, Regular expressions, Recursive definition, NFA with e-moves, Inter-conversion between NFA and DFA, Regular expression and FA, Pumping lemma.

[Unit 2] Context Free Grammars   **[7 Hours]**

Definition, Production rules, Ambiguous grammar, Removal of ambiguity, Chomsky hierarchy, Context Free Grammar (CFG) – definition, Simplification of CFG.

[Unit 3] Context Free Languages   **[7 Hours]**

Definition of context free languages, Regular grammar definition, Left linear, Right linear grammar, Inter-conversion between left linear and right linear regular grammar, Regular grammar and finite automata, CNF, GNF, Derivation graphs, Type 0 and Type 1grammars.

[Unit 4] Push down Automata   **[7 Hours]**

Formal definition, Pushdown automata (PDA), Deterministic Pushdown automata (DPDA) – definition, Non-deterministic Pushdown automata (NPDA) - definition, relative powers of DPDA and NPDA.

[Unit 5] Turing Machines and Undecidability   **[7 Hours]**

Definition, Computing with Turing machine, Extensions of Turing machines, Random access Turing machines, Non-deterministic Turing machines, Grammars, The Church's Turing hypothesis, Universal Turingmachines, The Halting problem, Unsolvable problems about Turing machines.

Text Book:

1. Hopcroft, Ullman, Motwani, *Introduction to Automata Theory*, *Languages, and Computation*, Addison Wesley Publication, 2nd Edition, 2001.

Reference Books:

1. Daniel I. A. Cohen, *Introduction to Computer Theory*, Wiley Publication, 1st Edition, 1986.
2. John C. Martin, *Introduction to Languages and Theory of Computation*, McGraw-Hill Publication, 4th Edition, 2010.
3. Krithivasan Kamala, *Introduction to Formal Languages, Automata Theory and Computation*, Pearson Education, 1st Edition, 2009.
4. Papadimitriou, Lewis, *Elements of the Theory of Computations*, PHI Publication, 2nd Edition, 1997.
5. E. V. Krishnamurthy, *Introductory Theory of Computer Science*, Springer-Velang New York Inc., 1st Edition, 1985.

BTCOC503: Software Engineering

[Unit 1]   **[7 Hours]**

Introduction: Professional software development, Software engineering ethics, Case studies. Software processes: Software process models, Process activities, Coping with change, The rational unified process.

[Unit 2]   **[7 Hours]**

Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods. Requirements engineering: Functional and non-functional requirements, The software requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management.

[Unit 3]   **[7 Hours]**

System modeling: Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering. Architectural design: Architectural design decisions, Architectural views, Architectural patterns, Application architectures.

[Unit 4]   **[7 Hours]**

Design and implementation, Object-oriented design using UML, Design patterns Implementation issues, Open source development.

[Unit 5]   **[7 Hours]**

Software testing, Development testing, Test-driven development, Release testing, User testing. Dependability properties, Availability and reliability, Safety Security.

Text Book:
1. Ian Sommerville, *Software Engineering*; 9th Edition, Addison-Wesley Publishing Company, USA.

Reference Books:
1. S.A. Kelkar, Software Engineering, , Prentice Hall of India, 2007.
2. Pressman, Software Engineering, Tata McGraw Hill, 6th Edition, 2006.
3. Pankaj Jalote, Software Engineering, Narosa Publishers, 3rd Edition, 2006.

NPTEL Course:
1. Software Engineering, Prof. Rajib Mall, Department of Computer Science and Engineering, IIT Kharagpur.

BTCOE504 (A): Human Computer Interaction

UNIT 1:
INTRODUCTION TO HCI, THE HUMAN: Introduction, Input–Output Channels, Human Memory, Thinking: Reasoning and Problem Solving. **The Computer:** Introduction, Text Entry Devices, Positioning, Pointing And Drawing, Display Devices, Devices For Virtual Reality And 3d Interaction, Physical Controls, **The Interaction:** Introduction, Models Of Interaction, Ergonomics, Interaction Styles, Elements Of The Wimp Interface.

UNIT 2:
Design Process: Interaction Design Basics: Introduction, The Process Of Design, Navigation Design, Screen Design And Layout. **HCI in the Software Process:** Introduction, the Software Life Cycle, Iterative Design and Prototyping, Design Rationale. **Design Rules:** Introduction, Principles to Support Usability, Golden Rules and Heuristics

UNIT 3:
Implementation Support: Introduction, Elements of Windowing Systems, Programming the Application, User Interface Management Systems. **Evaluation Techniques:** Introduction, Goals of Evaluation, Evaluation through Expert Analysis, Evaluation through User Participation. **Universal Design:** Introduction, Universal Design Principles, and Multi-Modal Interaction, **User Support:** Introduction, Requirements of User Support, Approaches to User Support, Adaptive Help Systems

UNIT 4:
Cognitive Models: Introduction, Goal and Task Hierarchies, Linguistic Models, Physical and Device Models. **Communication and Collaboration Models:** Introduction, Face-To-Face Communication, Text- Based Communication, Group Working.

UNIT 5:
Groupware: Introduction, Groupware Systems, Computer-Mediated Communication, Meeting And Decision Support Systems, Shared Frameworks For Groupware. **Ubiquitous Computing and Augmented Realities:** Introduction, Ubiquitous Computing Applications Research, Virtual and Augmented Reality. **Hypertext, Multimedia and the World Wide Web:** Introduction, Understanding Hypertext, Web Technology and Issues, Static Web Content, Dynamic Web Content.

Text Book:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale ‒Human Computer Interaction‖, Pearson Education, 3rd Edition, 2003.

eference Books:

1. B. Shneiderman, Designing the User Interface, Addison-Wesley Publishing Company.
2. Jenny Preece, Helen Sharp, Yvonne Rogers, Interaction Design: Beyond Human-Computer Interaction, Wiley Publication, 4th Edition, 2015.
3. Gerard Jounghyun Kim, Human–Computer Interaction: Fundamentals and Practice, CRC Press, 2015.
4. Jenifer Tidwell, Designing Interfaces, Patterns for Effective Interaction Design, O'Reilly Media, 2nd Edition, 2010.

NPTEL Course:

1. Human Computer Interaction, Prof. K. Ponnurangam, Dept. of Computer Science and Engineering, IIIT Delhi.

BTCOE504 (B): Numerical Methods

[Unit 1] **[7 Hours]**

Solution of Algebraic and Transcendental Equation: Bisection method, Method of false position, Newton's method and Newton-Raphson method.

[Unit 2] **[7 Hours]**

Solution of Linear Simultaneous Equation: Gauss elimination method, Gauss-Jordan method, Iterative method of solution- Jacobi iteration method, Gauss-Seidal iteration method, Relaxation method.

[Unit 3] **[7 Hours]**

Finite Differences: Forward difference operator, Backward difference operator, Central difference operator, New- ton's interpolation formulae, Newton's forward–backward-central interpolation formulae.

[Unit 4] **[7 Hours]**

Differentiation and Integration: Newton-Cortes formula, Trapezoidal rule, Simpson one–third rule, Simpson three- eighth rule.

[Unit 5] **[7 Hours]**

Numerical Solution of ODE: Picard's methods, Taylor series method, Euler's method, Modified Euler's method, Runge Kutta method.

Text Book:
1. B. S Grewal, Higher Engineering Mathematics, 40th edition, Khanna publication

Reference Books:
1. S. S. Shastri, Introduction to Numerical Methods, PHI publication.
2. V. Rajaraman, Computer Oriented Methods, 3rd edition, PHI publication.
3. Conte and De boor, Elementary Numerical Analysis, BPB publication.
4. E. Kreyszig, Advanced Engineering Mathematics, BPB publication.
5. Steven C Chapra, Numerical Methods for Engineers, 5th edition, McGraw Hill publication.

NPTEL Course:
1. Numerical Methods, Prof. Ameeya Kumar Nayak and Prof. Sanjeev Kumar, IIT Roorkee.

BTHM505 (A): Economics and Management

[Unit 1]   **[7 Hours]**

Introduction, Market Equilibrium: Demand and Supply, Elasticity of Demand Forecasting, Production, Exercises on Economics, Cost-Volume-Profit Relationships, Cost Management Systems and Activity Costing System.

[Unit 2]   **[7 Hours]**

Relevant Information and Decision Making, Cost Allocation, Exercises on Economics, Double-Entry Bookkeeping, Job Casting, Process Costing, The Master Budget, Flexible Budgets and Variance Analysis.

[Unit 3]   **[7 Hours]**

Financial Statements, Analysis of Financial Statements, Time Value of Money, Comparison of Alternatives.

[Unit 4]   **[7 Hours]**

Depreciation Accounting, Evolution of Management Thoughts, Functions of Management Directing.

[Unit 5]   **[7 Hours]**
Product Development, Forecasting Revisited, Capacity Planning, Product / Services Strategies and Plant Layout, Production Planning and Control.

Text Book:
  1. R. Paneerselvam, Engineering Economics, PHI publication.

Reference Books:
  1. Robbins S.P. and Decenzo David A., Fundamentals of Management: Essential Concepts and Applications, Pearson Education.
  2. L. M. Prasad, Principles and Practices of Management.
  3. K. K. Dewett & M. H. Navalur, Modern Economic Theory, S. Chand Publications.

NPTEL Course:
  1. Economics / Management / Entrepreneurship, by Prof. P. K. J. Mohapatra Department of Industrial Engineering & Management, IIT Kharagpur.

BTHM505 (B): Business Communication

[Unit 1] [6 Hours]

Introduction, Definitions & Concepts, Communicative Competence.

[Unit 2] [6 Hours]

Intercultural Communication, Nonverbal Communication, Thought and Speech, Translation as Problematic Discourse.

[Unit 3] [6 Hours]

Barriers to Communication, Listening, Communication Rules, Communication Style.

[Unit 4] [6 Hours]

Interpersonal Communication, Relational Communication, Organizational Communication. Collaboration, Communication in Groups and Teams, Persuasive Communication.

[Unit 5] [7 Hours]

Negotiation and Conflict Management, Leadership, Written Communication in International Business, Role of Technology in international Business Communication, Moving to Another Culture, Crisis Communication, Ethics in Business Communication.

Text Book:
1. Mary Ellen Guffey, Essentials of Business Communication, Sixth Edition, South-Western College Publishing

Reference Books:
1. Bovee, Courtland, John Thill & Mukesh Chaturvedi, Business Communication Today: Dorling kindersley, Delhi.
2. Kaul, Asha, Business Communication, Prentice-Hall of India, Delhi.
3. Monippally, Matthukutty M. Business Communication Strategies. Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. Sharma, Sangeeta and Binod Mishra, Communication Skills for Engineers and Scientists, PHI Learning Pvt. Ltd., New Delhi.

NPTEL Course:
1. International Business Communication, by Aradhana Malik, IIT Kharagpur.

BTCOL506: Database Systems Laboratory

List of Experiments:

1. Defining schema for applications.
2. Creating tables, Renaming tables, Data constraints (Primary key, Foreign key, Not Null), Data insertion into a table.
3. Grouping data, aggregate functions, Oracle functions (mathematical, character functions).
4. Sub-queries, Set operations, Joins.
5. Creation of databases, writing SQL and PL/SQL queries to retrieve information from the databases.
6. Assignment on Triggers & Cursors.
7. Normal Forms: First, Second, Third and Boyce Codd Normal Forms.
8. Assignment in Design and Implementation of Database systems or packages for applications such as office automation, hotel management, hospital management.
9. Deployment of Forms, Reports Normalization, Query Processing Algorithms in the above application project.
10. Large objects – CLOB, NCLOB, BLOB and BFILE.
11. Distributed data base Management, creating web-page interfaces for database applications using servlet.

BTCOL506: Software Engineering Laboratory

List of Experiments:

1. To perform the system analysis: Requirement analysis, SRS. (Both Functional and Nonfunctional requirements. For a set of 10 sample problems, from a book on Software Engineering by Rajib Mall.)
2. To perform the function oriented diagram: DFD and Structured chart.
3. To perform the user's view analysis: Use case diagram.
4. To draw the structural view diagram: Class diagram, object diagram.
5. To draw the behavioral view diagram: Sequence diagram, Collaboration diagram.
6. To draw the behavioral view diagram: State-chart diagram, Activity diagram.
7. To draw the implementation view diagram: Component diagram.
8. To draw the environmental view diagram: Deployment diagram.
9. To perform various testing using the testing tool unit testing, integration testing

BTCOM507: Mini Project-1

In this subject head, it is expected that the student should complete the following tasks.

1. Identify problem statement / idea which is solving one problem preferably local problem may be in their University / College / near by vicinity.
2. Do the literature survey,
3. Design the solutions
4. Implement solution using latest technology
5. Write 20-25 pages report using latex
6. Present / demonstrate the solution in front of faculty member