ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
GUWAHATI

Course Structure and Syllabus
(From Academic Session 2018-19 onwards)

B.TECH

COMPUTER SCIENCE AND ENGINEERING
5TH SEMESTER

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati
Course Structure

(From Academic Session 2018-19 onwards)

B. Tech 5th Semester

Semester V/ B.TECH/Computer Science and Engineering

Sl. No.	Sub-Code	Subject	Hours per Week			Credit	Marks	
			L	T	P	C	CE	ESE
Theory								
1	CSE181501	Database Management System	3	0	0	3	30	70
2	CSE181502	Design and Analysis of Algorithm	3	0	2	4	30	70
3	CSE181503	Formal Language and Automata Theory	3	0	0	3	30	70
4	CSE1815PE1*	Program Elective-1	3	0	0	3	30	70
5	HS181506	Engineering Economics	3	0	0	3	30	70
Practical								
1	CSE181511	Database Management System Lab	0	0	4	2	15	35
2	CSE181516	Web Programming	0	1	4	3	15	35
3	SI181521	Internship-II (SAI – Academia)	0	0	0	1	-	100
TOTAL			15	1	10	**22**	**180**	**520**
Total Contact Hours per week : 26								
Total Credits: 22								

PROGRAMME ELECTIVE – 1 SUBJECTS		
Sl. No	**Subject Code**	**Subject**
1	CSE1815PE11	Microcontrollers and Applications
2	CSE1815PE12	Queuing Theory and modelling
3	CSE1815PE13	Information Retrieval
4	CSE1815PE14	Computer Graphics
5	CSE1815PE1*	Any other subject offered from time to time with the approval of the University

Detail syllabus:

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181501	Database Management System	3-0-0	3

MODULE 1:
Database System Architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML)

Data Models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations

MODULE 2:
Relational Query Languages
Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS -MYSQL, ORACLE, DB2, SQL server
Relational Database Design
Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design
Query Processing and Optimization
Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms

MODULE 3: Storage Strategies
Indices, B-trees, hashing

MODULE 4: Transaction Processing
Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery

MODULE 5: Database Security
Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection

MODULE 6: Advanced Topics
Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining

Textbooks/Reference Books:

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
2. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
3. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education
4. "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181502	Design and Analysis of Algorithm	3-0-2	4

MODULE 1: Introduction
Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

MODULE 2: Fundamental Algorithmic Strategies
Brute-Force, Greedy, Dynamic Programming, Branch and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving, Bin Packing, Knap Sack, text/string matching, subset sum, TSP; Heuristics –characteristics and their application domains.

MODULE 3: Graph and Tree Algorithms
Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

MODULE 4: Data structures
red black trees, Fibonacci heap, binomial heap; Sorting- linear time, Amortized complexity, Median and order statistics

MODULE 5: Tractable and Intractable Problems
Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques

MODULE 6: Advanced Topics
Approximation algorithms, Randomized algorithms, Evolutionary algorithms, Class of problems beyond NP – P SPACE

Textbooks/Reference Books:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz et al.
3. Algorithm Design, 1ST Edition, Jon Kleinberg and Éva Tardos, Pearson.
4. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
5. Algorithms—a Creative Approach, 3RD Edition, Udi Manber, Addison-Wesley, Reading, MA.

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181503	Formal Language and Automata Theory	3-0-0	3

MODULE 1: Finite Automata and Regular Expressions
Deterministic and non-deterministic finite automata, regular expressions, two way finite automata, finite automata with output: Mealy and Moore machines; Properties of Regular Sets: Pumping lemma, closure properties, decision algorithm, MyHill-Nerode theorem and minimization of finite automata.

MODULE 2: Context-Free Grammars (CFG)
CFGs, derivation trees, simplification, Chomsky normal forms, Greibach normal forms; Pushdown Automata (PDA): Definitions, relationship between PDA and context free languages; Properties of Context-Free Languages: Pumping lemma, closure properties, decision algorithm

MODULE 3: Turing Machines
The Turing machine model, computable languages and functions, techniques for Turing machine construction, modification of Turing machines, church's hypothesis, Turing machines as enumerators; Undesirability: properties of recursive and recursively enumerable languages, universal Turing machines, rice's theorem, post correspondence problem, Greibach's theorem, introduction to recursive function theory, oracle computation; Chomsky Hierarchy: regular grammars, unrestricted grammars, context sensitive languages, relations between classes of languages

Textbooks/Reference books:

1. Mishra &Chandrasekharan, Theory of computer science: Automata language and computation, Prentice Hall of India, 3rd Ed, 2007
2. P. Linz, Introduction to Formal Language and Computation, Narosa, 2nd Edition, 2006
3. Nasir & Sirmani, A Text Book on Automata Theory, Cambridge University Press, 2008
4. H. R. Lewis & C. H. Papadimitriou, Elements of the Theory of Computation, Prentice Hall of India, 2nd Edition, 2006

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1815PE11	Microcontrollers and Applications	3-0-0	3

MODULE 1: Fundamentals of Microprocessors

Fundamentals of Microprocessor Architecture, 8-bit Microprocessor and Microcontroller architecture, Comparison of 8-bit microcontrollers, 16-bit and 32-bit microcontrollers, Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems, Overview of the 8051 family

MODULE 2:

The 8051 Architecture, Internal Block Diagram, CPU, ALU, address, data and control bus, working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles

MODULE 3: Instruction Set and Programming, Addressing modes

Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction, Assembly language programs, C language programs, Assemblers and compilers, Programming and debugging tools.

MODULE 4: Memory and I/O Interfacing

Memory and I/O expansion buses, control signals, memory wait states, Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, timers, counters, memory, devices

Module 5: External Communication Interface: Synchronous and Asynchronous Communication. RS232, SPI, I2C, Introduction and interfacing to protocols like Blue-tooth and Zig-bee

Module 6: Applications: LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing

Textbooks / References:

1. M. A.Mazidi, J. G. Mazidi and R. D. McKinlay, "The8051Microcontroller and Embedded Systems: Using Assembly and C",Pearson Education, 2007
2. K. J. Ayala, "8051 Microcontroller", Delmar Cengage Learning, 2004
3. R. Kamal, "Embedded System", McGraw Hill Education, 2009
4. R. S. Gaonkar, ", Microprocessor Architecture: Programming and Applications with the 8085", Penram International Publishing, 1996
5. D.A. Patterson and J.H. Hennessy, "Computer Organization and Design: The Hardware/Software interface", Morgan Kaufman Publishers, 2013.
6. D. V. Hall, "Microprocessors & Interfacing", McGraw Hill Higher Education, 1991

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1815PE12	Queuing Theory and Modelling	3-0-0	3

MODULE 1: Introduction
When simulation is appropriate and when not, advantages and disadvantages of simulation, application areas in communication, computer and software design, systems and systems environment, components of a system, discrete and continuous systems, model of a system, types of models, discrete-event simulation, steps in a simulation study. Simulation Examples- Simulation of queuing systems, on-demand and inventory systems, simulation for reliability analysis etc.

MODULE 2: General Principles
Concepts in discrete event simulation: event scheduling/time advances algorithms, world views. List Processing: properties and operations, data structures and dynamic allocation, techniques

Module 3: Simulation Software
Integrated environments. Examples and review of some existing software popular and useful in the industry, e.g., Arena, Auto Mod, Extend, Flexsim, Micro Saint, Pro Model, Quest, SIMUL8, WITNESS etc. Simulation using languages and environments like C++/Java/GPSS/SSF etc. Experimentation and Statistical-Analysis Tools: common features and relevant current products

MODULE 4:
Statistical Models in Simulation-Terms and concepts, statistical Models, review of discrete and continuous distributions. Review of Poisson (stationary and non-stationary) processes, empirical distributions; elementary Queuing Theory- Basic Structure of Queuing Models, Input Source (Calling Population), Queue, Queue Discipline, Service Mechanisms. Notations and relationships between *L, W, Lq,* and *Wq.* Little's Formula, role of Exponential Distribution and Properties, Birth and Death Processes. M/M/s queues. Finite queue variation in M/M/s/K models with different s values. Finite Calling Population cases, Queuing Models involving Non-Exponential Distributions: M/G/1, M/D/s, M/E k/s (involving Erlang distribution), Models without a Poisson Input, Models involving hyper exponential distributions, Priority Discipline Queuing Models: Preemptive and Non-Preemptive with results, properties and server number variations, Queuing Networks: Equivalence Property, Infinite Queues in Series and Product Form Solutions, Jackson Networks

MODULE 5:
Application of Queuing Models- Review of Characteristics (calling population system capacity, arrival processes, behavior and disciplines, service times and mechanisms etc.) and notations, Application of Long-Run Measures of Performance: Time average in system, average time spent per customer, Little's Formula and server utilization, costs, Steady State behavior of Infinite (M/G/1, M/M/c/infinity, M/M/c/N/infinity) and finite(M/M/c/K/K) Calling Population Models, Use of Network of Queues

MODULE 6:
Random Number Generation- Properties. Generation of Pseudo-Random Numbers, Techniques for Generation of Pseudo-Random Numbers: Linear Congruential, Combined Linear Congruential, Random Number Streams, Tests for Random Numbers: Frequency Tests and Tests for Autocorrelation, Random Variate Generation- Inverse Transform Techniques for Exponential, Uniform, Weibull, Triangular and for Empirical Continuous Distributions, Acceptance-Rejection Techniques for Poisson (Stationary and Non-Stationary) Distribution and Gamma Distribution. Special Properties like the Direct Transformation for the Normal and Lognormal Distributions, Convolution Method and others

MODULE 7:
Input Modeling- Data collection, Identifying the Distribution with Data: Histograms, Selection of the Appropriate Family of Distributions, Quantile- Quantile Plots, parameter Estimation: Sample Mean and Sample Variance and various biased and unbiased estimators, Goodness of Fit Tests applied to Simulation inputs: Chi-Square and Chi-Square with Equal Probabilities, Kolmogorov-Smirnov Tests, p-Values and Best Fits, Verification and Validation of Simulation Models- Verification and Validation of Simulation Models. Calibration and Validation: Face Validity, Validation of Assumptions, Input-Out Transformation Validation

MODULE 8:
Output Analysis of a Single Model- Output analysis and types of simulation, Stochastic Nature of the Output Data. Measures of Performance and Estimation: Point Estimation and Confidence-Interval Estimation. Output Analysis for Terminating Simulations and Estimation of Probabilities, Output Analysis of Steady State Simulations: Initialization Bias, Error Estimation, Replications, Sample Size and Batch Means for Interval Estimation.

MODULE 9:
Comparison and Evaluation of Alternative System Designs- Comparison of Two System Designs.; Sampling with Equal and Unequal Variances, Common Random Numbers, Confidence Intervals with Specified Precision, Comparison of Several System Designs: Bonferroni Approaches to Multiple Comparisons and to Screening and to Selection of the Best. Meta modeling L Sample Linear Regression, Testing for Significance, Multiple Linear Regression, Random Number Assignment for Regression, Optimization via Simulation: Robust Heuristics

MODULE 10:
Simulation of Computer Systems- Simulation Tools: Process Orientation and Event Orientation. Model Input: Modulated Poisson Process and Virtual-Memory Referencing, High-Level Simulation, CPU and Memory Simulations. Simulation of Computer Networks- Traffic Modeling, Media Access Control: Token-Passing Protocols and Ethernet, Data Link Layer, TCP, Model Construction

Text Books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson and David M. Nicol, Discrete-Event System and Simulation, Prentice Hall of India, New Delhi, 2005
2. Averill M. Law, Simulation modeling and analysis (SIE), Tata McGraw Hill India, 2007
3. David Cloud, Larry Rainey, Applied Modeling and Simulation, Tata McGraw Hill, India.

Reference Books:

1. Gabriel A. Wainer, Discrete-event modeling and simulation: a practitioner's approach, CRC Press, 2009.
2. Bernard P. Zeigler, Herbert Praehofer, Tag Gon Kim, Theory of modeling and simulation: integrating discreteevent and continuous complex dynamic systems, Academic Press, 2000.
3. Averill M. Law, W. David Kelton, Simulation modeling and analysis, McGraw Hill, 2000.
4. Walter J. Karplus, George A. Bekey, Boris Yakob Kogan, Modeling and simulation: theory and practice, Springer, 2003
5. Stanislaw Raczynski, Modeling and simulation: the computer science of illusion, Wiley, 2006.
6. Mohammad Salameh Obaidat, Georgios I. Papadimitriou, Applied system simulation: methodologies and application, Springer, 2003.
7. VanDijk, Nico M.; Boucherie, Richard J. (Eds.) 2011. Queueing Networks: A Fundamental Approach. 798 p.148 illus. Springer.
8. Bhat, U. Narayan, An Introduction to Queueing Theory: Modeling and Analysis in Applications, Springer 2008 (Birkhäuser Boston)
9. James J. Nutaro, Building software for simulation: theory and algorithms, with applications in C++. Wiley, 2010

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1815PE13	Information Retrieval	3-0-0	3

MODULE 1: Introduction
Basics of Information Retrieval and Introduction to Search Engines; Boolean Retrieval-: Boolean queries, Building simple indexes, processing Boolean queries

MODULE 2:
Term Vocabulary and Posting Lists- Choosing document units, Selection of terms, Stop word elimination, Stemming and lemmatization, Skip lists, Positional postings and Phrase queries; Dictionaries and Tolerant Retrieval: Data structures for dictionaries, Wildcard queries, Permu term and K-gram indexes, Spelling correction, Phonetic correction

MODULE 3:
Index Construction- Single pass scheme, distributed indexing, Map Reduce, Dynamic indexing; Index Compression - Statistical properties of terms, Zipf's law, Heap's law, Dictionary compression, Postings file compression, Variable byte codes, Gamma codes

MODULE 4:
Vector Space Model- Parametric and zone indexes, Learning weights, Term frequency and weighting, Tf- Idf weighting, Vector space model for scoring, variant tf-idf functions

MODULE 5:
Computing Scores in a Complete Search System- Efficient scoring and ranking, Inexact retrieval, Champion lists, Impact ordering, Cluster pruning, Tiered indexes, Query term proximity, Vector space scoring and query operations

MODULE 6:
Evaluation in Information Retrieval: Standard test collections, unranked retrieval sets, Ranked retrieval results, Assessing relevance, User utility, Precision and Recall, Relevance feedback, Rocchio algorithm, Probabilistic relevance feedback, Evaluation of relevance feedback

MODULE 7:
Probabilistic Information Retrieval- Review of basic probability theory, Probability ranking principle, Binary independence model, Probability estimates, probabilistic approaches to relevance feedback. Text Classification- Rocchio classifier, K Nearest neighbor classifier, Linear and nonlinear classifiers, Bias-variance tradeoff, Naïve Bayes and Support Vector machine based classifiers

MODULE 8:
Text Clustering- Clustering in information retrieval, Evaluation of clustering, K Means and Hierarchical clustering, Introduction to Linear Algebra, Latent Semantic Indexing.

Textbooks/Reference Books:

1. C. D. Manning, P. Raghavan, and H. Schutze, *An Introduction to Information Retrieval,* Cambridge University Press, 2009.
2. R. Baeza-Yates and B. Ribeiro-Neto, *Modern Information Retrieval, Pearson Education*, 1999

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE1815PE14	Computer Graphics	3-0-0	3

MODULE 1: Display Devices
Refresh cathode ray tubes, random scan and raster scan devices, color CRT monitors, 3-D monitors. Display Processor- random scan system and raster scan system, Interactive Input methods: Input devices, logical classification of input devices, input functions, Interactive picture construction techniques, Graphics software-co-ordinate representation, graphics functions, software standards-GKS, PHIGS etc.

MODULE 2: Output Primitives
Points and lines, loading and frame buffer, line drawing algorithms - DDA, Bresenham's line drawing algorithms; circle generating algorithm-midpoint Circle algorithm. Attributes of output primitives: Lane attributes, curve attributes, color tables, area fill attributes, character attributes, bundled attributes, anti-aliasing

MODULE 3: Two Dimensional Viewing
Viewing, pipelines, windowing concepts, clipping algorithms, polygon clipping, Structure and Hierarchical models- Concept, editing, structure, basic modeling concepts

MODULE 4:
3-D Concepts: 3-D viewing- view plane, dimension of window projections, 3-D display techniques; 3-D object representation- polygon surfaces; curved lines and surfaces- Spline curved, Bezier curves and surfaces; constructive solid geometry methods; Oc trees, Fractal geometry methods; 3-D transformations

MODULE 5: Visible Surface Detection Methods
classification of algorithms, comparisons of algorithms, Illuminations Models and surface rendering models- Halftone patterns, Ray tracing

MODULE 6:
Introduction to color models and applications, design of animation sequences, animation language, Use of graphics of Java language, Graphics part of Java has to be covered in this course

Textbooks/Reference Books:

1. D. Hearn and P. M. Backer, Computer Graphics, Prentice Hall of India, 1986.
2. W. K. Giloi, Interactive Computer Graphics, Prentice Hall of India, 1978
3. W. Newman and R. F. Sproul, Principles of Interactive Computer Graphics, McGraw Hill Publication, 1980.
4. D. F. Rogers, Procedural Elements of Computer Graphics, McGraw-Hill Publication, 1983.
5. S. Harington, Computer Graphics: A Programming Approach, Tata McGraw-Hill Publication.

6. D. F. Rogers, Mathematical Elements of Computer Graphics, McGraw-Hill Publications, 1983

Course Code	Course Title	Hours per week L-T-P	Credit C
HS181506	Engineering Economics	3-0-0	3

Course Outcomes (COs):

The students will be able to

1. Acquire knowledge about economics its nature, scope and importance.
2. Understand the economic laws, principles, and theories and their relevance in present day situation.
3. Develop the ability of critical thinking to meet the challenges at the national and global problems.
4. Apply knowledge in finding out socio-economic problems and appropriate measures to deal with them.
5. Equip students with vital knowledge to run government and non-government institutions and bodies.
6. Assemble knowledge which is vital for industry and research and evolve proper policy for economic development.

MODULE 1: Introduction to Economics (3 Lectures)

Meaning and Definition of Economics, Nature and Scope of Economics, Concept of Micro and Macro Economics.

MODULE 2: Utility Analysis (3 Lecture)

Meaning of Utility, Utility Function, Consumers Equilibrium, Concept of Indifference Curve, properties of Indifference Curve, Equilibrium under Indifference Curve.

MODULE 3 : Demand and Supply Analysis (4 Lectures)

Law of Demand, Demand Function, Elasticity of Demand, Types of Elasticity of Demand, Measurement of Elasticity of Demand, Demand Forecasting, Law of Supply, Supply Function.

MODULE 4: Revenue, Production & Cost Analysis (4 Lectures)

Average, Marginal and Total Revenue, Revenue Function, Average, Marginal and Total Cost, Cost Function, Short and Long Run Cost Curves. Break Even Point, Managerial Uses of Cost Function, Cobb Douglas Production Function

MODULE 5 : Market Structure (4 Lectures)

Concept of Market, Price-Output Determination under Perfect Competition, Monopoly Market and Monopolistic Competition

MODULE 6 : Money, Banking and National Income (8 Lectures)

Definition of Money, Function of Money, Index Numbers, Construction of Index Numbers, value of Money, Causes of Inflation, Functions of Commercial and central bank, Central bank and its monetary policy, Money Market and Capital Market, Functions of Stock exchange, Concept of National Income, Measurement of National Income, Concept of Investment.

MODULE 7: Introduction to Environmental Economics (5 Lectures)

Concept of Environmental Economics, Cost -Benefit Analysis, Social Cost, Externalities, Concept of Pareto Equilibrium, Externality, Market Failure.

MODULE 8: Public Finance (3 Lectures)

Introduction to Public Finance, Concept of Budget, Types of Budget, Budget Receipts, Concept of Goods and services Tax (GST).

Textbooks/Reference Books:

1. Managerial Economics by V. Agarwal: Pearson Pvt. Limited, New Delhi.
2. Engineering Economics by Dr. A. Ahmed & G. Begum: Chandra prakash, Guwahati
3. Principles of Engineering Economics with Application by Dr. Z. A. Khan, A. N. Siddiquee, B. Kumar, M. H. Abidi: Cambridge University Press.
4. Public Finance and Public Policy by Dr. R. K Choudhury: Kalayani publishers
5. Quantitative Methods for Economics by R. Veerachamy: New Age International Publication Ltd.
6. Micro and Macro Economics by Dr. M. L. Seth: Educational Publishers, Agra -3
7. A Koutsoyiannis: Modern Microeconomics
8. Environmental Economics by R. N. Bhattacharya: Oxford Publication.

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181511	Database Management System Lab	0-0-4	2

[The detailed manuals and other references should be provided at least one week in advance before each experiment - Students would only resolve doubts and carry out experiments in the labs]

LIST OF EXPERIMENTS:

1. Write statements for creation/alteration/view of relational database schema along with necessary integrity constraints. Insert tuples into the created tables.
2. Write SQL statements for selection, updation and deletion of data (students should be able to use features like selection, projection, joins, grouping, set theoretic operations, nested sub query, views etc.)
3. Write statements for creating and using stored procedures, functions and triggers.
4. Write statements for handling transactions and recovery.
5. Perform operations related with user management, access control and security.
6. Write a program to implement a B tree using any programming language of your choice.

Note: Database management systems like MySql, Oracle, PostgresSQL, SQL server, DB2 etc. can be used to perform the experiments.

Course Code	Course Title	Hours per week L-T-P	Credit C
CSE181516	Web Programming	0-1-4	3

[The detailed manuals and other references should be provided at least one week in advance before each experiment - Students would only resolve doubts and carry out experiments in the labs. Students must carry out two experiments per lab]

Introduction to Web Development **(Tutorial)**: History of WWW, The HTTP protocol, how servers works, how clients (web browsers) work – including WebKit/WebCore/Blink browser engine, v8 JavaScript engine, etc.

WEB PROGRAMMING LABORATORY

1. **Create a skeleton HTML page**: Create a basic skeleton of HTML page with <head>, <body> , <title> and <meta> tags, Document relevant information using comments, Insert CSS and JavaScript using <style> and <script> tags, Insert CSS and JavaScript using external files

2. **Insert elements into the body of an HTML page**: Use elements like <p>, <h1> - <h6>, <b>, , <i> , , <del> , <ins> , <sub> , <sup> ,
 , <hr> , <pre> and for formatting, Insert images, videos and audio using <img> , <video> and <audio> elements, Insert hyperlinks using <a> element, Understand usage of HTML5 semantic elements like <article> , <section> , <nav> , <aside> , <header> , <footer> , <summary> , etc.

3. **Create lists and tables in a HTML page**: Create unordered, ordered and description lists, Create table using <table> , <tr> , <th> and <td>, Use colspan and rowspan attribute of table

4. **Create a HTML form to submit data to a server**: Create a form with different (text , password , email , tel , number , radio , checkbox , textarea , file) input fields, Set default value and placeholder in input fields, Understand required , validate , disabled , readonly , autofocus , min , max and step attributes of input field, Validation of input (e.g., phone number, email) using Regular Expressions and pattern attribute, Understand GET and POST methods, Understand the action attribute

5. **Process submitted form data using PHP**: Process GET and POST data and display processed output, save uploaded file into a directory in the server, send email message to notify user

6. **Style HTML elements using inline CSS**: Set background color and image of page, Set text color, text alignment, font, font size and formatting, Understand shape of elements using border, Manipulate space inside and outside elements using padding and margin, Shape elements using box-radius

7. **Select HTML elements for styling using CSS selectors**: Understand class and id attribute of HTML elements, Select elements for styling using class and id simple selectors, Select elements using pseudo selectors

8. **Position HTML elements on a page using CSS**: Set absolute, fixed and relative positions of Elements, Design a grid layout of a HTML page using CSS Grid Layout module

9. **Animate HTML elements on a page using CSS**: Set transition effect of elements, Set animation on elements using @keyframes

10. **Design a responsive page for multiple devices**: Use @media query to make HTML page change design based on screen resolution and orientation

11. **Manipulate HTML DOM using JavaScript**: Different ways to output data using JavaScript, Read values from form input elements, Change innerHTML of elements, Change style and attribute of elements

12. **Send AJAX request to a server and receive response using XML and JavaScript**: Send AJAX request from JavaScript and receive server response, Encode request and decode response using XML in JavaScript, Decode request and encode response unsung XML in PHP, Understand JSON data exchange formats

13. **Store persistent data using cookies, session and WebSQL**: Set cookie and session variables using JavaScript and PHP, Use a database on client browser using WebSQL

14. **Interface PHP with MySQL**: Insert data into a table in a MySQL database, Use prepared statements to protect against SQL injection, Select and display data from a table in a MySQL Database

15. **Object oriented programming using PHP**: Organize code into classes and objects, Use external PHP libraries

16. **Create a JSP servlet program to handle form data**: Understand JSP life cycle, Create JSP program on Tomcat, Apply exception handling in JSP to display error page

17. **Interface JSP servlet with database**: Understand usage of database middleware, Use JDBC to perform CURD operations on a database, Save data BLOB on database

18. **Deploy a full-stack web application**: Install Apache httpd on a virtual machine, Configure the Apache httpd server, Deploy a web application on a LAMP server, Understand load balancers

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