SEVENTH SEMESTER

CSE 700 Project / Thesis

50 Marks, 2 Credit, 4 Hours/Week

To be decided by respective project supervisor/s.

CSE 711 Compilers

75 Marks, 3 Credits, 3 Hours/Week

Introduction to Compilers: Introductory Concepts, Types of Compilers, Applications, Phases of A Compiler.

Lexical Analysis: Role of The Lexical Analyzer, Input Buffering, token Specification, Recognition of tokens, Symbol Tables.

Parsing: Parser and Its Role, Context Free Grammars, top-Down Parsing.

Syntax-Directed Translation: Syntax-Directed Definitions, Construction of Syntax Trees, top-Down Translation.

Type Checking: Type Systems, Type Expressions, Static and Dynamic Checking of Types, Error Recovery.

Run-Time Organization: Run-Time Storage Organization, Storage Strategies.

Intermediate Code Generation: Intermediate Languages, Declarations, Assignment Statements. **Code Optimization:** Basic Concepts of Code Optimization, Principal Sources of Optimization. **Code Generation. Features of Some Common Compilers:** Characteristic Features of C, Pascal and Fortran Compilers.

Text Book:

1. Principle of Compiler Design: Aho, Ulman & Ravishethi.

Reference Books:

1. Compiler Design Theory: Philip.
2. Compiler Construction, Theory and Design: Willam A. Barrette.

CSE 712 Compilers Lab

25 Marks, 1 Credit, 2 Hours/Week

(Recommended but not limited to the following topics)

- Recognition of parts of speech of every word of a given sentence.
- Simulating a Deterministic Finite Automaton or DFA.
- Simulating a Non-deterministic Finite Automaton or NFA.
- Write a program in LEX to use the start state feature of the LEX program
- Write a program in LEX to eat up C/C++ style comments.
- Write a program in LEX to count the number of characters, words and lines of any given string.
- Recognizing word with LEX.
- Extend an English language parser to handle a more complex syntax; prepositional phrases in a subject, adverbs modifying adjective.
- Make the parser handle compound verbs better
- Add new word and token types for auxiliary verbs.
- Some words can be more than one parts of speech. Ex watch, fly, time, bear. How could handle them.
- Adding a new word and token type NOUN or VERB, and add it as an alternative to the rules for subject verb and object.

CSE 713 Artificial Intelligence

75 Marks, 3 Credits, 3 Hours/Week

What Is Artificial Intelligence: The AI Problems, The Underlying Assumption, What Is An AI Technique?

Problems, Problem Spaces and Search: Defining The Problem As A State Space Search, Production System, Problem Characteristics.

Heuristics Search Techniques: Generate and Test, Hill Climbing, Best First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

Knowledge Representation Issues: Representation and Mappings, Approaches to Knowledge Representation, Issues In Knowledge Representation.

Using Predicate Logic: Representing Simple Facts In Logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution.

Representing Knowledge Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching.

Game Playing: Overview, The Mimimax Search Procedure, Adding Alpha-Beta Cutoffs, Additional Refinements, Iterative Deepening.

Planning: Overview, An Example Domain: The Blocks World, Components of A Planning System, Goal Stack Planning.

Understanding: What Is Understanding, What Makes Understanding Hard, Understanding As Constraint Satisfaction.

Natural Language Processing: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing.

Expert Systems: Representing and Using Domain Knowledge, Expert System Shells Explanation, Knowledge Acquisition.

AI Programming Language: Python, Prolog, LISP

Text Book:

1. Artificial Intelligence: A modern approach: Russell and Norvig.

Reference Books:

1. Artificial Intelligence: Nils J. Nilsson.
2. Artificial Intelligence: Elaine Ritch & Kevin Knight.
3. Advanced Turbo Prolog: Herbert Schildt.
4. Introduction to Turbo Prolog: Townsend.
5. Common LISP Language: Guy L. & Steele Jr..
6. Expert System: Deiter Nesendane.
7. LISP: Patrick Henry, Winston Berthold, Klaus Paul Horn.

CSE 714 Artificial Intelligence Lab

25 Marks, 1 Credit, 2 Hours/Week

(Recommended but not limited to the following topics)

- Implementing basic logic gates in Prolog.
- Implementing human family relation using Prolog
- Implementing monkey-banana problem using Prolog
- Implement the logics for selection process in an interview using Prolog
- Using Dynamic Database using Prolog
- Implement Fibonacci number and m^n value using Lisp.
- Implementation of AND gate with Perceptions.
- Implementation of NOR gate with Perceptions.
- Implementation of XOR gate with Back Propagation Neural Network
- Implementation of Genetic Algorithm, DFS, and BFS.

CSE 715 Computer Graphics

75 Marks, 3 Credits, 3 Hours/Week

Introduction to Computer Graphics. Display Devices and Software. Basic Raster Graphics Algorithms For Drawing 2D Primitives; Two Dimensional and Three Dimensional Viewing, Clipping and Transformations, Projections; Three Dimensional Object Representation: Polygon Surface, B-Spline Curves and Surfaces, BSP Trees, Octrees. Fractal Geometry Methods; Visible Surface Detection Methods: Z-Buffer Method, BSP Tree Method,
Ray Casting Method: Illumination Models, Surface Rendering Methods,: Polygon Rendering, Ray Tracingterrain Visualisation with Height Mapping, Modeling Surface Details with Texture Mapping; Color and Shading Models;

Text Book:

1. Principles and practices in C: James Foley et al: Computer Graphics.

Reference Books:

1. Procedural Elements of Computer Graphics: David F. Rogers.
2. Theory and Problems of Computer Graphics: A. Plastock & G. Kalley.
3. Computer Graphics A Programming Approach: Steven Harrington.
4. Pattern Recognition Principle: Gonzaleg.
5. Principle of Interactive Computer Graphics: Newman-Sprocell.
6. Computer Graphics: Roy A. Plastock, Gordon Kalley.

CSE 716 Computer Graphics Lab

25 Marks, 1 Credit, 2 Hours/Week

(Recommended but not limited to the following topics)

- Draw a wire-cube using slope independent (scan conversion) mid-point line draw algorithm and projection matrix (using glVertex2i0);)
- Draw interactively animated RGB color cube (e.g., mouse dragging based rotating cube).
- Draw interactively animated RGB color cube (e.g., Keyboard controlled based rotating cube)
- Draw animated RGB color cube, where the rotation and translation is calculated using geometric transformation matrices
- Draw a solid sphere(s), where different type of illumination / reflection property is controlled by keyboard
- Draw a solid sphere(s), where position of point light source is controlled by mouse motion.
- Draw a texture mapped solid cube (each face is mapped with different textures)
- Draw animated circle(s) using (scan conversion) mid-point circle draw algorithm (e.g., slowly moving from left to right)
- Draw animated ellipse(s) using (scan conversion) mid-point circle draw algorithm (e.g., slowly moving from left to right)
- Draw a texture mapped solid sphere(s)
- Draw a wheel using slope independent (scan conversion) mid-point line draw algorithm and mid-point circle draw algorithm
- Draw an animated, ball dropping on a floor (apply effect of gravity on the ball)

CSE 717 Information Security

75 Marks, 3 Credits, 3 Hours/Week

The knowledge units in this area collectively encompass the following: (i) Recognition that security is risk management and inherently includes tradeoffs, (ii) Familiarity with the implications of hostile users and misuse cases, (iii) A framework for understanding algorithms and other technological measures for enhancing security, and (iv) Strategic and tactical design issues in information security.

History, overview, and principles: State examples of famous security breaches and denials of service. Discuss common computer crime cost estimates and the difficulty of estimating them. Discuss the professional's role in security and the tradeoffs involved. Explain and defend the use of each of various security principles. Explain and defend the use of each of various security mechanisms, for example least privilege, fail-safe defaults, complete mediation, separation of privilege, and psychological acceptability.

Relevant tools, standards, and/or engineering constraints: Discuss the major provisions of a relevant law such as HIPAA or the EU Data Protection Directive. Summarize intellectual property and export control laws affecting security, especially encryption. Articulate some challenges of computer forensics.

Data security and integrity: Define confidentiality and integrity. Give examples of systems where integrity alone is sufficient. Define "perfect forward secrecy" and explain why it is desirable.

Vulnerabilities and exploitation: Define misuse cases and explain its role in information security. Perform a simple fault tree analysis. Explain the types of errors that fuzz testing can reveal. Discuss issues related to the difficulty of updating deployed systems. Explain the role code reviews in system security. Define the problem of insecure defaults. Explain the tradeoffs inherent in responsible disclosure.

Resource protection models: Explain the pros and cons of various discretionary and mandatory resource protection models. Illustrate an access control matrix model. Define the Bell-LaPadula model.

Secret and public key cryptography: State the motivation for putting all encryption algorithm variability in the keys. Discuss the effect of processing power on the effectiveness of cryptography. Explain the meaning of and relationship between the three basic classes of cryptographic attacks: ciphertext only, known plaintext, chosen plaintext. Discuss the similarities and differences among the three basic types of cryptographic functions: (zero-, one-, and two-key): hash, secret key, and public key. Discuss block and key length issues related to secret key cryptography. Demonstrate and discuss the motivations and weaknesses in various methods for applying secret key (block) encryption to a message stream such as cipher block chaining (CBC), cipher feedback mode (CFB), and counter mode (CTR).

Message authentication codes: Explain why hashes need to be roughly twice as long as secret keys using the birthday problem. Discuss the uses of hashes for fingerprinting and signing. Discuss the key properties of a cryptographic hash function contrasted with a general hash function.

Network and web security: Describe the goals of Transport layer security (TLS) and how they are attained using secret and public key methods along with certificates. Discuss the reasons for using a firewall, various topologies, and firewall limitations. Describe the basic structure of URLs, HTTP requests, and HTTP digest authentication as they relate to security. Explain the use of HTTP cookies including session cookies, expiration, and re-authentication for key operations. Define cross-site scripting. Explain an SQL injection attack and various methods of remediation.

CSE 719 OPTION - I

75 Marks, 3 Credits, 3 Hours/Week

CSE 719 Modeling and Simulation

75 Marks, 3 Credits, 3 Hours/Week

Simulation Modeling Basics: Systems, Models and Simulation; Classification of Simulation Models; Steps In A Simulation Study; Concepts In Discrete-Event Simulation: Event-Scheduling Vs. Process-Interaction Approaches, Time-Advance Mechanism, Organization of A Discrete-Event Simulation Model; Continuous Simulation Models; Combined Discreet-Continuous Models; Monte Carlo Simulation; Simulation of Queuing Systems.

Building Valid and Credible Simulation Models: Validation Principles and Techniques, Statistical Procedures for Comparing Real-World Observations and Simulation Outputs, Input Modeling; Generating Random Numbers and Random Variates; Output Analysis. Simulation Languages; Analysis and Modeling of Some Practical Systems.

Text Book:

1. System Simulation: Geoffrey Gordon.

Reference Book:

1. Discrete-event System Simulation: Banks J. & Carson JS.

CSE 719 Special Topics Related to CSE

75 Marks, 3 Credits, 3 Hours/Week