SYRIAN ARAB REPUBLIC
DAMASCUS UNIVERSITY
Faculty of Information Technology Engineering

Detailed List & Syllabuses of Courses

Taken by a graduate at

The Faculty of Information Technology Engineering,
Department of Artificial Intelligence & Natural
Language Processing

Contents

The first page

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The First Year

Physics 1

Syllabus
- General mechanics laws
  - Motion equations
  - work and energy
- Physics of semi-conductors (preliminary of electrical and electronic circuits)
  - Crystal structure of solids
  - Quanta-mechanic for reasoning the fundamental characteristics of energy levels in solids and situations density function and the statistical laws which clarifies the structures of bodies.
  - The situation of equilibrium of semiconductors.
  - Pure semi-conductors.
  - Charge porters density in pure semiconductors.
  - Charge porters transmission via an electrical field.
  - Propagation current density.
  - The link (P-N).
  - Spatial charge.
  - The direct and indirect polarization of I inks.
  - Stable situation.
  - Mechanical resistance.
  - Zener effect.
  - One-side links.
  - Applications in links of (P-N).
  - The transistor (types, its characteristic curves, gain factor, practical example in its manipulations).

Teaching hours
- Theoretical: 4 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 6 hours a week.
- Total hours per semester: 84 hours per semester.

Evaluation
- Classroom activities 15%
- Assessments 15%
- Final exam 70%

English Language 1

Teaching hours
- Theoretical: 4 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation
- Final exam 100%

General Algebra

Syllabus
- Set, binary relations, equivalence relations, order relations, partitions, totally ordered sets, superior element, greatest element, counting, binomial theorem, arrangements and permutations.
- Decomposition internal lows, Group, subgroup, homomorphism, symmetrical group.
- Ring, integral domain, principal ring, principal ideal, prime ideal, prime numbers, GCD, LCM, Euclidian division.
- Polynomial degree, roots, irreducible polynomial, division with increasing (decreasing) powers.

Teaching hours
- Theoretical: 2 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation
- Classroom activities 5%
- Assessments 10%
- Practical exam 15%
- Final exam 70%

Analysis 1

Syllabus

- Sequences
    - Increasing and decreasing sequences
    - Bounded sequences
    - Limit of a sequence
    - Convergence
    - Divergence
    - Monotony
    - Cauchy sequences.
- Series
    - Partial sum
    - Convergence of a series
    - Absolute convergence
    - Non negative series
    - Riemann series
    - Comparison of series
    - Alternative series.
- Real function's limit
- Functions continuity,
- Real function's zeros compact subsets and continuity
- Lipchitz condition
- Theorem of fixed point.

Teaching hours

- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation

- Classroom activities 5%
- Assessments 10%
- Practical exam 15%
- Final exam 70%

Computer Operating Principles

Syllabus
- Fundamental concepts, Informatics and computers.
- Information representation.
- Computer hardware components.
- Computer peripherals.
- Computer software components.
- Digital information transmission.
- Informatics network and interne.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- 1st assignment 8%
- 2nd assignment 8%
- Classroom activities 10%
- Final exam 70%

Socialist National Culture

Teaching hours
- Theoretical: 2 hours a week.
- Total hours a week: 2 hours a week.
- Total hours per semester: 28 hours per semester.

Evaluation
- Final exam 100%

Programming 1

Syllabus

- Introduction to algorithms
  - Pseudo-code
  - Flow Chart
- Basics programming statements (Read, Write, Assign, Condition, Loops).
- Basic predefined functions and operators.
- Variables and primitive types (Integer, Boolean, Char, Real, String).
- Arrays (One dimension and multidimensional arrays)
- Functions and Procedures
- Passing variables to functions (pass by value, pass by reference)
- Recursion

Teaching hours

- Theoretical: 4 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 6 hours a week.
- Total hours per semester: 84 hours per semester.

Evaluation

- Weekly labs 10%
- Weekly assignments 10%
- Assessments 10%
- Final exam 70%

Analysis 2

Syllabus
- Derivative of high order, Taylor series, finite development, local study of a function.
- Sequences, Series of functions, simple, uniform and normal convergence, power series.
- Piecewise continuity, primitives and integrals, integration by pans, integration by variable change, fractions partition and in integrals.
- Generalized integrals and parametric integrals, Euler's functions.

Teaching hours
- Theoretical: 4 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 6 hours a week.
- Total hours per semester: 84 hours per semester.

Evaluation
- Classroom activities 8%
- Assignment 2%
- Practical exam 20%
- Final exam 70%

Linear Algebra

Syllabus
- Fields, symmetrical group.
- Vector space, free system, generator system basis dimension.
- Linear map, kernel, image.
- Matrix, square matrix, invertible matrix, matrix of linear map.
- Linear map.
- Linear system.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- Classroom activities 5%
- Assessments 10%
- Practical exam 15%
- Final exam 70%

Electrical & Electronic circuits

Syllabus
- Introduction: electrical circuits, and
- Concepts of current, energy and power.
- Resistances and CUM law.
- Continuous feeding resources (ideal, practical).
- Kirchhoff laws.
- Alternative feeding resources, and generalized OUM law.
- Laplace transformations, transmission functions and filters.
- Semi-conductors, P-N (Polarization-Modalaziation, type).
- Bi-polarized transistor (effects, forms, work types, modalaziation, calculating of work point).
- Fields effects transistor: types JFET and MOseft, forms, modalaziation.
- Transistor amplifications: calculating of amplifications mediums, famous forms of the amplifications and their characteristics.
- The amplificatory and its applications: Differentiated amplificatory, some linear and non-linear amplifier.
- Response to separate electronic elements.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- Weekly reports 10%
- Assessments 10%
- Practical exam 10%
- Final exam 70%

English Language 2

Teaching hours
- Theoretical: 4 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation
- Final exam 100%

Programming 2

Syllabus
- Pointers.
- Complex types (Enum, Records)
- Using Files.
- Programming Libraries: use and build a programming Library.
- Introduction to object oriented programming.

Teaching hours
- Theoretical: 4 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 6 hours a week.
- Total hours per semester: 84 hours per semester.

Evaluation
- Weekly labs 10%
- Weekly assignments 10%
- Assessments 10%
- Final exam 70%

The Second Year

Probabilities and Statistics

Syllabus
- Events and their probabilities (Conditional probability, random independency, probability spaces).
- Random Variables (Law of probability, probability density, random independency, mathematical expectation, law of large numbers, random vectors, some famous random variables, mutual random distributions, conditional random distributions and mathematical expectation).
- Genetic functions and their applications, genetic functions, distinguished functions for
- Famous random variables, law of large numbers and central limitation theorem.
- Attending lines (random systems, attending lines, single server attending Lines, multi-windows attending line).
- Fundamentals concepts in Statistics (general problem in decision making,
- Statistical decisions, decision problem precision, optimized procedures, loyalty and ordering of statistical procedures, sufficient statistics).
- Punctual estimation (Optimum probability in punctual estimations, solid estimations,
- Trust sets and intervals).
- Hypotheses tests, Niman-persol preliminary.
- Random numbers (Generating, regular distributed random numbers, linear method in measurement some other methods in generating regular distributed random numbers).
- Random tests (general methods in hypotheses tests, experimental tests).

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- Classroom activities 10%
- Practical exam 20%
- Final exam 70%

Algorithms and Data Structures 1

Syllabus
- Basic concepts in algorithms.
- Iterative Algorithms.
- Divide-and-conquer Algorithms.
- Algorithmic Analysis and Efficiency
- Time and Space Complexity.
- Search and Sort Algorithms.
- Recursive Algorithms.
- Recursive Drawing and Fractals.
- Transforming recursive Algorithms to iterative Algorithms.
- Backtracking Algorithms.
- Dynamic Programming.
- Greedy Algorithms.
- Basic concepts in data structures.
- Abstract data typing.
- Linear Data Structures.
  - Vectors.
  - Linked lists.
  - Double Linked lists.
  - Circular Linked lists.
  - Queue
  - Stack
  - Set
  - Map
- Indexing Data.
  - Skip List
  - Hash Table.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 3 hours a week.
- Total hours a week: 6 hours a week.
- Total hours per semester: 84 hours per semester.

Evaluation
- 1st assignment 10%
- 2nd assignment 10%
- Assessments 10%
- Final exam 70%

Analysis 3

Syllabus
- Function of several variables derivability first order differential form
- Power series - exponential function - analytic functions holomorphic functions - Cauchy theorem.
- Laurent series, residues theorem and its applications.
- Fourier's series and its applications.

Teaching hours
- Theoretical: 4 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 6 hours a week.
- Total hours per semester: 84 hours per semester.

Evaluation
- Classroom activities 15%
- Assessments 15%
- Final exam 70%

Computer architecture 1

Syllabus
- The machine language instruction set.
- The microprocessor Design and Implementation.
- Memories Organization and Design.
- Interfacing processors and peripherals.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- 1st assignment 8%
- 2nd assignment 8%
- Classroom activities 4%
- Assessments 10%
- Final exam 70%

Logical Circuits

Syllabus
- Number systems and Information Representation:
- Binary and hexadecimal number system. Negative number representation. BCD
- codes. escces-l codes. gray codes.
- Boolean Algebra: AND gate. Or gate. NOT gate. Twth tables. Boolean Algebra laws.
- Combinational circuit minimization: Kamaugh maps, Maklawski algorithm.
- Famous combinational circuits: decoders, multiplexers. Full Adder. PLA. ROM.
- Introduction to sequential logic: RS Flip flop. Jk flip flop. D flip flop. Registers. Counters.
- Synchronous sequential circuits Design: Finite state machines. Timing methodologies. examples.

Teaching hours
- Theoretical: 2 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation
- Weekly reports 15%
- Practical exam 15%
- Final exam 70%

Programming 3

- Object-Oriented Programming.
    - Class and Object
    - Controlling access to class members
    - Constructor and Destructor
    - Properties
    - Composition
    - Static members
    - Methods Overloading
    - Inheritance
    - Polymorphism
- Inner Classes
- Abstract Classes
- Interfaces
- Templates

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- Weekly labs 10%
- Weekly assignments 10%
- Assessments 10%
- Final exam 70%

Algorithms and Data Structures 2

Syllabus
- Trees
  - Generalized Trees
  - Binary Trees
  - Binary Search Trees
  - Heaps (Heap Sort, Priority Queue)
- Balanced Trees
  - AVL Trees
  - B-Trees
- Graphs
  - Graph Basics: Directed\Undirected Graphs, Weight\Unweighted Graph
  - Graph Traversal: Depth First Search (DFS) and Breadth First Search (BFS)
  - Topological Sort
  - Shortest Path (Dijkstra Algorithm)
  - Minimum Spinning Tree
- Hash Tables

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 3 hours a week.
- Total hours a week: 6 hours a week.
- Total hours per semester: 84 hours per semester.

Evaluation
- 1st assignment 10%
- 2nd assignment 10%
- Assessments 10%
- Final exam 70%

Arabic Language

Teaching hours
- Theoretical: 4 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation
- Final exam 100%

Communication skills

Syllabus
- Management Concepts
- Writing Curriculum Vitae (CV)
- Interview Skills
- Communication Skills
- Negotiation Skills
- Meetings Management
- Team Building
- Presentation Skills
- Cyber Law
- Reporting Skills
- Preparing a Scientific Report or Research

Teaching hours
- Practical: 3 hours a week.
- Total hours a week: 3 hours a week.
- Total hours per semester: 42 hours per semester.

Evaluation
- CVs 10%
- Lecture evaluation questionnaires 5%
- General personal evaluation 10%
- Presentation 45%
- Personal site 10%
- Questionnaires 10%
- Free activity 10%

English Language 3

Teaching hours
- Theoretical: 4 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation
- Final exam 100%

Digital communications and Information Theory

Syllabus

- Entropy and Information, Uncertainty, Entropy and its properties, Conditional Entropy, Information, Mutual Information and its properties, Data processing theorem, Relative Entropy, source coding theorem, Memory less sources, Instantaneous and uniquely decipherable codes, The Kraft-McMillan inequalities, Noiseless coding theorem for memory less sources, Constructing compact codes, Shannon-Fano Algorithms, Lempel-Ziv algorithm Communication Through noisy channels, the discrete memory less channel, the capacity of channel, the Noisy Coding Theorem, General Sources, the structure of natural languages, Differential Entropy and Gaussian Channel.
- Network Information theory, Multiple access channel, Broad cost channel Signals and linear systems, Analogue Pulse Modulation, Pulse Code Modulation PCM, Base - band Digital Transmission, Band- pass Digital Transmission, Modems, Data Networks protocols.

Teaching hours

- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation

- 1st assignment 8%
- 2nd assignment 8%
- Classroom activities 4%
- Assessments 10%
- Final exam 70%

Numerical Analysis

Syllabus
- Numbers presentation, floating-point, rounding, errors, machine precision, propagation of errors and stability.
- Resolution of non linear equations: Secant method, Newton's method, iterative methods, Muller's method.
- Interpolation: polynomial interpolation, Newton divided differences, Hennitte interpolation, piecewise polynomial interpolation, spline functions, cubic lagrange interpolation.
- Numerical integration: trapezoidal rule, Simpson's rule, Gaussian quadrature, Gauss-Legendre quadrature, adaptive numerical integration.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- Classroom activities 6%
- Practical exam 24%
- Final exam 70%

The Third Year

Operational Research

Syllabus

- Graph theorem convolutions (fundamental definitions, information-representation of data).
- Research algorithms inside a graph (wide search, deep search, applications).
- Minimum tree (properties of minimum weight tree, Kruskal algorithm, Prim algorithm).
- Research for the shortest paths (from a nodal points to other nodal points, dijkstra algorithm, Bellmann algorithm, general algorithm in searching for shortest paths. Linear programming- mathematical concepts and tools (linear programming signification, general form of linear program, example in formulating a linear program model methods in solving linear programs)
- Linear programming: Sipmlex method (canonic formula of linear programs. specification a circuit primitive original simplex algorithm, table, form to original primitive simplex algorithm, matrix of basis changing and the canonic formula of inversion, modified simplex algorithm, complexity of simplex algorithm.
- Binary problem and the complementary of linear programming: (concept, explaining the binary problem for a linear program (variables and marginal costs),
- Introduction in problems complexity: (what is an efficient algorithm, NP classes, NP-Complete classes).

Teaching hours

- Theoretical: 2 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation

- Seminars 15 %
- Classroom activity 15%
- Final exam 70%

Programming Languages

Syllabus
- Java Programming Language.
- Java as structured programming language.
- Using Basic Programming Packets.
- Exception Handling.
- Multi –Threading.
- Using Collections.
- Building Graphical User Interfaces (GUI)
- Events and Listeners.
- ANSI-C Programming Language.
- C as structured programming language.
- Specific programming techniques in C.
- Programming Languages comparison (strength and weaknesses).

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- 1st assignment 2.5%
- 2nd assignment 2.5%
- Project 15%
- Assessments 10%
- Final exam 70%

Computer Architecture 2

Syllabus
- Pipelining.
- Multiprocessing.
- Superscalar Architecture.
- Performance related issues.
- Analysis and Design a simple CPU.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- 1st assignment 8%
- 2nd assignment 8%
- Classroom activities 4%
- Assessments 10%
- Final exam 70%

Principles of Artificial intelligence

Syllabus
- Introduction to Artificial Intelligence.
- Intelligent Agents.
- Logical Agents.
- Forward and backward chaining.
- Inference.
- First Order Logic
- Inference in first-order logic.
- Introduction Knowledge-Based Systems.
- Introduction to Expert Systems.
- Prolog.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- Practical part 30%
- Final exam 70%

Graphics and Computer Aided Design

Syllabus
- Standard definition of graphics.
- Devices definition of graphics.
- Bi-dimensional graphics.
  - Basic algorithm (ex Bresenham).
  - Standard graphical system and basic functions.
  - GUI.
  - Graphical file format (vector, raster).
- Three-dimensional graphics.
  - Geometrical Transformation.
  - Projection and clipping.
  - Modeling.
  - Solids and Boolean Operations between them.
  - Bezier and spline.
  - Coloring, Lighting and Shading.
  - Texturing.
  - Computer-aided design.
  - Ray Tracing.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- Practical part 30%
- Final exam 70%

Scientific Calculations Project

Teaching hours
- Theoretical: 1 hours a week.
- Practical: 3 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation
- Final interview 100%

Basics of Information Networks

Syllabus
- Historical preliminary of computer networks beginning.
- General definition of communication protocols.
- OS layers and service primitives
- Serial ports and the protocol RS232.
- Local networks:
  - Topology of local networks.
  - Ethernet protocol.
- Internet protocols: TCP/IP family:
  - Internet layers.
  - Internet addresses.
  - Encapsulation.
  - Demultiplexing.
  - Protocol IP (IPV4,lPV6).
  - Protocol X25.

Teaching hours
- Theoretical: 4 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 6 hours a week.
- Total hours per semester: 84 hours per semester.

Evaluation
- Practical part 30%
- Final exam 70%

Databases 1

Syllabus
- Introduction to databases.
- Entity-Relation model and Entity Relational Diagram (ERD)
- Relational model (Relational Algebra).
- SQL language.
- Integrity Constraints.
- Relational Database Design.
- Storage and File Structure.
- Concurrency Control.
- Recovery systems**.**

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- 1st assignment 10%
- 2nd assignment 10%
- Assessments 10%
- Final exam 70%

English Language 4

Teaching hours
- Theoretical: 4 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation
- Final exam 100%

Automata & Formal languages

Syllabus
- Basic Concepts in alphabets and languages.
- Finite Automaton Model.
- Deterministic Finite Automaton (DFA).
- Non Deterministic Finite Automaton (NFA).
- Non Deterministic Finite Automaton with ε-transitions (ε-NFA).
- Regular Expressions.
- Properties of Regular Languages
- Context-Free Grammars.
- Properties of Context Free Grammars.
- Pushdown Automaton.
- Turing Machines.
- Chomsky Hierarchy.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 3 hours a week.
- Total hours a week: 6 hours a week.
- Total hours per semester: 84 hours per semester.

Evaluation
- 1st assignment 2%
- Project 20%
- Seminars 8%
- Final exam 70%

Third year Project

Evaluation
- Final interview 100%

The Forth Year

Operating Systems 1

Syllabus
- Computer & OS History.
- Operating systems types and features.
- Computer Hardware.
- System Components.
- System Calls.
- Virtual Machines.
- System Design.
- Process Concept.
- User and Kernel Threads.
- Inter-process Communication.
- Process scheduling.
- Critical-Selection Problem
- Synchronization Hardware.
- Semaphores & Monitors.
- Classical Synchronization Problems.
- Deadlock Problem & Solutions.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- 1st assignment 8%
- 2nd assignment 8%
- Classroom activities 4%
- Assessments 10%
- Final exam 70%

Economy & Business Management

Syllabus
- Management and Organization
- Manager Roles (Planning, Organizing, Directing, Controlling)
- Planning and Strategic Planning
- Strategic Analysis Tools
- Leadership Style
- Human Resources Management
    - Organizational Charts & Job Description
    - HR Planning & Recruitment
    - HR Development
    - HR Evaluation
- Engineering Economics
- Terms and Conditions of Engineering Credibility and Engineering Syndicate
- Ethics of the profession

Teaching hours
- Theoretical: 2 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation
- Project 30%
- Final exam 70%

Software Engineering 1

Syllabus
- Software Engineering Principles.
- Software process models.
    - Plan-driven development.
    - Agile development.
- Requirement Engineering
    - RE phases.
    - RE management.
    - Change control.
- Analysis concepts and principles.
- Analysis Modeling
    - Use Case Diagram
    - Activity Diagram
    - Sequence Diagram
    - Collaboration Diagram
    - Class Diagram
    - Sate Diagram.
- Design concepts and principles.
    - Architectural Design.
    - Detailed Design.
    - Design Modelling.
- Software Implementation.
- Software Deployment.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- 1st assignment 10%
- 2nd assignment 10%
- Assessments 10%
- Final exam 70%

Intelligent Search Algorithms

Syllabus
- Introduction to Artificial Intelligence
- AI and Internal Representation
    - o Representation in AI
    - o Graph Representation
- Representation, Heuristic Concept, Brief History.
- Search in State Spaces
    - o State-Space Graphs Searching
    - o Explicit State Spaces Uninformed Search
    - o Heuristic Search using Evaluation Functions
    - o A General
- Graph Searching Algorithm (Algorithm *A**).
- Searching Goal Trees
    - o Goal Tree (And/Or Trees)
    - o And/Or Uninformed Search Trees
    - o And/Or Heuristic Search Trees
    - o A General Tree Searching Algorithm (Algorithm OA*)
- Search in Game-Playing
    - o Two-Agent Games
    - o The Minimax Procedure
    - o The Alpha-Beta Procedure
    - o The Alpha-Beta Strategy Heuristics in Game Trees

Teaching hours
- Theoretical: 2 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation
- Assignment 20%
- Assessments 10%
- Final exam 70%

Compilers

Syllabus

- General Introduction.
- Lexical Analysis.
- Syntactic Analysis.
  - Context Free Grammars
  - Descendent Analyzers, LL Parsing
  - Ascendant Analyzers, LR Parsing
- Syntax-Directed Translation
  - Attribute Definitions
  - Evaluation of Attribute Definitions
- Semantic Analysis.
- Run-Time Organization
- Intermediary Code Generation.

Teaching hours

- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation

- 1st assignment 5%
- Mini project 20 %
- Assessments 5%
- Final exam 70%

Neural Networks

Syllabus
- Introduction to Neural Networks.
- Learning Process.
- The Perceptron.
- Feedforward Multilayer Perceptrons.
- Backpropagation Learning Algorithm.
- Newton Method for Minimization a function.
- Levenberg Marquardt Algorithm (LMA).
- Learning Vector Quantization (LVQ).
- Simulated Annealing Algorithm.
- Associative Memory.
- Recurrent Networks.
- Hopfield & Metropolis Learning Algorithm.
- Self-Organizing Networks (Kohonen Self-Organizing Map).
- Introduction to Deep Learning using Neural Networks.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- 1st assignment 10%
- 2nd assignment 10%
- 3rd assignment 10%
- Assessments 10%
- Final exam 60%

Parallel Programming

Syllabus
- Parallel computers: types, architectural features, increasing computational process speed potential.
- Evaluating and debugging of parallel programs: parallel execution time and time complexity.
- Geometrical transformation of images.
- Mandelbrot set.
- Partitioning and divide-and-conquer strategies.
- Divide-and-Conquer examples.
    - Sorting using bucket set.
    - Numerical integration.
    - Adding and sorting numbers.
    - Prime numbers generation.
    - Solving a system of linear equations.
- Synchronous and local computations.
- Synchronous iteration examples.
    - Solving a system of linear equations by iteration.
    - Program example: shortest path problem.
- Programming with shared memory.
- Specifying parallelism.
- Language construct for parallelism.
- Dependency analysis.
- Program example: UNIX P threads Java.
- Numerical algorithms.
- Matrix and Matrix vector multiplication.
- Relationships of matrices to linear equation and implementing matrix multiplication.
- Direct and recursive implementation.
- Iterative methods and faster convergence methods.
- Image processing.
- Mean and Median.
- Weighted masks, edge detection, edge detection masks.
- The Hough transform.
- Transformation into the frequency domain.
- Discrete and fast Fourier Transform.

Teaching hours
- Theoretical: 2 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation
- 1st assignment 10%
- 2nd assignment 10%
- Assessments 10%
- Final exam 70%

Multimedia and Hypermedia Systems

Syllabus

- History of Multimedia
- Hypermedia vs. Multimedia
- Image and Graphics representations
  - Vector and Raster images
  - Color images, grayscale and black\white images
  - Image Color systems (RGB, CMYK, YUV, HSV, YCbCr, L*a*b*)
  - Dithering and color lookup table
  - Image File formats (BMP, GIF, PNG, JPEG, TIFF)
- Basic concepts of sound
  - Analog to Digital Conversion (Sampling and Quantization)
  - Sound File formats (WAV, MP3)
  - Frequency Domain
- Basic concepts of videos
  - Video Standards
- Information Lossless compression
  - Run Length Encoding (RLE)
  - Huffman
  - Arithmetic coding
  - Lempel–Ziv–Welch (LZW)
- Information Lossy compression
  - Discrete Cosine Transformation (DCT)
  - JPEG algorithm
  - MPEG
- Introduction to Multimedia Networks

Teaching hours

- Theoretical: 2 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation

- 1st assignment 10%
- 2nd assignment 10%
- Projects 10%
- Final exam 70%

Virtual Reality

Syllabus

- Introduction to Virtual Reality:
    - Definition of Virtual Reality.
    - Virtual Reality elements: Illusion, Immersion &Interaction, Augmentation.
- Virtual Reality Applications:
    - Graphical Applications
    - Medical Applications.
    - Robotics Applications.
    - Other Applications.
- Basics of Computer Graphics.
    - Computational Geometry.
- Geometrical Modeling.
- Dynamic Modeling:
    - Dynamic Models Types & Comparisons.
    - Dynamic Models Abstraction.
    - Using Dynamic Models.
    - Dynamic Models Interaction.
    - Matching Geometrical Models Behavior with Objects' real behavior.
- Introduction to Augmented Reality.

Teaching hours

- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation

- Mini-Project 30%
- Final exam 70%

English Language 5

Teaching hours

- Theoretical: 4 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation

- Final exam 100%

Marketing

Syllabus
- Role Of Marketing in Organization Management
- Marketing Management
- Customer Behavior
- Customer Relationship Management
- Marketing Mix
- Pricing and Production Costs
- E-Marketing
- Corporate Social Responsibility
- Marketing and Competition
- Entrepreneurship
- Marketing Plan

Teaching hours
- Theoretical: 2 hours a week.
- Practical: 1 hours a week.
- Total hours a week: 3 hours a week.
- Total hours per semester: 42 hours per semester.

Evaluation
- Classroom activities 5%
- 1st assignment 5%
- 2nd assignment 5%
- Assessments 10%
- Summarizing assignment 5%
- Final exam 70%

Knowledge Base system

Syllabus
- Introduction, Terminology and Perspectives
- Knowledge Presentation:
    - Expert Systems
    - Intelligent Reasoning
- Knowledge Presentation Techniques
    - First Ordered Logic
    - Predicate Calculus
    - Rule Based Systems
        - Forward Chaining
        - Backward Chaining
    - Semantic net
    - Frames
    - Scenarios
- Rule Based System components and techniques
- Conflict Resolution Strategies
- Uncertainty handling, certainty factors.
    - General Introduction.
    - Techniques:
        - certainty factor
        - Bayesian probability theory
        - fuzzy set theory
- JESS

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- Mini project 20 %
- Practices and classroom activity 20%
- Final exam 60%

Fourth year Project

Evaluation
- Final interview 100%

The Fifth Year

Project Management

Syllabus
- Project Management Concepts
- Project Life Cycle & Knowledge Areas
- Project Scope
- Project Scheduling
- Project Cost Management
- Quality Assurance
- Resources Management
- Risk Management
- Project Communication Plan
- Procurement Plan
- Stakeholder Management Plan
- Project Integration
- Social Responsibility

Teaching hours
- Theoretical: 2 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 4 hours a week. Total hours per semester: 56 hours per semester.

Evaluation
- Classroom activities 5%
- 1st assignment 5%
- 2nd assignment 5%
- Assessments 10%
- Summarizing assignment 5%
- Final exam 70%

Machine Learning

Syllabus
- Introduction to Machine Learning.
- Supervised Learning
    o The perceptron
    o Linear regression and Logistic regression
    o Kernel machines
    o Support vector Machine (SVM)
    o Ensemble learning (random forests)
    o Graphical models
    o Boosting
    o Naïve Bayes
    o Multi-class learning
    o Multi-feature regression
- Unsupervised & Semi Supervised Learning
    o Clustering (k-means, hierarchical)
    o Soft Clustering (GMMs)
- Feature Extraction and Selection (PCA, FA)
- Dimensionality Reduction
- Training Example Representation
- Advanced models and recent topics

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- Classroom activities 5%
- 1st assignment 10%
- 2nd assignment 5%
- 3nd assignment 10%
- Seminar 5%
- Lab exam 10%
- Final exam 60%

Natural Languages Processing

Syllabus
- Speech Processing
    - o Speech Production & Modeling.
    - o Processing of Digital Signals.
    - o Speech Encoding.
    - o Speech synthesis.
    - o Speech recognition.
- Text Processing
    - o General Definition of Natural Language Processing.
    - o Common Applications.
    - o Morphological Lingual Analysis and Synthesis.
    - o Syntactical Lingual Analysis and Synthesis.
    - o Semantic Lingual Analysis and Synthesis.
    - o Pragmatical Lingual Analysis and Synthesis.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- Project 40%
- Final exam 60%

Data Mining & Expert Systems

Syllabus
- Data Mining:
    - Introduction.
    - Classification.
    - Clustering
        - Partitioning Methods
        - Hierarchical Clustering
        - Density-based clustering
    - Association Rules.
    - Tree mining.
    - Sequence Clustering.
- Expert Systems:
    - Introduction to Expert Systems.
    - Fuzzy Expert Systems.
    - Fuzzy Propositions.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- Data Mining Project 20%
- Expert Systems 20%
- Final exam 60%

Computer Vision

Syllabus

- Introduction to Computer Vision and its applications
- Low level image processing
    - 2D and 3D Transformations
    - Image coloring spaces
    - Image Histogram and Histogram equalization
    - Linear Image Filtering
    - Non-linear Image Filtering
    - Low pass and High pass filter
    - Morphological Operations(Dilation, Erosion, Closing, Opening, Hit-Miss, Mexican Hat)
    - Skeleton and Thickening
    - Frequency Filtering
    - Image Interpolation and InPainting
    - Edge Detection
    - Hough Transform (line transform, circle transform)
- High level image processing
    - Features Detection and Matching
    - Features Tracking
    - SIFT & SURF
    - Histogram of Oriented Gradient (HoG)
    - Image Segmentation
    - Thresholding (Hysteresis Thresholding, Otsu Thresholding, Adaptive Thresholding)
    - Background Subtraction (Mixture of Gaussian, Foreground Detection, GrabCut)
    - Optical Flow
    - Motion Detection
    - Motion History Gradients
    - Template Matching
    - Object Detection
    - Object Detection using Deep Learning (CNN, R-CNN, Fast R-CNN, Mask R-CNN, Yolo, SSD)

Teaching hours

- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation

- 1st assignment 10%
- 2nd assignment 10%
- Project 20%
- Final exam 60%

Fuzzy Logic & Genetic Algorithms

Syllabus

- Fuzzy Logic:
    - o Fuzzy Logic and Fuzzy Systems.
    - o Fuzzy Sets and Fuzzy Logic.
    - o Fuzzy relations.
    - o Fuzzy implications.
    - o Fuzzy rule-based systems.
    - o Fuzzy reasoning schemes.
    - o Fuzzy Image Processing.
    - o Color Image Enhancement Using the Support Fuzzification.
    - o Fuzzy Information Retrieval.
- Genetic Algorithms:
    - o Schema Theory.
    - o Using Genetic Algorithms.

Teaching hours

- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation

- Fuzzy Logic 1st assignment 10%
- Fuzzy Logic 2nd assignment 10%
- Genetic Programming Project 20%
- Final exam 60%

Information Systems Security

Syllabus
- Introduction to Information Systems Security.
- Encryption
  - Symmetric algorithms.
  - Asymmetric algorithms.
  - Message Authentication and Digital Signature.
  - User Authentication and Cryptographic Key Infrastructure.
- Database Systems Security.
- Networks Security.
- Web Security.
- Malicious Software, Intrusion Detection, and Firewalls
- Operation Systems Security.
- Information Security Management.
- Security Policies.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- 1st assignment 8%
- 2nd assignment 8%
- Classroom activities 4%
- Assessments 10%
- Final exam 70%

Robotics

Syllabus
- Introduction to Robotics
    - Robot definition and classification.
    - Robot general structure and its main components.
    - Current & Future Robotics applications.
- Robot modeling & Control
    - Modeling of Mechanical articulated systems.
    - Direct & Inverse geometrical modeling.
    - Direct & Inverse kinematics.
    - Trajectory Generation.

Teaching hours
- Theoretical: 3 hours a week.
- Practical: 2 hours a week.
- Total hours a week: 5 hours a week.
- Total hours per semester: 70 hours per semester.

Evaluation
- 1st assignment 10%
- 2nd assignment 10%
- 3rd assignment 10%
- Lab exam 10%
- Final exam 60%

English Language 6

Teaching hours
- Theoretical: 4 hours a week.
- Total hours a week: 4 hours a week.
- Total hours per semester: 56 hours per semester.

Evaluation
- Final exam 100%

Graduation Project

Evaluation
- Final interview 100%

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