Modern Academy for Computer Science and Management Technology in Maadi
Computer Science Department

Courses Resume

Courses Given by the Computer Science Dpt.

First year – First Semester										
Category	Code	Course title	Total hours	No of hours / week			Evaluations			
				L	E	P	Written	Year Work	Lab	Total
B	B113	English Language (I)	4	2	2	0	75	25	-	100
S	B117	Professional Ethics and Legal Aspects	2	2	0	0	40	10	-	50
S	M102	Business Organization	4	2	2	0	60	15	-	75
B	B101	Mathematics (I)	6	4	2	0	95	30	-	125
B	B107	Physics (I)	8	4	2	2	100	25	25	150
C	C101	Introduction To computers	6	4	2	0	100	25	25	150
Total			30	18	10	2				650

Title: English Languages (1) Code: B 113

Overall Aims of Course:

The material reflects the stylistic variety that advanced learners have to be able to deal with the course gives practice in specific points of grammar to consolidate and extend learners existing knowledge. Analysis of syntax, comprehension, Skimming and scanning exercises develop the learner's skills, comprehension questions interpretation and implication. The activities and games used develop listening, speaking and writing skills through a communicative, functional approach, with suggested topics for discussion and exercises in summary writing and composition

Title: Professional ethics & legal aspects Code: B 117

Overall Aims of Course:

Computer crime and ethics, nature of computer crime, criminal and civil law overview, basis for protection against computer crimes, suitability and application of intellectual property to computers , application of patent to computers , copyright and its range of application ownership and third party rights, trade secrets and unfair competition, computer contracts and liability , privacy, viruses and other programmed threats, legal protection against viruses, global information networks and related legal aspects.

Title: Business organization Code: M 102

Overall Aims of Course:

Management concepts, levels and types of management, characteristics of successful management, the planning process, setting organization objectives and goals organization, people and production, decision making fundamentals of control, control techniques and methods of human resources-management , role of purchasing and materials management in business.

Title: Mathematics 1 Code: B 101

Overall Aims of Course:

Pre-calculus review sets. Real-valued function The continuity and the differentiability of a real function. Techniques of differentiation, Derivatives of the trigonometric functions. Implicit differentiation. Linear approximations and differentials. Applications of the derivative: Extreme of functions, optimization problems, velocity and acceleration. Integrals: Indefinite integrals change of variables, definite integrals, the fundamental theorem of calculus, numerical integration. Applications of definite integrals: Areas, solids of revolution, are length and surfaces of revolution, work, moments and centers of mass. Transcendental functions: Derivative of inverse function, natural logarithm function, exponential functions, inverse trigonometric functions, hyperbolic and inverse hyperbolic function, indeterminate forms and I'hopitale rule.

Title: Physics 1 Code: B 107

Overall Aims of Course:

Mechanics: physics and measurements, motion in one dimension, vectors, motion in two dimensions, laws of motion, circular motion and its applications, work and energy, potential energy and conservation of energy, linear momentum and collision. Rotation of a rigid body , rolling motion, law of gravity.

Title: Introduction to computer Code: C 101

Overall Aims of Course:

Computer definition, different computer types, digital computer, analog computer, general-purpose computer, special purpose computer, hybrid computer. Computer organization, computer hardware, input/output units, storage media, computer memory types, arithmetic and logical unit (A L U), computer software, computer programming, computers and networking, software development systems, Information management, database management systems and applications, operating systems. Computer Crime and Security. Computer issues and Health. Introduction to programming languages, General form of Pascal program: Expressions: arithmetic expressions. Simple data types: Real, integer, Boolean, character sub range, and enumerated Data types, input and output. Statements Conditional control structures: Compound statements, Boolean expressions, IF statements, Case statements. Repetition statements: While statement, repeat statement, for statement.

First year – Second Semester										
Category	Cod	Course title	Total hours	No of hours / week			Evaluations			
				L	E	P	Written	Year Work	Lab	Total
B	B114	English Language (II)	4	2	2	0	75	25	-	100
S	E102	Introduction To Economics	2	2	0	0	40	10	-	50
B	B102	Mathematics (II)	6	4	2	0	95	30	-	125
B	B108	Physics (II)	8	4	2	2	90	15	20	125
B	B109	Electronics	6	4	0	2	90	20	15	125
C	C102	Fundamentals of Structure Programming	6	4	0	2	90	15	20	125
Total			32	20	6	6				650

Title: English language 2 **Code:** B 114

Overall Aims of Course:

The material reflects the stylistic variety that advanced learners have to be able to deal with. The course gives practice in specific points of grammar to consolidate and extend learners existing knowledge. Analysis of syntax; comprehension; skimming and scanning develop the learner's skills; comprehension questions interpretation and implication. The activities and games used develop listening. Speaking and writing skills through a communicative, functional approach, with suggested topics for discussion and exercises in summary writing and composition.

Title: Principles of economics **Code:** E 102

Overall Aims of Course:

Economics as a science. The Economic problem, supply and Demand Analysis. Demand Elasticity, Market Mechanisms and Equilibrium, Consumer Theory, Theory of Distribution, Gross National product Measurement, Theories, Theory of profit, Theories of Interest, Theory of Rent.

Title: Mathematics 2 **Code:** B 102

Overall Aims of Course:

Techniques of integration: integration by parts, trigonometric integrals and substitutions, integrals of rational functions, quadratic expressions, tables of integrals, improper integrals. Infinite series: Sequences, convergent or divergent series, positive-term series (basic comparison test, limit comparison test, ratio and root tests). Alternating series and absolute convergence, power series, power series representations of functions, McGauran and Taylor series, applications of Taylor polynomials. Differential equations: Definition, classifications and terminology. Technique of solution of ordinary first-order first-degree differential equations (separable, reducible to separable, homogeneous, reducible to homogeneous, linear. Reducible to linear, exact differential, nonexact differential-integrating factor). Applications.

Title: Physics 2 **Code:** B 108

Overall Aims of Course:

Optics: Superposition of waves, interference, diffraction and polarization. Electricity and magnetism: electric field, Gauss's law magnetic field, sources of magnetic field and Faraday's law, electromagnetic waves. Selected topics: Introduction to modern physics and applications, molecules and solids, superconductivity.

Title: Electronics **Code:** B 109

Overall Aims of Course:

Electronic components and basic laws. Principles of circuit-analysis: Dividers. Equivalent sources, methods of solutions, circuits with nonlinear resistance, maximum power-transfer, sinusoidal excitation and impedance concept, magnitude and phase-shift of RLC circuits. Frequency response of linear circuits, passive filters types and characteristics. Diode-circuits: half and full-wave rectifiers, Zener regulators and limiters. Transistor circuits :BJT characteristics, types, basic configuration, biasing and load line , equivalent circuits, voltage gain , input and output impedance, coupling. Practical circuits, FET circuits: Characteristics, types, basic configuration, switching modes. Operational amplifiers: principles, basic circuits: adder, follower. Differentiator, integrator, comparator, Schmitt-circuit, special circuit's .Active filters: types, characteristics. Oscillators: Relaxation,

feedback, RC, LC and Voltage controlled oscillators. Display elements: Light-emitting-diodes, liquid.

Title: Fundamentals of structured programming **Code:** C 102

Overall Aims of Course:

Structured Program development: Problem solving, decision structures, repetition structures. Top-down and stepwise refinement. Subprograms: Procedures. Functions. Structured data types: one-dimension arrays, two-dimension arrays. Sets. Records. Files: Text files random handling files. Dynamic data structures (Pointers). Recursion: Recursive functions, towers of Hanoi.

Second year – First Semester										
Category	**Code**	**Course title**	**Total Hours**	**No of hours / week**			**Evaluations**			
				L	**E**	**P**	**Written**	Year Work	**Lab**	**Total**
O	B213	Report Writing	4	2	2	0	60	15	-	75
B	B201	Mathematics (III)	6	4	2	0	95	30	-	125
C	C201	Data Structure	6	4	0	2	75	10	15	100
C	C202	Logic Design	6	4	0	2	90	15	20	125
C	C203	Operating Systems (I)	6	4	0	2	90	15	20	125
S	I201	Introduction To Information Systems	6	4	0	2	75	10	15	100
Total			34	22	4	8				650

Title: Repot Writing **Code:** B 213

Overall Aims of Course:

This course aims to give the student the basic rudiments of report writing. The rationale for report writing, the structure of reports, and such details as physical appearance and linguistic style will be discussed in addition to writing reports. Students will also be given supplementary exercises, as necessary, to enhance their general writing skills.

Title: Mathematics 3 **Code:** B 201

Overall Aims of Course:

Sets, sequences, algorithms and pseudo codes, prepositional logic. Proof by induction. Matrices and Boolean matrices. Relations and functions. Graph theory. Posits lattices. Boolean algebra. Linear equations and matrices. Vector spaces. Inner product spaces. Linear transformations. Eigen values and eigenvectors. Canonical forms. Jordan forms.

Title: Data Structures **Code:** C 201

Overall Aims of Course:

Abstract Data Types (ADT)Stacks: Definition and operations, implementation of stacks with array and records, applications of stacks . Queues: Definitions, implementation of circular queues, applications of queues. Linked lists: Singly linked lists, linked stacks, linked queues, doubly linked lists, application of linked lists. Tree structures, binary trees: binary tree traversals, binary tree search. Searching Definitions, sequential search. Sorting: Definitions, insertion sort, selection sort. Hashing: Hash functions, perfect Hash functions.

Title: Logic Design **Code:** C 202

Overall Aims of Course:

Basic logic concepts: Logic states, number systems, Boolean algebra, basic logical operations, gates and truth tables. Combinational logic: Minimization techniques, Multiplexers and de-Multiplexers, encoders, adders and sub tractors

Look-ahead carry, comparators, programmable logic arrays and memories, design with MSI, logic families, tri-state devices, CMOS and TTL logic interfacing. Sequential logic: flip-flops, monostable multi-vibrators , latches and registers, counters , shift registers. Analog to digital conversion, digital-to-analog conversion. Data acquisition. Microprocessors.

Title: Operating System 1 **Code:** C 203

Overall Aims of Course:

Definition, History, concepts & structure. processes, Interposes communication, classical IPC Problems, process scheduling, memory management , file systems, input/output, deadlocks, case study : Unix, MS-DOS.

Title: Introduction to Information Systems **Code:** I 201

Overall Aims of Course:

Fundamental concepts, objective of information system, system definition, subsystem definition, message passing in information system, message levels data, information knowledge, needs, characteristics, sources, data processing(DP)

Electronic data processing (EDP), management information system (MIS) ,decision support system(DSS) , office automation system(OAS), executive information system(EIS), expert system (ES), computer based information system (CBIS), types of CBIS , relationships among CBISS, the evolutionary view, the hierarchical view, the contingency view , the importance of CBIS, the nature of information system in different organizations. Management concepts in CBIS, data management, the organization of data. Application oriented files, database approach, decision-making concepts and tools decision support system (DSS), building a DSS, application of DSS.

Second year – Second Semester										
Category	**Code**	**Course title**	**Total Hours**	**No of hours / week**			**Evaluations**			
				L	E	P	**Written**	Year Work	**Lab**	**Total**
S	B216	Human Behaviour	2	2	0	0	40	10	-	50
B	B202	Mathematics (IV)	6	4	2	0	95	30	-	125
C	C204	File Organization	6	4	0	2	90	15	20	125
C	C205	Operating Systems (II)	6	4	0	2	90	15	20	125
C	C206	Object Oriented Programming	6	4	0	2	90	15	20	125
B	B203	Numerical Computing Techniques	6	4	2	0	75	25	-	100
Total			32	22	4	6				650

Title: Human Behavior **Code:** B 216

Overall Aims of Course:

Organization of Behavior. Individual Behavior. Learning self-management Perception, attribution and the judgment of others. Components of the perceptual process. Basic biases in person

perception. Biological and social needs. Individual objectives success or failure in the organization. How human needs operate in organization. The exchange relationship. Pay and motivation.

Title: Mathematics 4 **Code:** B 202

Overall Aims of Course:

Second and higher-order differential equations. Applications of second-order differential equations with constant coefficients. Systems of linear differential equations. Series solutions. Laplace transforms. Special functions. Partial differential equations. Boundary value problems. Fourier series and integrals. Diffusion, potential and wave equations in rectangular, cylindrical, and spherical co-ordinates.

Title: File Organization **Code:** C 204

Overall Aims of Course:

File processing environment: Overview of files, blocking and buffering, secondary storage devices. Sequential access: Sequential file organization, external sort/ merge algorithms. Random access: Direct addressing, hashing, perfect hashing, dynamic hashing. Tree-structured file organization: High-balanced binary search trees, B-tree, B+-tree, indexed sequential file organization. List-structured file organization: Multiple-key, and inverted files. The merits of these file organization and the optimum choice for a given application.

Title: Operating System 2 **Code:** C 205

Overall Aims of Course:

Distributed systems, hardware concepts, software concepts, design issues, communication in distributed systems, synchronization, processes and processors, distributed file systems. Case study: AMOEBA, MACH.

Title: Object Oriented Programming **Code:** C 206

Overall Aims of Course:

Objects: Objects classes and inheritance through, a design example, deriving an object oriented design. Functional oriented design: Data flow diagrams, structure charts, data dictionaries, deriving structure charts, design examples, concurrent systems design. User interface design: User interface design objectives, interface metaphors, WIMP (Window, Icons, Menus, and Pointing) interfaces using color displays.

Title: Numerical Computing Methods **Code:** B 203

Overall Aims of Course:

Computational errors. Floating-point computation. Root finding: Bisection method, Newton's method, and secant method. Approximation theory: polynomial approximation, least squares method, interpolation, extrapolation, Numerical differentiation and integration. Initial value problems for ODE: Euler's method Taylor-series methods, and Rung-Kutta methods. Numerical solutions of nonlinear systems of equations: Boundary-value problems for ODE. Numerical solutions to partial differential equations.

Third year – First Semester										
Category	**Code**	**Course title**	**Total Hours**	**No of hours / week**			**Evaluations**			
				L	**E**	**P**	**Written**	Year Work	**Lab**	**Total**
C	C301	Formal languages and Automata	6	4	2	0	60	15	-	75
B	B301	Probability and Statistical Analysis and Its Applications	6	4	2	0	95	30	-	125
C	C302	Logic Programming	6	4	0	2	90	15	20	125
C	C303	Analysis and Design of Algorithms	6	4	0	2	90	15	20	125
C	C304	Database management Systems	6	4	0	2	90	15	20	125
B	B302	Operation Research	4	2	2	0	65	10	-	75
S		Human Righs	2	2	-	-	100	-	-	100
Total			36	24	6	6				650

Title: Formal Language & Automata **Code:** C 301

Overall Aims of Course:

Alphabets and languages. Finite representation of language. Deterministic and non-deterministic finite automata and their applications. Equivalence considerations. Regular expressions. Context-free languages. Context-free grammars. Regular languages. Pushdown automata. Properties of context-free languages.

Determinism and parsing top-down parsing and bottom-up parsing. Turing machines: Computing with Turing machines, combining Turing machines, and nondeterministic Turing machines.

Title: Probability & Statistical Analysis & Applications **Code:** B 301

Overall Aims of Course:

Sample space, probability axioms, combinatorial techniques, conditional probability independence and Bays" Random variables; distribution functions, moments and generating function. Some probability distributions. Joint distributions the Chebychev inequality and the law of large numbers. The central limit theorem and sampling distributions. Review of sampling theory and distributions. Estimation theory: Unbiasedness, efficiency, points estimates, confidence interval estimates (for mesns, proportions. Differences, sums, variances, and variance ratios), maximum likelihood estimates.

Tests of hypotheses and significance: Null hypothesis, type I and type II errors. Level of significance, special tests of significance for small samples. Operating characteristic curves, quality control chart, fitting theoretical distributions to sample frequency distributions, goodness of fit. Curve fitting, regression and correlation: Method of least squares, multiple regression,(linear generalized and rank) correlation. Correlation and dependence. Analysis of variance: purpose, one-factor experiments. Variation, linear mathematical models, F-test for the null hypothesis of equal means. Modifications for unequal numbers of observations, two-factor experiments, experimental design.

Title: Logic Programming **Code:** C 302

Overall Aims of Course:

Introduction: Facts, objects, and Predicates: Expressing facts, turbo prolog objects. Prolog variables: Using variables, bound and free variables, anonymous variables, compound goals, backtracking, variable rules. Using rules: Rules, variables in rules. Prolog execution rules, using the trace, unification, execution control, the built-in predicate. Simple input and output. Controlling execution: Success through failure; the fail predicate, exclusion using the fail predicate, recursion, and the cut. Arithmetic operations. Compound objects Dynamic database. Lists. String operations.

Title: Analysis & Design of Algorithms **Code:** C 303

Overall Aims of Course:

Algorithm concept. Analysis and complexity. Design methods: Divide and conquer: The general method, binary search, merge sort, quick sort, selection, and matrix multiplication. Greedy method: The general method, minimum spanning Trees. Dynamic Programming: The general method, shortest paths, optimal search trees, and the traveling salesman problem. Backtracking: The general method, the 8-queens problem. NP-hard and NP-complete problems: Cook's theorem, NP-hard graph problems.

Title: Database Management **Code:** C 304

Overall Aims of Course:

An overview of database management; what is database system, operational data, data independence, relational systems and others. Architecture of a database system: The three levels of architecture, the external level, the conceptual level, the internal level mappings, the database administrator, the database management system. The internal level: Database accesses, page sets and files, indexing. Hashing, pointer chains, comparison techniques. An overview of DB2: Relational databases, the SQL language, major system components. Relational algebra: A syntax for the relational algebra, traditional set operations, special relational operations. Relational calculus: Tuple-oriented relational calculus, relational calculus vs. relational algebra, domain-oriented relational calculus, query-by-examples. Data definition: Base tables indexing. Data Manipulation: Simple queries join queries, built-in functions, advanced features, update operations.

Title: Operations Research **Code:** B 302

Overall Aims of Course:

Linear programming: Formulations and graphical solution. Algebraic solution: the simplex method and dual-simplex method. Sensitivity analysis. Transportation and assignment problems. Integer programming: cutting-plane algorithms, branch and bound method Dynamic Programming: Examples of the dynamic programming Models and computations, solution of linear programs by dynamic programs. Project scheduling by PERT-CPM.

Third year – Second Semester										
Category	**Code**	**Course title**	**Total hours**	**No of hours / week**			**Evaluations**			
				L	E	P	**Written**	Year Work	**Lab**	**Total**
C	C305	Assembly Language	4	2	0	2	75	10	15	100
C	C306	System Analysis and Design	6	4	2	0	75	25	-	100
C	C307	Software Engineering	6	4	0	2	90	15	20	125
C	C308	Artificial Intelligence	6	4	0	2	75	10	15	100
C	C309	Computer Graphics	4	2	0	2	90	15	20	125
C	C310	Computer Architecture and Organization	6	4	0	2	75	10	15	100
Total			32	20	2	10				650

Title: Assembly Languages **Code:** C 305

Overall Aims of Course:

Microprocessors: Architecture, ALU, registers, accumulators, memory addressing control logic, addressing modes. Assembler instructions , pseudo-operation and operators, data definitions : byte , word, immediate operands, difference between EXE and COM program files , program logic and organization : JMP, LOOP, CALL, stack segment, Boolean operation: AND, OR, XOR, TEST, NOT, shifting and rotation, string instructions, arithmetic: Processing binary data , processing ASCII and BCD data, table processing, procedures, interrupts, programming techniques, COM programming numeric calculations, text management, screen processing, I/O libraries, linking with high level languages.

Title: System Analysis & Design **Code:** C 306

Overall Aims of Course:

Fundamental concepts, system definition, the different types of users, communication gap, system analyst, system management , structure system analysis, system analysis tools data flow diagram (DFD), data dictionary , English structure, decision tables, decision trees.

The system life cycle, problem definition and modules, feasibility study. Source and destination of data, stores, development plan, and analysis phase, IPO chart, generating alternatives. Design methods, automation boundary, alternative implementations, system flow chart, system components, cost/benefit analysis, implementation schedule, physical elements, programs, files, manual procedure and training forms. Analyst's recommendation, logic of the process, detailed design, identifying options, system control program, screens, reports and files, test plan, implementation and maintenance.

Title: Software Engineering **Code:** C 307

Overall Aims of Course:

Introduction: Well-engineered software, the software process, software evolution, and software reliability. Human factors in software engineering: Human diversity, knowledge processing, group working. Software specification and system modeling: The software requirements document, requirements evolution, system contexts, viewpoint analysis model description, real-time system modeling, data modeling. Requirements definition and specification: Requirements specification, nonfunctional requirements definition. Requirements validation and prototyping: The prototyping process, prototyping techniques. Formal specifications, algebraic specification. Model based specification. Software design: Top-down design, systems design, design decomposition, software design quality, design description languages.

Title: Artificial Intelligence **Code:** C 308

Overall Aims of Course:

Artificial and Human Intelligence: Domains of Al-symbolic processing: Semantic nets, modeling, model based reasoning, frames. Inference techniques: Implication, forward and backward chaining, inference nets, predicate logic, quantifiers, tautology, resolution, and unification. Rule based systems: Inference engine, production systems. Problem solving, planning, decomposition and basic search techniques. AI languages: Symbolic and coupled processing prolog: Objects and relations, compound goals, backtracking, search mechanism, dynamic databases, Lisp: program structure and operations, functions, unification, memory models. Fields of AI: heuristics and game playing, automated reasoning problem solving,

computational linguistics and natural language processing, computer vision, AI based computer systems: Sequential and parallel inference machines, relation between AI and artificial neural nets, fuzzy systems.

Title: Computer Graphics **Code:** C 309

Overall Aims of Course:

Introduction to computer graphics: History, applications, and graphics system software. Output primitives: points, lines, circles, ellipses, character generation. Attributes of output primitives: color and intensity, area filling, character attributes. Two-dimensional transformations: Basic transformations; translation, scaling and rotation. Matrix representations and homogeneous coordinates, Composite transformations. Windowing and clipping. Segments. Interactive input devices.

Title: Computer Architecture & Organization **Code:** C 310

Overall Aims of Course:

Basic computer organization and design: Computer instructions and their codes, timing and control, execution of instructions. Input, output and interrupt. Assembly language: Programming loops, programming arithmetic operations, subroutines, I/O programming. Central processor organization: Processor bus organization. Arithmetic logic unit, stack organization. Instruction formats. Addressing modes. Data transfer and manipulation, program control. Microprogramming control organization: control memory. Address sequencing. Arithmetic processor design and algorithms: Comparison and subtraction of unsigned binary numbers, addition and subtraction algorithms, multiplication and division algorithms. Input/output organization: Peripheral devices, asynchronous data transfer, direct memory access. Memory organization: Auxiliary memory, virtual memory, cache memory, memory management hardware. Pipeline and vector processing. Multiprocessors.

Fourth year – First Semester										
Category	**Code**	**Course title**	**Total hours**	**No of hours / week**			**Evaluations**			
				L	E	P	**Written**	Year Work	**Lab**	**Total**
C	C401	Modelling and Simulation	6	4	0	2	90	15	20	125
C	C402	Compiler Theory	6	4	2	0	75	25	-	100
C	C403	Image Processing	6	4	0	2	75	10	15	100
C	C404	Computer Networks	6	4	0	2	90	15	20	125
C	C409	Selected Topics I	6	4	0	2	75	10	15	100
P	C419	Project	4	4	0	0	-	-	-	100
Total			34	24	2	8				650

Title: Modeling and Simulation **Code:** C 401

Overall Aims of Course:

Basic simulation modeling. Nature of simulation. System models, discrete event simulation of a single-server queuing system. Simulation of an inventory system. List processing in simulation. Simulation languages. Simulation of time sharing system. Simulation output data and stochastic processes. Building valid and credible simulation models. Principles of valid simulation modeling. Verification of simulation computer programs. An approach for developing valid simulation models. Statistical procedures for computing real-world observation output data. Some practical considerations: Selecting input probability distributions. Random number generators. Generating random variables. Output data analysis for a single system.

Title: Compiler Theory **Code:** C 402

Overall Aims of Course:

Introduction and overview. Scanning- theory and practice: Regular expressions, finite automata and scanners, scanner generation, practical considerations, translating regular expressions to finite automata Grammars and parsing: Context frees grammars, parses and recognizers, grammar analysis algorithms. Semantic processing: Syntax-directed translation, semantic processing techniques. Symbol tables: Basic techniques, block-structured and extensions, Implicit declarations, Run-time storage organization: Static allocation, stack allocation, program layout in memory. Data structures: declaration-processing fundamentals action routines, Procedures and functions If statements, loops, case statement, exception handling passing parameters to subprograms. Code

generation and optimization: Register and temporary management, interpretive code generation, generating code from trees and tags, optimizing subprogram calls, loop optimization.

Title: Image Processing **Code:** C 403

Overall Aims of Course:

Scope and applications of image are processing. Perspective transformations (Modeling picture taking. perspective transformations in homogeneous coordinates and with two reference frames). The spatial frequency domain (The sampling theorem, template matching and the convolution theorem, spatial filtering). Enhancement and Restoration, image segmentation. Image representation: (Spatial differentiation and smoothing. template matching, region analysis, contour following). Descriptive methods in scene analysis. Hardware considerations. Applications.

Title: Computer Networks **Code:** C 404

Overall Aims of Course:

Introduction: The use of computer network structure, net work architecture, the ISO reference model, examples of networks, Network topology: Connectivity analysis, delay analysis, backbone design, and local access network design. The physical layer: The theoretical basis for data communication, the telephone system. Transmission and multiplexing, terminal handling errors. The data link layer: Elementary data link protocols, sliding window protocols, analysis of protocols. The network layer: Virtual circuits and datagram's routing algorithms, satellite packet broadcasting. Local network: Carrier sense networks, ring networks, shared memory system. The transport and session layers: Transport protects design issues, interconnection of packet-switching networks. The presentation layer: network security and privacy, text compression, virtual terminal protocols, file transfer protocols. The application layer: Distributed data base systems, distributed computations.

Title: Selected Topics 1 (speech processing) **Code:** C 410

Title: Project **code:** C 419

Overall Aims of project:

Students are allowed to choose among a number of projects suggested by the different staff members. The general aim of the project is to allow each student to integrate all the disciplines he has studied in a unified chunk of knowledge. On the behavioral side, students are allowed to work in a team so as to practice working in a collaborative environment. This emphasizes also a proper documentation and presentation procedure.

Fourth year – Second Semester										
Category	**Code**	**Course title**	**Total hours**	**No of hours / week**			**Evaluations**			
				L	E	P	**Written**	Year Work	**Lab**	**Total**
C	C405	Theory of Computation	6	4	2	0	90	35	-	125
C	C406	Neural Networks	6	4	2	0	90	15	20	125
C	C407	Distributed Computing	6	4	2	0	75	25	-	100
C	C408	Computer Security Methods	4	4	0	0	80	20	-	100
C	C410	Selected Topics II	6	4	0	2	75	10	15	100
P	C419	Project	4	4	0	0	-	-	-	100
		Total	32	24	6	2				650

Title: Theory of Computation **Code:** C 405

Overall Aims of Course:

Church's thesis: Grammars, the M-recursive functions, and Turing computability of the M-recursive functions. The uncompatability: The halting problem. Turing innumerability, Turing acceptability, and Turing decidability, unsolvable problems about Turing machines and M-recursive functions. Computational complexity: Time-bounded Turing machines. Rate of growth of functions. NP-Completeness. The complexity hierarchy. The prepositional calculus: Syntax, Truth-assignment, Validity and satisfiability . Equivalence and normal forms. Compactness.

Title: Neural Networks **Code:** C 406

Overall Aims of Course:

Introduction and a historical review: Overview of neurocomputing, history of neurocomputing. Neural network concepts: Basic definition, connections, processing elements. Learning laws: Self-adaptation equations, coincidence learning. Performance learning, competitive learning, filter learning, spatial-temporal learning, Associative networks: Data transformation structures, linear association network. Learn matrix network, recurrent associative networks. Mapping networks: Multilayer data transformation structures, the mapping implementation problem, Kolmogorov"s theorem the back-propagation neural network, self-organizing map, counter propagation network. Spatiotemporal, stochastic, and hierachical networks: Spatiotemporal pattern recognizer neural network, the Boltzman machine network and the neurocognition network.

Title: Distributed Computing **Code:** C 407

Overall Aims of Course:

Introduction to parallel and distributed architectures. Models of computation: SISD, SIMD, MISD, and MIMD Computers. Shared-memory SIMD computers. Interconnection-network SIMD Computers: Linear array, two-dimensional array, tree connection, perfect shuffle connection, cube connection Analyzing algorithms. Some parallel computer algorithms: selection, merging, sorting and searching. Parallel programming languages. Parallel compilers . operating system.

Title: Computer Security Methods **Code:** C 408

Overall Aims of Course:

Overview: Characteristics of computer intrusion, points of vulnerability, methods of defense. Basic encryption and decryption: Different types of ciphers characteristics of good ciphers, crypt analysis. Secure encryption systems : Hard problems Properties of arithmetic , public-key systems , and the data encryption standard (DES) , enhancing cryptographic security involving programs : Information accesses problems , viruses and worms , controls against attach , operating system control , administrative controls . Design of secure operating system: models of security, penetration of operating system examples of security in general purpose operating systems.

Database security: reliability and integrity, sensitive data, the inference problem, multilevel data security. Personal computer security measures. Protection for files, copy protection. Computer network security and communication security.

Title: Selected Topics 2 (multi media) **Code:** C 409

Title: Project **code:** C 419

Overall Aims of project:

Students are allowed to choose among a number of projects suggested by the different staff members. The general aim of the project is to allow each student to integrate all the disciplines he has studied in a unified chunk of knowledge. On the behavioral side, students are allowed to work in a team so as to practice working in a collaborative environment. This emphasizes also a proper documentation and presentation procedure.

Elective Topics:

Title: NATURAL LANGUAGE PROCESSING **Code:** C 411

Overall Aims of Course:

Introduction: NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation, the problem of ambiguity, The role of machine learning, Brief history of the field; N-gram Language Models: The role of language models, Simple N-gram models, Estimating parameters and smoothing. Evaluating language models; Part Of Speech Tagging and Sequence Labeling: Lexical syntax, Hidden Markov Models, Maximum Entropy Models, Conditional Random Fields; Syntactic parsing: Grammar formalisms and treebanks, Efficient parsing for context-free grammars (CFGs), Statistical parsing and probabilistic CFGs (PCFGs).

Title: Computer vision **Code:** C 413

Overall Aims of Course:

Introduction: AI, Computer Vision, and Robots Sensing, seeing, and perceiving, what is the role of vision?; Images: Sources of imagery, The physics of imaging, representing, acquiring, and displaying images, Gray scale, color, noise, lens distortion, and filtering; Image processing, preprocessing, and image correction: Enhancing features and correcting imperfections, Addressing noise, lens distortion, and blurring; Computer Vision Paradigms: Bottom-up, top-down,

neural net, Pixels, lines, boundaries, regions, and object representations, "Low-level", "intermediate-level", and "high-level" vision, Historical and illustrative examples: L. Roberts, Brice & Fennema; Finding edges and lines: Finding edges (low-level), Gradients, zero crossing detectors, line models Roberts, Sobel, Cany; Finding and grouping lines (intermediate-level): Boundary tracing, line fitting, Hough transform; Finding and processing regions: Finding "elementary regions" (low-level), Merging, splitting, and grouping regions (intermediate-level); Grouping and analyzing lines and regions (high-level): Guzman, Clowes and Huffman.

Title: Computer interface and terminals **Code:** C 414

Overall Aims of Course:
Overview of Data Communications; Terminal Devices, Modems, Interfaces, Service Units; Transmission Modes and Media; Local Area Network/Wide Area Network: Network topologies, Contention Protocols, OSI Model, Ethernet, Token ring, Token bus, FDDI, Network Devices, TCP/IP; Common Carrier Services: WAN Technologies, X.25 and Frame Relay, ISDN and B-ISDN , ATM, xDSL, Wireless Protocols (WIFI, Wimax), Cellular Mobile Systems

Title: Data communication **Code:** C 415

Overall Aims of Course:

Course management and Introduction: Basic Concepts and History of Telecom; OSI models; Signals; Encoding & Modulating; Interfaces and Modems; Transmission Media; Local Area Network; Switching; ATM; SONET/SDH; TCP/IP Protocols; TCP/IP Architectures; Next Generation of TCP/IP protocols:Ipv6 and ICMPv6; Network Security.

Title: Microprocessor-based system **Code:** C 417

Overall Aims of Course:

Introduction: Architecture, Assembly, ISA, Toolchains, Memory and I/O Architecture; Memory/Peripheral Bus: AMBA; Memory-Mapped Peripherals; Interrupts, ARM NVIC; Timers; Memory Technologies; Serial busses: UART, SPI, and I2C; ADCs/DACs; Wireless Communications; PCB Design and Fabrication; ARM Cortex-M0 and LPCXpresso; ARM Guest.

Title: Pattern recognition **Code:** C 410

Overall Aims of Course:

Introduction to pattern recognition via character recognition: grids, connectivity and contour tracing.; Smoothing: regularization, local averaging, median filtering and polygonal approximation; Differentiation: image enhancement, the Laplacian operator and unsharp masking; Moments of area and perimeter for shape measurement; Medial axis transforms: skeletonization algorithms and medial axis algorithms; Topological feature extraction: convex hulls and convex deficiencies; Processing line drawings: Freeman chain coding and geometric probability; Detecting structure in noisy pictures: Hough transforms, proximity graphs, relative neighborhood graphs, sphere-of-influence graphs, alpha-hulls, crusts and beta-skeletons; Estimation of parameters: maximum likelihood and Bayesian estimation; Estimation of misclassification: generalization, substitution, leave-one-out and bootstrap; Nearest neighbor decision rules: editing, condensing and efficient nearest neighbor search; Cluster analysis and unsupervised learning: decision-directed learning, graph-theoretic methods, agglomerative and divisive methods; Using context in pattern recognition: Markov methods and the Viterbi algorithm; Support Vector Machines; Music Information Retrieval.

Title: Architecture of Parallel Processing **Code:** C 418

Overall Aims of Course:

Parallel Computer Architecture: Classical Use of Parallelism, Parallel Computer Models, Dimensions of Scalability and Design Principals, and Flynn's Taxonomy of Parallel Architectures. Enabling Technologies: Processor Architecture and Technology Trends, Thread-Level Parallelism, Distributed Memory and Latency Tolerance, Cache Coherence Protocols, Shared- Memory Consistency, and Performance of Parallel Computers. Parallel Programming: Basics of Parallel Programming, Parallel Programming Models, Levels of Parallelism, Message-Passing Programming, Data-Parallel Programming, and Performance of Parallel Programs.

Title: Speech Processing **Code:** C 412

Overall Aims of Course:

The nature of speech signal; speech processing techniques; in time domain: energy, zero crossing rate; speech processing in frequency domain: Fourier transform and cepstrum analysis, bank of filters: linear predictive analysis; Speech recognition systems; Hidden Markov modeling for speech recognition; speech synthesis systems.

Title: Expert Systems **Code:** C 409

Overall Aims of Course:

Introduction; Expert System Features; Sample applications; Using Prolog's inference engine; User Interface; Backward chaining with uncertainty; Forward chaining.

Title: Multimedia **Code:** C 416

Overall Aims of Course:

Introduction to Multimedia; Text in multimedia: introduction, font selection, text on screens and internet, text compression algorithms; Audio in multimedia: usage, properties, formats, compression algorithms and editing; Digital graphics: introduction, digital camera technology, editing, the International Standard Bodies and coding techniques; Digital video: introduction, capture & display, color spaces, the human visual system, video quality, standards of digital video representation and video editing; Video compression: introduction, motion-compensation prediction, model-based coding, video CODECs and video coding techniques; Multimedia and networks: introduction, protocols, network and transport protocols, multicasting, application protocols for multimedia, caching, RTSP, quality of service and server-side computation.