Faculty of Engineering
Cairo University

Internal Regulations
for the Bachelor of Science Degree

2006

Computer Engineering

Computer Engineering

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First Term

No.	COURSE		Weekly Hours				Grading System				Final Exam (hrs)
	CODE	TITLE	Lec.	Exc.	Lab	Total	Term Work	Lab / Oral	Final Exam	Total	
1	CMP 101A	Logic Design	3	1	1	5	30	20	75	125	2
2	CMP 102	Data Structures and Algorithms	3	1	2	6	30	30	90	150	2
3	ELC 125A	Electrical & Electronic Circuits	3	1	-	4	20	-	70	100	2
4	MTH 125A	Mathematics (2)	3	1	-	4	30	-	70	100	2
5	PHY 125A	Physics (2)	3	1	1	5	30	20	75	125	2
6	CVE 125	Civil Engineering	3	1	-	4	30	-	70	100	2
7	GEN 125*	Report Writing and Presentation Skills	2	-	-	2	15	15	-	-	-
TOTAL			20	6	4	30				700	

* Continuing course: Term work is added at the end of the second term.

Second Term

No.	COURSE		Weekly Hours				Grading System				Final Exam (hrs)
	CODE	TITLE	Lec.	Exc.	Lab	Total	Term Work	Lab / Oral	Final Exam	Total	
1	CMP 101B	Logic Design	3	1	1	5	30	20	75	125	2
2	CMP 103	Programming Techniques	3	1	2	6	30	20	100	150	2
3	ELC 125B	Electrical & Electronic Circuits	3	1	-	4	30	-	70	100	2
4	MTH 125B	Mathematics (2)	3	1	-	4	30	-	70	100	2
5	PHY 125B	Physics (2)	3	1	1	5	30	20	75	125	2
6	INT 125B	Mechanical Engineering	3	1	-	4	30	-	70	100	2
7	GEN 125*	Report Writing and Presentation Skills	2	-	-	2	10	-	60	100	2
TOTAL			20	6	4	30				800	

* Continuing course: Term work is added at the end of the second term.

Computer Engineering

Second Year

First Term

No.	COURSE		Weekly Hours				Grading System				Final Exam (hrs)
	CODE	TITLE	Lec.	Exc.	Lab	Total	Term Work	Lab / Oral	Final Exam	Total	
1	CMP 201A	Microprocessor Systems	3	1	1	5	30	20	75	125	2
2	CMP 202	Introduction to Database Management Systems	3	1	2	6	40	20	90	150	2
3	CMP 205	Computer Graphics and Man Machine Interface	3	1	1	5	30	20	75	125	2
4	ELC 225-1A	Electronics & Digital Electronic Circuits	3	1	-	4	30	-	70	100	2
5	EPM 225	Power Engineering	3	1	-	4	30	-	70	100	2
6	MTH 225A	Mathematics (3)	3	1	-	4	30	-	70	100	2
7	GEN 225*	Project Management & Economics	2	-	-	2	15	15	-	-	-
TOTAL			20	6	4	30				700	

* Continuing course: Term work is added at the end of the second term.

Second Term

No.	COURSE		Weekly Hours				Grading System				Final Exam (hrs)
	CODE	TITLE	Lec.	Exc.	Lab	Total	Term Work	Lab / Oral	Final Exam	Total	
1	CMP 201B	Microprocessor Systems	3	1	1	5	30	20	75	125	2
2	CMP 203	Software Engineering	3	1	2	6	40	20	90	150	2
3	CMP 206	Multimedia	3	1	1	5	40	10	75	125	2
4	ELC 225-1B	Electronics & Digital Electronic Circuits	3	1	-	4	30	-	70	100	2
5	ELC 225-2	Signals and Systems	3	1	-	4	30	-	70	100	2
6	MTH 225B	Mathematics (3)	3	1	-	4	30	-	70	100	2
7	GEN 225*	Project Management & Economics	2	-	-	2	10	-	60	100	2
TOTAL			20	6	4	30				800	

* Continuing course: Term work is added at the end of the second term.

Computer Engineering

Third Year

First Term

No.	COURSE		Weekly Hours				Grading System				Final Exam (hrs)
	CODE	TITLE	Lec.	Exc.	Lab	Total	Term Work	Lab / Oral	Final Exam	Total	
1	CMP 301A	Computer Architecture	3	1	1	5	30	20	75	125	2
2	CMP 302	Design and Analysis of Algorithms	3	1	1	5	30	20	75	125	2
3	CMP 303A	Operating Systems	3	1	1	5	30	20	75	125	2
4	CMP**	Elective Course (1)	3	1	1	5	30	20	75	125	2
5	ELC 325-2	Communications Engineering	3	1	-	4	30	-	70	100	2
6	MTH 325	Numerical Analysis (3)	3	1	-	4	30	-	70	100	2
7	GEN 325*	Sales, Marketing and Communication Techniques	2	-	-	2	15	15	-	-	-
TOTAL			20	6	4	30				700	

* Continuing course: Term work is added at the end of the second term.

** Elective Courses see Third Year Elective Courses' List.

Second Term

No.	COURSE		Weekly Hours				Grading System				Final Exam (hrs)
	CODE	TITLE	Lec.	Exc.	Lab	Total	Term Work	Lab / Oral	Final Exam	Total	
1	CMP 301B	Computer Architecture	3	1	1	5	30	20	75	125	2
2	CMP 303B	Operating Systrems	3	1	1	5	30	20	75	125	2
3	CMP 305	Integrated Circuit Design and VLSI Technology	3	1	1	5	30	20	75	125	2
4	CMP 306	Advanced Programming Techniques	3	1	1	5	30	20	75	125	2
5	ELC 325-1	Control Engineering	3	1	-	4	30	-	70	100	2
6	ELC 325-3	Digital Communications	3	1	-	4	30	-	70	100	2
7	GEN 325*	Sales, Marketing and Communication Techniques	2	-	-	2	10	-	60	100	2
TOTAL			20	6	4	30				800	

* Continuing course: Term work is added at the end of the second term.

Computer Engineering

Third Year

Electives

CMP 341	Information technology and Advanced Languages
CMP 342	Computer Systems Programming
CMP 343	Theory of Computation and Programming
CMP 361	Selected Topics in Information Technology
CMP 362	Selected Topics in Computer Engineering
CMP 363	Elective course selected from Electronics and Communication Engineering Department courses
CMP 364	Elective course selected from Biomedical and Systems Engineering Department courses

Computer Engineering

Fourth Year

First Term

No.	COURSE		Weekly Hours				Grading System				Final
	CODE	TITLE	Lec.	Exc.	Lab	Total	Term Work	Lab / Oral	Final Exam	Total	Exam (hrs)
1	CMP 401	Advanced Database Systems	3	1	-	4	30	-	70	100	2
2	CMP 402A	Machine Intelligence	3	1	-	4	30	-	70	100	2
3	CMP 404*	Computer Security & Case Studies Consultation	1	1	-	2	15	15	-	-	-
4	CMP 405A	Computer Networks	3	1	-	4	30	-	70	100	2
5	CMP 407	Modeling and Simulation Techniques	3	1	-	4	30	-	70	100	2
6	CMP**	Elective Course (3)	3	1	-	4	30	-	70	100	2
7	CMP**	Elective Course (3)	3	1	-	4	30	-	70	100	2
8	CMP 480*	Project	2	1	1	4	50	-	-	-	-
TOTAL			21	8	1	30				600	

* Continuing course: Term work is added at the end of the second term.
** Elective Courses see Fourth Year Elective Courses' List.

Second Term

No.	COURSE		Weekly Hours				Grading System				Final
	CODE	TITLE	Lec.	Exc.	Lab	Total	Term Work	Lab / Oral	Final Exam	Total	Exam (hrs)
1	CMP 402B	Machine Intelligence	3	1	-	4	30	-	70	100	2
2	CMP 403	Languages and Compilers	3	1	-	4	30	-	70	100	2
3	CMP 404*	Computer Security & Case Studies Consultation	1	1	-	2	10	-	60	100	2
4	CMP 405B	Computer Networks	3	1	-	4	30	-	70	100	2
5	CMP 406	Mobile and Wireless Networks	3	1	-	4	30	-	70	100	2
6	CMP**	Elective Course (4)	3	1	-	4	30	-	70	100	2
7	CMP**	Elective Course (5)	3	1	-	4	30	-	70	100	2
8	CMP 480*	Project	2	1	1	4	50	100	-	200	-
TOTAL			21	8	1	30				900	

* Continuing course: Term work is added at the end of the second term.
** Elective Courses see Fourth Year Elective Courses' List.

Computer Engineering

Fourth Year

Electives

CMP 441	Computer Peripherals
CMP 442	Fault Tolerant Computing
CMP 443	Computer Manufacturing Technology
CMP 444	Computer Interfacing
CMP 445	Embedded Systems
CMP 446	Image Processing and Computer Vision
CMP 447	Optical Networks
CMP 448	Parallel and High Performance Computing
CMP 449	Real Time Computers
CMP 450	Artificial Neural Networks
CMP 461	Advanced Topics in Information Technology
CMP 462	Advanced Topics in Computer Engineering
CMP 463	Elective course selected from Electronics and Communication Engineering Department courses
CMP 464	Elective course selected from Biomedical and Systems Engineering Department courses

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Computer Engineering

First Year – First Term

CMP 101A Logic Design (3+1+1)
Number systems and data representation - Boolean algebra - simplification of Boolean functions - logic gates - combinational and sequential logic circuits – Registers and counters.

CMP 102 Data Structures and Algorithms (3+1+2)
Data types and representation - file structures- data structures representation in storage media and memory allocation- linear lists -stacks - queues - deques - memory allocation - trees - graphs- searching, sorting algorithms and their analysis- hashing- programming project

MTH 125A Mathematics (2) (3+1)
(Algebra & Calculus) Series and expansion of functions - Fourrier series - Laplace transforms - partial differentiation – Differential equations – Numerical Integration.

PHY 125A Physics (2) (3+1+1)
[T1:3+1] Electromagnetic spectrum- electron emission –waves and particles duality- properties of magnetic, dielectric, metallic and semiconducting materials- electric and electromagnetic fields- wave propagation- static magnetic fields.

ELC 125A Electrical and Electronic Circuits (3+1)
Basic circuit components - analysis of DC and AC circuits - three phase circuits - resonant circuits and filters- simplification of resistive circuits-analysis of circuits-circuit theory (combinational- Thevenin- Norton- Replacement- maximum power)- analysis of time resonant circuits- RLC circuits- 3-phase circuits (representation- measurement and computation)

CVE 125 Civil Engineering (3+1)
Fundamentals of building construction -specifications for computer sites and locations- (types of buildings - specifications of materials used in buildings and internal partitions) - insulation against heat, moisture, noise and pollution - principles of fire protection - architectural and civil drawings - testing and acceptance criteria.

GEN 125* Report Writing & Presentation Skills (2+0)
(Presentation Skills) Preparation of short talks- seminar training - communication skills and training on scientific discussion and workshop participation.

Computer Engineering

First Year – Second Term

CMP 101B Logic Design (3+1+1)
combinational and sequential logic circuits design - applications for the design and testing of arithmetic and logic units.

CMP 103 Programming Techniques (3+1+2)
Introduction to software design - evolution and comparison of programming languages - types and characteristics of translators – basics of structured programming - function versus object oriented programming- introduction to parallel programming- program maintenance &testing - documentation - numerical and non-numerical examples- programming project.

MTH 125B Mathematics (2) (3+1)
(Discrete Math) numbers-generating functions- sets - groups- graphs - some combinatoric examples – Basic Mathematical logic – Introduction to Formal languages and finite automata – Recursive definitions – Recurrence relations – Asymptotic analysis.

PHY 125B Physics (2) (3+1+1)
[T1:3+1] currency in linear magnetic media- magnetic potentials- Maxwell equations- late potential- time dependent fields- electromagnetic fields in homogeneous static nonlinear media.

ELC 125A Electrical and Electronic Circuits (3+1)
Properties of electronic devices - rectification and voltage stabilization circuits – semiconductors- PN- junctions- application of diode circuits- Zener Diode.

INT 125 Mechanical Engineering (3+1)
Pprinciples of robot motion- degrees of freedom- motor control - heat transfer in itegrated circuits—heat design of circuits- heat integrators- heat transfer in semiconductors- material and heat design of electronic boards.

GEN 125 Report Writing & Presentation Skills (2+0)
(Report writing) Principles of technical report writing- structure and training using word-processing CV preparation – usage of different editorial software packages.

Computer Engineering

Second Year – First Term

CMP 201A Microprocessor Systems (3+1+1)
Computer architecture - CPU architecture - fetch and execution cycle - addressing modes - instruction set - memories - memory interfacing - timing diagrams - assembly language - instruction formats - data representation - arithmetic operations- kernels and macros.

CMP 202 Introduction to Database Management Systems (3+1+2)
Basic database concepts - data structures and operations - data modeling - database system architecture - data definition and data manipulation languages - query languages including Algebra and SQL – comparison of relational- hierarchical and network databases- software package training – project.

CMP 205 Computer Graphics and Man Machine Interfacing (3+1+1)
Fundamentals of computer graphics - display devices - fundamentals of graphic algorithms - two dimensional graphics - polygon representation - polygon filling - polygon clipping - three dimensional graphics - back face removal - scan line and ray tracing - illumination and shading models - programming examples- project.

ELC 225-1A Electronic & Digital Electronic Circuits (3+1)
Transistors- BST- MOS- JFBT- Amplifiers - oscillators - filters - earthing and insulation - electronics of display devices - fabrication techniques - troubleshooting protocols.

EPM 225 Power Engineering (3+1)
Transformers - DC machines - AC machines - synchronous machines - special electrical machines (step motors, fixed magnet machines, two phase servo motors) - electronic control of electrical machines - UPS systems - power distribution networks -air-conditioning- earthing - protection of electric equipment.

MTH 225A Mathematics (3) (3+1)
(Matrices) Matrices- Definition- Operations- and applications in circuits and simulation.

GEN 225* Project Management and Economics (2+0)
(Project management) - Introduction to management - quantitative and qualitative aspects of management - decision making - manpower allocation - implementation and maintenance management plans - basics of project management - project management within constrains of resources, time and cost - activity/event networks - critical path - time scheduling - management of implementation and servicing works - examples of software packages used in project management

Computer Engineering

Second Year – Second Term

CMP 201B Microprocessor Systems (3+1+1)
program controlled and interrupt driven I/O - I/O interfacing - connection of terminals, discs and I/O ports – interrupt assembly programming.

CMP 203 Software Engineering (3+1+2)
Software life cycle - concepts and methods of analysis - constrained system design - data, functions and relationships specifications - implementation procedures - standard specifications - reliability measures and quality assurance - integral testing - error analysis - software maintenance - documentation- project training.

CMP 206 Multimedia (3+1+1)
Introduction to multimedia- Basic principles- recording and transferring sound- photography- video - digital and audio video- compression- integration- special requirements and archieving techniques of multimedia – Examples (including Egyptian national archieving).

ELC 225-1A Electronic & Digital Electronic Circuits (3+1)
(Digital Circuits) Digital circuits - analog to digital and digital to analog conversion – digital logic circuits- sequential circuits- radio and TV circuits- video and layer recording circuits- electronic systems in communication - integrated circuits.

ELC 225-2 Signals and Systems (3+1)
Representation of signals - transforms (Fourier, Laplace, Z) - digital filters - noise - introduction to systems - linear systems and circuits - time and frequency domains analysis.

MTH 225B Mathematics-3 (3+1)
(Probability and Statistics]Theory of probability - conditional probabilities - probability distribution functions - random variables - continuous and discrete distributions. Introduction to statistics - statistical measures - statistical analysis.

GEN 225 Project Management and Economics (2+0)
(Economics) Principles of economics - cost benefit analysis and economical feasibility - economic comparison - economic life - risk analysis.

Computer Engineering

Third Year – First Term

CMP 301A Computer Architecture (3+1+1)
Von Newman and Harvard architecture- Computer arithmetic - design of ALU - pipelined ALU and processor -multiprocessors- control unit - instruction repertoires (RISC, CISC) – RAM access- interrupt circuits - bus synchronization - I/O devices - channels - memory architectures - connection of computer peripherals.

CMP 302 Design and Analysis of Algorithms (3+1+1)
Algorithm Design and analysis- examples. Techniques for designing efficient algorithms - analysis of complexity - complexity bounds of fundamental problems, graph problems and combinatorial problems – Balanced binary search trees – Dynamic programming – Divide-and-conquer – Search – Branch-and-bound – Fundamentals of parallel algorithms – Applications (approximate string matching, data compression, computational geometry) – NP-completeness – NP-hardness.

CMP 303A Operating Systems (3+1+1)
Types of operating systems - functions of operating systems - process states - memory management - virtual memory - processor management - process scheduling - case study (Unix - Lunix).

CMP ** Elective Course -1 (3+1+1)
Elective course to be selected from the list of elective courses.

MTH 325 Numerical Analysis-3 (3+1)
Error analysis - applied numerical methods in matrix algebra and linear equations, roots of polynomials, curve fitting and extrapolation- numerical integration – Numerical solutions of differential and partial differential equations.

ELC 325-2 Communications Engineering (3+1)
Introduction to communication systems – Amplitude modulation – Signal extraction by demodulation – Interference in amplitude modulation – Receiver equipment – Stereo - representation of transmission media – analog, pulse and phase modulation - digital communication systems - coding and transmission of data.

GEN 325 Sales, Marketing and Communication Techniques (2+0)**
Introduction to Sales and Marketing techniques – Market Analysis and Forecasting – Sales Skills – Distribution – Advertising and Information – Writing Request for Proposals and Specifications – Physiological factors for client understanding – Communication Skills and Client Trust.

Computer Engineering

Third Year – Second Term

CMP 301B Computer Architecture (3+1+1)
(Parallel & Distrib. Syst) Distributed Systems- parallel processors architecture - scalable computer platforms - vector processors - vectorizing compilers - systolic arrays - loosely and tightly coupled processors - symmetric and CC-NUMA multiprocessors- data flow machines - interconnecting networks - clustering - parallel programming - performance evaluation - case studies.

CMP 303B Operating Systems (3+1+1)
multiprocessor systems - device management - deadlock prevention - file systems - system resilience - network and distributed operating systems – real time systems-programming project.

CMP 305 IC Integrated Circuits Design and VLSI System Design (3+1)
Digital system design- (VLSI- FPGA-) VHDL language- simulation software package- digital circuits- memory circuits- data acquisition systems- D/A and A/D conversion circuits-manufacturing digital circuits- fault detection and recovery- project.

CMP 306 Advanced Programming Techniques (3+1+1)
Programming Techniques in Network and various Media Types – New Programming Techniques (e.g. Internet) – Languages for Internetworking programming and Data Transfer.

ELC 325-1 Control Engineering (3+1)
Linear control systems - transfer functions - signal flow graphs - feedback control systems - stability criteria: Routh/Hurwitz table, Bode's plot, Nyquist contour, root locus - digital computer control - optimal control - applications.

ELC 325-3 Digital Communication (3+1)
Introduction to communication systems - representation of transmission media – optic fiber and satellite communication- multi-connectivity-telephone aanalysis- vector design layouts- switching systems and their function- deterioration and attenuation- telephone exchanges- transmission and encoding systems- error detection and recovery.

GEN 325 Sales, Marketing and Communication Techniques (2+0)**
Marketing Techniques – Rules for Writing Offers – Pricing of Products – Salesman Duties in Technology – Techniques and methods of Product Offers – Management of Sales and Marketing projects

Computer Engineering

Third Year - Elective Courses

CMP 341 Information technology and Advanced Languages
Principles of IT- information system design- software design- Paradigms of programming languages – Sample languages (Imperative languages - Functional languages (ML) – List processing (Lisp) – Logic programming (Prolog) – Object-oriented programming (Java)) and applications- project.

CMP 342 Computer Systems Programming (3+1)
Functions of system software components - design of hardware drivers, loaders and linkers, compilers, assemblers, interpreters and utilities - case study of real system programming.

CMP 343 Computation and Programming Theory (3+1)
Introduction - basic automata concepts - acceptors - regular expressions - sequential machines - Turing machine - universal machine - computable and non-computable functions - recursive functions - Markov algorithms - Godel numbering - computer programming languages – program verification and proof of program correctness.

CMP 361 Selected Topics in Information Engineering and Technology
Selected topics related to the state of the art in information technology.

CMP 362 Selected Topics in Computer Engineering
Selected topics related to the state of the art in computer engineering.

CMP 363 Elective Course from Electronics and Communication Engineering
Elective course to be selected from the list of courses from the Electronics and Communication Engineering Department.

CMP 364 Elective Course from Biomedical and Systems Engineering
Elective course to be selected from the list of courses from the Biomedical and Systems Engineering Department.

Computer Engineering

Fourth Year – First Term

CMP 401 Advanced Database Systems (3+1)
Review of Database Query and Data Manipulation Languages - distributed databases - multicopy databases - database administration: security, concurrence control and performance monitoring –temporal databases- objected oriented databases—decision support systems- data warehousing- data mining- data compression - sizing and timing – practical design and applications.

CMP 402A Machine Intelligence (3+1)
Introduction to artificial intelligence(concepts and definitions)- knowledge acquisition and representation - production systems - semantic networks - frames - knowledge issues – problem representastion and solution- inference - uncertainty – fuzziness- expert systems and knowledge engineering.

CMP 404* Computer System Security and Case Study Consultation (1+1)
(Consultation) System automation - evaluation sheets- hardware comparison- licenses- writing tenders and offers- evaluating computer systems and networks- tender laws- software ethics and vendor obligations.

CMP 405A Computer Networks (3+1)
Seven layer communication model - network architecture and protocols - network planning and design - routing techniques and algorithms.

CMP407 Modeling and Simulation Techniques (3+1)
Introduction to modeling and simulation- application of modeling and simulation in different fields- examples of modeling and simulation of computer units(memory- discs- processors- OS-) model development-simulation techniques- simulatig operational loads- analysis of results of modeling and simulating computers- project.

CMP * Elective Course-2 (3+1)**
Elective course to be selected from the list of elective courses.

CMP * Elective Course-3 (3+1)**
Elective course to be selected from the list of elective courses.

CMP 480 Project (2+1+1)
All students undertake a major project as part of the program. The aim of the project is to provide the students - in groups - with an opportunity to implement the appropriate concepts and techniques to a particular design. A dissertation of the detailed project is submitted on basis of which the student is examined orally.

Computer Engineering

Fourth Year – Second Term

CMP 402B Machine Intelligence (3+1)
Introduction to expert systems and knowledge engineering.- knowledge representation – abduction- expert system building- knowledge engineering- Machine Learning - application fields that need intelligence (learning-planning-robotics- decision support systems- intelligent agents – Semantic web)

CMP 403 Languages and Compilers (3+1)
Introduction to the theory of languages - evolution of computer languages and translators - formal specification of languages - context dependent and context free languages - logical structure of a compiler - lexical, syntax and semantic analysis - code generation and optimization - storage and register allocation - runtime considerations.

CMP 404* Computer System Security and Case Study Consultation (1+1)
(Computer Security) digital signatures Introduction to cryptography - ciphering algorithms - principles of data security - hardware and software security techniques - software protection - computer viruses - databases and networks security.

CMP 405B Computer Networks (3+1)
network management - examples of LAN's and WAN's-ATM- high speed networking.

CMP 406 Mobile and Wireless Networks (3+1)
Wireless data communication – Wireless Computer Networks – Ad Hoc Networks – IP and ATM wireless networks – Mobile Networks – GSM – GPRS = CDMS – 3 generation Mobile Networks - project implementation.

CMP ** Elective Course-4 (3+1)
Elective course to be selected from the list of elective courses.

CMP ** Elective Course-5 (3+1)
Elective course to be selected from the list of elective courses.

CMP 480 Project (2+1+1)
All students undertake a major project as part of the program. The aim of the project is to provide the students - in groups - with an opportunity to implement the appropriate concepts and techniques to a particular design. A dissertation of the detailed project is submitted on the basis of which the student is examined orally.

Fourth Year

Elective Courses

CMP 441 Computer Peripherals (3+1)
Types of computer peripherals - connection of peripherals - use of channels - programming of channels - operation of channels in concurrence with CPU - synchronization and handshaking.

CMP 442 Fault Tolerant Computing (3+1)
Introduction to fault tolerant systems - faults and their manifestations - error detection - protective redundancy - fault tolerant software - measures of fault tolerance - case studies.

CMP 443 Computer Manufacturing Technology (3+1)
Special topics in the technology of computer manufacturing specially materials, devices and computer equipment - quality control and reliability measures.

CMP 444 Computer Interfacing (3+1)
Basic interfacing hardware - buses and memory/peripheral connections - interrupts - synchronous and asynchronous connections - serial and parallel interfaces - analog interfaces - special interfaces.

CMP 445 Embedded Systems (3+1)
embedded system design process- (development, simulation and testing)-embedded computing platform- embedded system interfacing- use of embedded systems in applications in different fields (communication, networking and industry).

CMP 446 Image Processing and Computer Vision (3+1)
Image representation - methods of image processing - enhancement - data compression - reconstruction from projection - features extraction - image analysis - pattern recognition - computer vision.

CMP 447 Optical Networks (3+1)
Introduction to Optical Networks- Propagation of signals in Optical Fiber- components (couplers- multiplexers and filters-optical amplifiers- transmitters- detectors- switches- wavelength converters)- modulation and demodulation- transmission system engineering- client layers of optical layer- WDM network elements and design- control and management- photonic packet switching- design example.

CMP 448 Parallel and High Performance Computing (3+1)
High perfotrmance algorithms- coupled processors- parallel programming- Storage devices and Interconnects- access patterns and optimizations- low-level I/O Interfaces- special purpose I/O techniques- data management and analysis- numerical examples.

CMP 449 Real Time Computers (3+1)

Introduction to real time computers - real time operation requirements - real time operating systems - data capture and processing in real time - examples of real time applications.

CMP 450 Artificial Neural Networks (3+1)
Introduction to basic concepts for NN-single and multilayer perceptrons- learning algorithms- feedforward and feedback architectures - recurrent networks- associative memory netwroks- design and hardware implementation of NN- typical examples(e.g. recognition- learning- prediction and expert systems).

CMP 461 Selected Topics in Information and Technology (3+1)
Advanced topics related to the state of the art in information technology.

CMP 462 Selected Topics in Computer Engineering (3+1)
Advanced topics related to the state of the art in computer engineering.

CMP 463 Elective Course from Electronics and Communication Eng (3+1)
Elective course to be selected from the list of courses from the Electronics and Communication Engineering Department.

CMP 464 Elective Course from Biomedical and Systems Engineering (3+1)
Elective course to be selected from the list of courses from the Biomedical and Systems Engineering Department.