



---

## ***Computer Science Dept. Courses Description***

**1901101 Discrete Mathematics:** (Prerequisite none)

*Logical and Symbolic statements: true values of a statement; Connection tools, Truth table, Equivalent; Counting methods; Methods of proof: induction and recursion; Sets and operations; Languages; Relations: directed graph, characteristics of relations; Functions: characteristics, domain and range; Matrices: algebra of matrices, simple operations, determinants, Cramer's rule.*

**1901102 Computer Skills-2 (C++):** (Prerequisite 1902100)

*Fundamental concepts of programming using C++; Basic structures of programming tools: variable names; Data types; Control structures; Arrays; Functions; Pointers; Introduction to classes and objects; Inheritance; Applications using C++. Weekly practice in the lab.*

**1901215 Advanced Programming:** (Prerequisite 1901102)

*A deeper look to C++ programming. Advanced topics include pointers and strings memory management (dynamic memory allocation), object oriented design, classes and data abstraction, operator overloading, inheritance, virtual functions and polymorphism, and templates. Other topics are, exception handling, file processing, standard templates library, detailed bits and strings operations, and the pre-processor, I/O Streams.*

**1901216 Programming In Special Languages:** (Prerequisite 1901215)

*Object-oriented Programming (OOP) Environment; Input/Output; Loops; Decision; Function; Array and Strings; Data structures; Encapsulation; Advanced variables; Object Oriented Programming; Useful OO features; Class and object; Polymorphism; Exceptions handing; Applet; I/O streams; Threads, Files; Weekly exercises in lab.*



**1901231 Data Structures:**

**(Prerequisite 1901102)**

*Data type and structures; Abstract data types and encapsulation; Stacks; Queues; Recursion; Linked Lists; Binary trees; General trees; File organization: sequential and indexed files; Graphs: representation, traversing, shortest path; Sorting: exchange, insertion, quick sort, heap and others; Searching. Weekly practice in the lab.*

**1901241 Theory of Computation:  
1901101)**

**(Prerequisite**

Sets; Relations; Closure and Languages; Finite automata: deterministic and nondeterministic; Closure and pumping lemma; Regular languages and expressions; Context-free grammar: regular languages and context-free languages, pushdown automata, closure, determinism and parsing, LL(1) grammar; Turing machines, combining Turing machines and machine schemas, examples; Introduction to P and NP classes.

**1901341 Theory of Algorithms:**

**(Prerequisite 1901231)**

*Definition of an algorithm, algorithm design and techniques, algorithm analysis. Concept of basic operation, concept of worst, best, and average case analysis, complexity analysis: big O, Omega and theta notations. Recurrence equations and recursive algorithms. Concept of algorithm correctness. Basic searching and sorting algorithms, hashing. Concepts of NP-completeness, Classical NP-complete problems.*

**1901351 Numerical Analysis:**

**(Prerequisite: 1901102 + 0301102)**

An introductory course to numerical analysis, introduces students to: computer arithmetic representation, error analysis; finding roots of a function, iterative methods; solution of linear systems of equations; solution of nonlinear systems; interpolation techniques; numerical integration, curve fitting, and differentiation; and optimization techniques. Weekly practice in the lab.



**1901352 Modelling and Simulation:**

**(Prerequisite: 1901231)**

Fundamentals concepts of computer simulation; models for computer simulation; random numbers: Pseudorandom number generation and testing, Monte Carlo methods. Introduction to distribution functions. Simulation modeling: discrete-event simulation, continuous simulation; verification and validation of simulation models: input analysis, output analysis. Queuing theory models; design codes, test and debug simulation programs. Sample applications. Weekly practice in the lab.

**1901356 Pattern Recognition:**

**(Prerequisite 1901231)**

*Introduction to the foundation of pattern recognition algorithms. Covering theoretical foundations of classification and pattern recognition and discuss applications in character, speech and face recognition, and some applications in automation and robotics. A list topics include: Bayesian decision theory, discriminate functions for normal class distribution, pattern estimation and supervised learning, nonparametric techniques linear discriminant functions and learning, unsupervised learning and clustering, neural networks including multilayer perceptrons, stochastic algorithms (such as genetic algorithms), and cellular automata. Weekly practice in the lab.*

**1901359 Computer Graphics:**

**(Prerequisite 1901231)**

introduction to graphics systems: screens, input / output units, application coordinate systems, output primitives: points, lines, polygons, circles, ellipses, area filling, attributes of output primitives, colors, patterns, aliases, transformation: translation, scaling, rotation, reflection, clipping: windows and view ports, line clipping, area clipping, text clipping, segments: structures, creating, updating, deleting,. Interactive graphics systems: windows, icons, menus, virtual reality, 3D graphics: representation, transformation, computer animation, applications. Weekly practice in the lab.



---

**1901361 Computer Networks-1:**

**(Prerequisite 1901231)**

This course explores key concepts and essential technologies of computer networks and broad range of topics in networking, including: General overview: Networks applications, Network classifications and topologies, Network layers, Channel performance measures, transmission media, Communication Network Protocols and architecture; Data link layer: framing, error detection and correction, CSMA/CD, LAN IEEE standards; Network layer: IP service model, IP Addressing, subnetting, Host configuration DHCP, ARP Protocol, ICMP protocol; Transport layer: UDP protocol, TCP protocol, TCP reliable transfer and sliding window, TCP flow and congestion control; Application layer: DNS protocol, NAT protocol, HTTP protocol, persistent and non-persistent HTTP connection. Weekly practice in the lab.

**1901375 Systems Programming:**

**(Prerequisite 0907335)**

Introduction; assemblers: basic function. Machine-dependent and machine-independent features, design options; loaders and linkers: basic functions, types of loaders, machine-dependent and machine-independent features, design options, Marko processor : basic functions, features, design options, basics of administration of operating systems and data design options, basics of administration of operating systems and databases. Weekly practice in the lab.

**1901441 Graph Theory:**

**(Prerequisite 1901341)**

*Concepts of a graph. Undirected graphs vs. directed graphs. Computer representation of graphs; Euler graph and De Bruijn sequences. Shortest path algorithm. Trees; minimum Spanning trees algorithms: Kruscal and Prime algorithms. Depth first search for directed and undirected graphs. Applications of a depth first search: nonseparable components and strongly connected graphs. Maximum flow in a network: Ford-Fulkerson Algorithm. NP-complete graph problems: graph coloring, maximum independent set, minimum vertex cover, traveling salesman problem.*



**1901442 Network Programming:** (Prerequisite 1901361+1901216)

This course introduces and explains the basic concepts of networking and discuss the practical aspects of network programming, including: General overview of networking theory; Internet Addressing using a programming language such as java or C#; Data Streams, Serialization, Exception handling; User Datagram protocol: DatagramPacket, DatagramSocket , Sending and receiving UDP packets, Building an UDP Client/Server; Transmission Control Protocol: TCP sockets, ServerSockets; Creating a TCP Client/Server ;Multi-Threaded Applications, Synchronization; Implementing Application protocols. Weekly practice in the lab.

**1901446 Computer Systems Performance:** (Prerequisite 1901231)

*Concepts of performance. Concepts of performance Metric and Benchmark programs. Characteristics of good performance metric, summarizing data: averaging performance and variability. Quantifying errors in experiments. Comparing alternatives. Measurement tools and techniques. Introduction to simulation. Analytical models: introduction to queuing theory.*

**1901459 Certified Software:** (Department's approval)

This course is designed to help students to gain rapid software application skills such as: Solaris System Software, Sun, Unix, Cisco, MSE and others. in this course the student will be able to develop and design a web applications and services, mobile applications and others using certified software's from Microsoft company or certified software's to achieve the final goal of the course which is getting an intentional certificate from international companies. Weekly practice in the lab.



---

**1901461 Computer Networks-2:**

**(Prerequisite 1901231)**

This course explains and discusses advanced concepts of computer networks, including: Wireless networks, IEEE 802.11, Mobile IP; VLANs, port-based VLAN, MAC-address-based VLAN, layer three information based VLAN; Routing protocol, RIP protocol, OSPF protocol; Advanced TCP, silly window syndrome, Adaptive timeout; Network security, confidentiality, authentication, access control, integrity; multimedia networking, SIP protocol, RTP protocol, RTCP protocol; Network management, SNMP protocol, SIM protocol, MIB protocol; Asynchronous Transfer Mode (ATM)

**1901462 Computer Security:**

**(Prerequisite 1901361)**

This course explains Security protocols, authentication protocols, data integrity, digital signatures, intrusion detection, key management and distribution, viruses and other malicious codes, information flow, mobile code and agent security. Cryptographic algorithms: Secret Key Encryption (DES), Public Key Encryption (RSA), Message Digest Algorithm (MD5); Attacks and countermeasures: Packet sniffing, Spoofing and denial of service; Application layer security: HTTPS, secure email; Transport layer security: TLS, SSL; Network layer security: IP security (IPSec), AH protocol, ESP protocol; access control and Firewalls: Filter-based firewalls, Proxy-based firewalls; wireless networks security, security in IEEE 802.11, WEP protocol, EAP protocol.

**1901464 Parallel Processing:**

**(Prerequisite 1901473)**

Introduction to high-performance computing. Processor architectures. Memory systems. Data and parallel Decompositions, parallel languages and architectures. Multiprocessors, multi-computers; routing topologies; shared memory and passage passing parallel processing. PRAM model; exclusive versus concurrent reads and writes; sample applications.



---

**1901466 Distributed Systems:**

(Prerequisite 1901361)

*Concepts of distributed system: advantages, hardware, software; design issues, communication in distributed systems: layered protocols, asynchronous transfer mod networks, client-server model, remote procedure call, RMI, group communication; synchronous: clock, mutual exclusion, election algorithms, atomic transactions, deadlocks; processes and processors: threads, system models, allocation, scheduling; fault tolerance; real time; distributed shared memory: consistency, page, variables, object-oriented based; case studies.*

**1901467 Multimedia Networking:**

(Prerequisite 1901361)

This course explains and discusses key concepts of Multimedia networking, including: Introduction: Digital Audio, Graphics and Video, voice over IP (VOIP); Characteristics of multimedia; Multimedia Perceptual Quality: Frame rate, Delay, Jitter, Loss; Compression standards; Real Time Multimedia Applications, Desk Top Conferencing, Video Conferencing, Video Mail, Distance Learning, Non-Real Time Multimedia Applications: World Wide Web, Multimedia Mail; Design of Networked Multimedia Applications; Transport layer multimedia: RTP protocol, RTCP protocol, SIP protocol; Quality of Service: Network layer support for multimedia, IntServ, DiffServ; Multimedia Multicasting; Multimedia programming, Future trends.





---

**1901469 Mobile Wireless Networks:**

(Prerequisite 1901361)

Wireless networks and their basic operation, different types of wireless technologies and systems, the basics of how they operate, different types of wireless voice, data and broadcast services, key commercial systems. Wi-Fi wireless networks, Bluetooth wireless technology, GSM cellular networks, cellular internet access via Wireless access protocol (WAP), GPRS and UMTS networks, wireless networks operating system; Symbian OS, Palm OS. Mobile IP and Mobile routing, Transport layer over wireless networks, Mobile wireless network applications.

**1901471 Design and Implementation of Programming Languages:**

(Prerequisite 1901241)

*Programming languages: design and basic approaches to language implementation; Informal semantics and implementation of various constructs from typical higher level languages; Languages (data, operations, control structures, storage management and operating environment); Case studies covering different paradigms; Imperative, Logic, Functional and object-oriented programming languages. Weekly practice in the lab.*

**1901472 Compiler Construction:**

(Prerequisite 1901471)

*Introduction to Compiling; Lexical analysis: specification and recognition of tokens, finite automata; Syntax analysis: grammars, top-down and bottom-up parsing; Syntax-directed translation; Semantic routines; Storage-allocation strategies; Code generation; Error recovery. Weekly practice in the lab.*

**1901473 Operating Systems:**

(Prerequisite 0907335 or 0907231)

Definition and role of the operating systems; history of operating systems and development; functionality and structuring methods of a typical operating system. Concepts of a process vs. the concept of a thread; scheduling and dispatching and context switching; concurrent execution: the "mutual exclusion" problem and some solutions. Deadlocks: causes, conditions, methods for resolution. Memory management; virtual memory management. I/O management; files: data, metadata, operations, buffering, sequential, nonsequential.





---

**1901480 Embedded Systems:**

**(Prerequisite 1901473)**

Embedded system concepts, hardware architecture, design and debugging, embedded processor selection, software development methodologies, real-time systems, synchronization mechanisms, interrupt latency, application programming interface, interrupt service routine, application design considerations.

**1901494 Special Topics:**

**(Department Approval)**

*Selected Topics in advance areas of Computer Science; Report and Documentation required. Weekly practice in the lab.*

**1901495 Project:**

**(Department Approval)**

Project includes theoretical and practical aspects in Computer Science, related to the current problems and applications in IT, Research oriented, technical report, and presentation. Weekly practice in the lab.

**1901498 Training:**

**(Department Approval)**

The student must be trained in an institution, for at least 6 weeks. The student must provide a report from the institution that shows the efficiency of this training, According to the regulations of the Dean's Council of the Faculty's Departments, or get a certificate in one of the information technology fields from a recognized institute.

**1902201 Interpersonal Communication:**

**(Prerequisite: 1903101)**

Technical definition, development documentation, system definition and specification –proposals, program reports, feasibility reports, instructions and manuals, project reports, research reports, resumes and interviews, team meeting reports, presentation and briefings, abstracts and summaries . Weekly practice in the lab.



---

**1902321 Database Systems:**

**(Prerequisite 1901231)**

Data Base (DB) Environment; DBMS architecture; Data modeling: Conceptual model, Entity relationship model (ERM), Extended ERM, Object Modeling Technique (OMT); Relational DBs; Data Base design; Data Base language: Structured Query Language (SQL); Views; Data Dictionary; Normalization process: 1NF, 2NF, 3NF; DB Integrity; DB Security; Modern DBMSs: Object-Oriented DBMSs; Physical Data Base design; Centralized and distributed Database systems; Case study. Weekly practice in the lab.

**1902341 Artificial Intelligence:**

**(Prerequisite 1901231)**

Introduction to AI and application; Exhaustive Search methods; Heuristic search Methods; First Order Logic for knowledge representation; Programming in PROLOG; Production rule systems; Principles of expert systems; Expert systems Programming in PROLOG; Knowledge Acquisition. Weekly practice in the lab.

**1902455 Image Processing:**

**(Prerequisite 1902359)**

Introduction, Data structure for image analysis; Shape representation; Image preprocessing; Image formats; Recognition; Feature extraction; Processing primitives; Modeling (e.g. quad applications); Local and global operations; Clustering: hierarchical and non-hierarchical methods, clustering using neural networks and genetic algorithms; Classifications; Nearest neighbors; Neural nets; Image enhancement; Segmentation application and measurement; Image storage and retrieval; Applications. Weekly practice in the lab.

**1902471 Software Engineering:**

**(Prerequisite 1902321)**

Software engineering processing methods; Software life cycle; Computer-based system engineering; Software project Management; Requirements and Specification: Requirement engineering, requirement analysis, models, prototyping, formal and algebraic specification; Software design: Architectural design, object-oriented, function-oriented, real-time and user interface design; Reliability; Maintenance; Portability; Documentation; Re-engineering and reverse-engineering; Case study. Weekly practice in the lab.



---

**1902475 System Analysis:**

(Prerequisite 1902321)

Introduction to systems development; Development life cycle; System Development feasibility; Development of fact finding methods; Context diagram; Data flow diagram; Decision tables and trees; Data dictionary; Installation; Training; Development Tools: Documentation, Maintenance, Conceptual design, DB design, Reverse engineering, Graphical user interface, Systems life cycle, System conversion, System charts and flow of control; Case study. Weekly practice in the lab.

**1903101 Fundamentals of Information Technology:**

(Prerequisite none)

Information Technology components, computer hardware: memory, CPU, machine cycle. numbering system: decimal, binary, octal, hexadecimal, operations, data representation, coding. communications and networks multimedia, E-business, system software and applications, information system: analysis and development, problem solving : algorithm, flowchart, pseudo code. Weekly practice in the lab.

**1903121 Web Application Development –1:**

(Prerequisite 1903101)

The course introduces students to the tools and techniques used for building Web-based applications. Students will gain an understanding of the fundamental workings of the Web. Students will be taught how to develop web applications using client-side tools such as HTML and Java Script and server-side tools such as ASP.

**1903232 Management Information Systems (MIS):**

(Prerequisite 1903101)

Fundamentals of Information Systems; Types and levels of MIS; IT in Business; Business Application of Information Technology; Managing Information Technology: global management, planning and information change; Security and protection issues. Weekly practice in the lab.

**1903353 Web Application Development-2:**

(Prerequisite 1903121)

Application of server-side scripting programming, Implementation of Web servers, SQL & MySQL, Database Interfaces (DBIs), Advanced ActiveX Data Objects (ADO.NET), Active Server Pages.NET (ASP.NET), Implementing Active Server Pages.NET using XML (Extensible Markup language), programming using Perl, Common Gateway Interface (CGI), PHP, Python, Java Servlets and JSP. Weekly practice in lab.