اسم التخصص	هندسة النظم الذكية
الدرجة العلمية للتخصص (بكالوريوس، دبلوم)	البكالوريوس في هندسة الحاسوب
القسم	الهندسة
الكلية	الهندسة وتكنولوجيا المعلومات
عميد الكلية (الاسم، رقم الهاتف، البريد الإلكتروني)	د. لبيب عرفة الهاتف: 0097022751566 فرعي: 123 البريد الالكتروني: l.arafeh@paluniv.edu.ps

1. نبذة عن التخصص ورسالته

نبذة:

يواكب التخصص التطورات السريعة في المجال، عبر تزويد الطلبة بالمعرفة والمهارات والخبرة اللازمة في كافة مجالات هندسة الحاسوب، والتي تشمل تصميم دوائر الحاسب وتنفيذها على مستوى اللوحات المطبوعة و الدوائر الإلكترونية المتكاملة، تصميم وتطوير وهندسة البرمجيات، كما تغطي الخطة الدراسية مواضيع أخرى كأنظمة التحكم والاتصالات وأنظمة التشغيل وشبكات الحاسب وأمن المعلومات وتطبيقات الهاتف الذكي، وعبر منظومة من مختبرات الدوائر الكهربائية، ومختبرات البرمجة، ومختبرات الشبكات، والاتصالات، ومختبرات عمارة وهيكلية الحاسب ومختبرات تصميم واختبار دوائر أشباه الموصلات فائقة التكامل. حيث سيتم تزويد الطالب بمهارات برمجية واسعة ويستطيع العمل على العديد من الأنظمة والمنصات الحاسوبية، بما يشمل أي نظام برمجي أو مادي.

يمنح البرنامج درجة البكالوريوس في هندسة الحاسوب بخطة دراسية مكونة من 162 ساعة معتمدة موزعة بمجملها على مجالات نظرية وعملية.

2. الساعات المطلوبة للحصول على درجة البكالوريوس- في هذا التخصص

المجموع	حرة	التخصص		الكلية		الجامعة	
		اختياري	إجباري	اختياري	إجباري	اختياري	إجباري
162	0	9	94	3	29	3	24

3. شروط القبول والاستمرار في التخصص

يقبل الطلبة الحاصلون على معدل 80% فأعلى في شهادة الدراسة الثانوية العامة (التوجيهي) من الفرع العلمي أو الصناعي أو ما يعادلها من الشهادات العالمية مثل البكالوريا الفرنسية والبكالوريا الدولية والشهادة العامة للتعليم (GCE) البريطانية

4. مجالات العمل

اسماء الأماكن المحتملة للتوظيف	المسميات الوظيفية المحتملة

1. مهندس حاسوب	1- شركات تطوير البرمجيات
2. مهندس شبكات	2- شركات تصميم وبناء الدوائر الكاملة
3. مهندس بيانات	3- تصميم وتركيب الشبكات
4. محلل في ذكاء الأعمال	4- شركات الإتصالات: العمل لدى الشركات المعنية بتقديم خدمات الإتصالات و تزويد الإنترنت
5. مهندس ومحلل بيانات ضخمة	5- شركات صناعية: العمل لدى الشركات و المصانع المعنية بإنتاج و تصنيع و تجارة الأجهزة الإلكترونية و الكهربائية مثل الشرائح و رقائق الحاسوب و غيرها من المنتجات الإلكترونية
6. مصصم ومطور لتطبيقات الويب والموبايل والأنظمة الذكية.	6- الحماية الرقمية: العمل في مجالات الحماية الرقمية لدى الشركات التي تعتمد على أنظمة الحاسب الآلي أو تكنولوجيا المعلومات في إدارة مهامها
7. مساعد بحث وتدريس.	7- المصانع: العمل لدى المصانع التي تستخدم النظم الحاسوبية في إداره مهامها
8. مصمم للأنظمة والبرمجيات الذكية والذكاء الاصطناعي.	8- المدارس: العمل لدى المدارس في مجالات الإشراف على مختبرات الحاسوب و تدريس مواد الحاسوب و الرياضيات
9. مدير لشركة ناشئة في أحد مجالات علوم البيانات والأنظمة الذكية.	9- شركات البرمجة: العمل في مجال تصميم و كتابة البرمجيات لكافة القطاعات مثل شركات الدواء و المستشفيات و البنوك
	10- شركات تكنولوجيا المعلومات: العمل في الشركات التي تختص في كافة مجالات تكنولوجيا المعلومات مثل تطوير المواقع الإلكترونية و التطبيقات
	11- التزويد و المبيعات: العمل في مجالات المبيعات و التسويق و المشتريات و التزويد في الشركات و الوكالات المعنية بالمنتجات الإلكترونية و الحواسيب و البرمجيات

5. مكونات الخطة الدراسية:

خطة البرنامج:

1) قائمة بأسماء وأرقام المساقات المطروحة في البرنامج:

تتوزع مساقات برنامج هندسة الحاسب إلى متطلبات الجامعة والكلية والبرنامج (التخصص) كما في الجدول التالي:

Requirements	Mandatory		Electives		Sub-Total		Percentage %		Total			
	Theoretical	Practical	Theoretical	Practical	Theoretical	Practical	Theoretical	Practical	Theoretical	%	Practical	%

University	22	2	3	0	25	2	15.6%	1.3%	25	15.6	2	1.3
Faculty	25	7	2	1	24	8	15%	5%	49	30.6	10	7.5
Program	66	28	9	0	75	28	44.4%	18.8%	120	75%	40	25%
Total									162		100%	

وبالتالي، فإن البرنامج المطروح يتكون من 27 ساعة معتمدة (16.6%) كمتطلبات جامعة، و 35 ساعة معتمدة (21%) كمتطلبات كلية، و 101 ساعة معتمدة (62.1%) كمتطلبات برنامج، وتشمل ما قيمته 40 ساعة معتمدة عملية (25%).

2) <u>توزيع المساقات</u>: فيما يأتي، أسماء وأرقام المساقات موزعة حسب المتطلبات:

أولاً: متطلبات الجامعة: يجب على الطالب أن ينهي 27 ساعة معتمدة (24 ساعة اجبارية و 3 ساعات اختيارية) كما يلي:

1. متطلبات الجامعة الإجبارية: يظهر الجدول التالي مساقات متطلبات الجامعة الاجبارية

المتطلب السابق	عدد الساعات المعتمدة			أسم المساق	رقم المساق
	الكلي	عملي	نظري		
-	0		0	استدراكي لغة عربية*	110100
-	3		3	مهارات في اللغة العربية1	110101
مهارات في اللغة العربية(110101) 1	3		3	مهارات التواصل باللغة العربية	110102
-	1	1		التربية الرياضية	112101
-	3		3	القضية الفلسطينية	113200
-	0		0	استدراكي لغة انجليزية**	120100
-	3		3	مهارات في اللغة الانجليزية1	120101
مهارات في اللغة الانجليزية(120101) 1	3		3	مهارات في اللغة الانجليزية2	120102
-	1		1	خدمة المجتمع	130300
-	3		3	الثقافة الاسلامية	151102
-	3		3	اساسيات الحاسوب والبرمجة	410131
-	1		1	مهارات التفكير الناقد	410211
24ساعة معتمدة				المجموع	

*يعطى للطلبة الذين لم يجتازوا امتحان المستوى في اللغة العربية، ولا يحتسب من المعدل العام.

**يعطى للطلبة الذين لم يجتازوا امتحان المستوى في اللغة الإنجليزية، ولا يحتسب من المعدل العام.

2. المتطلبات الاختيارية: يستطيع الطالب اختيار (3) ساعات معتمدة من المساقات المدرجة في الجدول التالي:

المتطلب السابق	عدد الساعات المعتمدة			أسم المساق	رقم المساق
	الكلي	عملي	نظري		
-	3		3	الوطن العربي والتحديات المعاصرة	142211
-	3		3	الديمقراطية وحقوق الإنسان والقانون الدولي الإنساني	210270
-	3		3	القانون في حياتنا	210260
-	3		3	مبادئ الإدارة	310100
-	3		3	جغرافية فلسطين	141210
-	3		3	علم التغذية	540102
-	3		3	الإسعافات الأولية	510111

-	3		3	مقدمة في الرعاية الصحية	510121
-	3		3	السيرة النبوية دراسة تحليلية	651101
-	3		3	نظام الأسرة في الإسلام	651202
-	3		3	علم المكتبات	110104
-	3		3	اللغة العبرية	120208
-	3		3	اللغة الفرنسية	120104
-	3		3	اللغة الإيطالية	120105
-	3		3	اللغة الإسبانية	120106
3ساعات معتمدة				المجموع	

ثانياً: متطلبات الكلية: تتكون متطلبات الكلية من 32 ساعة معتمدة: 29 اجبارية و3 اختيارية، موضحة في الجدول التالي:

Course Number	Mandatory Credit Hours		Electives		Total		Percentage %	
	Course Name	Theoretic	Practical	Theoretic	Practical	Theoretic	Practical	Theoretic	Practical
450101	Calculus1	3	0			3			
450102	Calculus2	3	0			6			
450111	General Physics	3				9			
450121	General Physics Lab.		1			9	1		
450201	Linear Algebra and Differential Equations	2	1			11	2		
470122	Computer Programming	2	1			13	3	15%	5%
470221	Engineering Entrepreneurship	3				16			
450201	Statistics & Probability	2	1			18	4		
450162	Engineering Drawings		1				5		
470211	Design Thinking	2	1			20	6		
450222	Engineering Project Management	2	1			22	7		
450202	Calculus 3	3	0			25	7		
450171	General Chemistry and Lab			2	1				
450172	Research Methods			2	1	2	1	1.3%	0.63%
450173	Numerical Analysis			2	1				
450174	Engineering Business Plan Development			2	1				

ثالثاً: متطلبات التخصص: تتكون متطلبات التخصص من 103 ساعة معتمدة: 94 اجبارية و 9 اختيارية.

1. المتطلبات الاجبارية: تشمل المتطلبات الاجبارية لبرنامج هندسة الحاسب (94) ساعة معتمدة المساقات المدرجة في الجدول التالي:
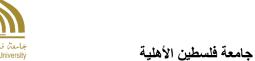
Course Number	Mandatory		
	Course Name	Theoretical	Practical

470112	Circuits and Electronics 1	3	0
470231	Circuits and Electronics 2	3	1
470201	Object Oriented Programming	3	1
470231	Signals and Control Systems	3	1
470202	Digital Logic Systems (plus HDL)	3	1
47311	Advanced Programming	3	1
470212	Data Structures and Algorithms	3	1
470321	Operating Systems	3	0
470301	Microcontrollers	3	1
470309	Instrumentation and Sensors Interfacing	3	1
470302	Web and Mobile Development 1	3	1
470331	Introduction to Artificial Intelligence and Machine learning	3	1
470341	Introduction to Database Technology	3	1
470311	Computer Graphics	3	
470441	Software Engineering	3	
470401	Web and Mobile Development 2	3	1
470332	Discrete Mathematics	3	0
470432	Fundamentals of Cyber Security	3	1
470421	Computer Organization and Architecture	3	1
470422	Programming Embedded Systems	3	1
470411	Computer Networks	3	1
470412	Introduction to Communications for Smart Devices	3	0
470590	Software Project		2
470200	Field Training 1		1
470300	Field Training 2		2
470400	Field Training 3		3
470591	Introduction to Graduation Project		1
470592	Graduation Project		3
Totals		66	28

2. متطلبات التخصص الاختيارية: يختار الطالب 9 ساعات معتمدة من المواد الآتية

Course Number	Electives		
	Course Name	Theoretical	Practical
470601	Big Data Analytics	3	
470602	Special Topics in Smart Systems Engineering	3	
470603	Computer Applications in Smart Systems	3	
470604	Special Topics	3	
470605	Internet of Things	3	
470606	Advanced Databases	3	
470607	Network Protocols for Smart Devices	3	
470608	VLSI	3	
470501	Applications and Operating System Security	3	

470402	Artificial Intelligence for Cybersecurity	2	1
470431	Introduction to Blockchain Technology	2	1
470502	Legal & Ethical Issues in Information Security	2	1
470322	Introduction to Cloud Systems and security	3	
Totals		9	

Courses Description:

Digital Logic Systems (plus HDL)	This course will cover Number systems and conversion, Boolean algebra, the assertion level concept; minterm and maxterm expansions, Karnaugh maps, combinatorial logic circuit design, NAND and NOR gate-based design. State machines and sequential circuits flip-flops, minimization of state tables, state assignment. Higher-level digital system design using SSI-MSI blocks such multiplexers/decoders, adders, memory and programmable gate arrays; bus-oriented systems. Digital system applications will include counters, magnitude comparators, Analog-to-Digital and Digital-to-Analog conversions, feedback control, sensor interfacing and signal conditioning. Furthermore, the course introduces finite state machines, hardware description language (HDL),
Object Oriented Programming	This course aims to introduce students to the basics of OOP, object design, classes, methods, inheritance, mechanisms of software reuse, classes and subclasses, effect of inheritance on software engineering, multi- inheritance, polymorphism, topics in Software Engineering (clarity, reusability and coherence) and objects.
Data Structures and Algorithms	The course starts by an introduction to the computer programming principles. The course then covers the following topics: data structure operations, queues and stacks and their applications, lists and strings, linked lists and their different variations, and their different variations, searching techniques, sorting techniques, tree structures and graphs. Furthermore, the course will introduce techniques for the design and analysis of efficient computer algorithms through theoretical backgrounds and examples of advanced methods and data structures. Topics include asymptotic growth analysis of functions, average and worst-case analysis, sorting and selection problems, advanced search trees, graph theory and related algorithms, divide and conquer and greedy programming paradigms, hashing, complexity classes of P, NP and NP-complete.
Software Engineering	This course introduces software engineering as a discipline, discusses stages of the software lifecycle, compares development models such as waterfall, prototyping, and incremental/ iterative. It covers software requirements analysis, effort and cost estimation, compares structured and object-oriented analysis and design methods. It also discusses verification/ validation, quality assurance, software reliability, testing methods, maintenance, documentation, project management and team structure, metrics, and available tools.
Circuits and Electronics 1	This course introduces the concepts of electrical circuits and electronics to students. Topics covered include: resistive elements and networks; circuit analysis methods including KVL, KCL and the node method; independent and dependent sources; linearity, superposition, Thevenin & Norton methods; digital abstraction, combinational gates; and MOSFET switches and small signal analysis. Analog networks include amplifiers, power supplies and oscillators. Digital efforts are concentrated in the CMOS and pseudo-NMOS areas with a brief look at the BJT logic. Explores basic concepts of frequency response, feedback and data conversion. Design and lab exercises are also significant components of the course.
Circuits and Electronics 2	Introduces design and analysis of semiconductor circuits. Analog networks include amplifiers, power supplies and oscillators. Digital efforts are concentrated in the CMOS and pseudo-NMOS areas with a brief look at the BJT logic. Explores basic concepts of frequency response, feedback and data conversion. Design and lab exercises are also significant components of the course.
Advanced Programming	This course is designed to allow students to experience how a real-world computer application ECOMs to life. This course builds on their previous programming skills and includes more advanced GUI techniques. In addition to smaller projects, students will

	work together to complete a large programming project of their choosing by the end of the semester. After many weeks of coding, they will complete an online help file, present their work to the class, and create WebPages showcasing their work.
Discrete Mathematics	Sets, relations and functions, application to data structure and graph representations, partial ordered sets, trees, algebraic structures, lattices and Boolean algebra, semi groups, groups, introduction to grammars and machines and languages, error correcting codes.
Operating Systems	This course introduces the main concepts of computer networking and operating systems for students. Topics include overviews of full introduction to modern operating system design, including memory management, scheduling, I/O, protection, and so on. The architecture of Unix-like operating systems (such as Linux) is used as an example of more general principles in OS design.
Web and Mobile Development 1	In this course, you'll explore the basic structure of a web application, and how a web browser interacts with a web server. You'll be introduced to the request/response cycle, including ET/POST/Redirect. You'll also gain an introductory understanding of Hypertext Markup Language (HTML), as well as the basic syntax and data structures of the PHP language, variables, logic, iteration, arrays, error handling, and super global variables, among other elements.
Web and Mobile Development 2	This course introduces students to programming technologies, design and development related to mobile applications. At the beginning an introduction to Cascading Style Sheets (CSS) will allow you to style markup for webpages. Lastly, you'll gain the skills and knowledge to install and use an integrated PHP/MySQL environment like XAMPP or MAMP. Design and development related to mobile applications. Topics include accessing device capabilities, industry standards, operating systems, and programming for mobile applications using an OS Software Development Kit (SDK). The students should be able to create basic applications for mobile devices.
Introduction to Cloud Systems and security	The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on parallel programming techniques for cloud computing and large-scale distributed systems which form the cloud infrastructure. The topics include: overview of cloud computing, cloud systems, parallel processing in the cloud, distributed storage systems, virtualization, security in the cloud, and multicore operating systems.
Introduction to Artificial Intelligence and Machine learning	Basic concepts and techniques of Artificial Intelligence, Data representation and knowledge data, Inference control, Examples of Models recognitions, Games, Theory proving, Searching Problems, Heuristic Search techniques, Inference rule, first predicate calculus, Inference by contradiction, Logical Reasoning, Production systems, Programming using Prolog, Knowledge representation, Expert systems, Applications. In addition, this course provides a broad introduction to machine learning and statistical pattern recognition. Topics include: supervised learning (generative / discriminative learning, parametric/non-parametric learning, neural networks (NNs), and support vector machines (SVM)); unsupervised learning (clustering, dimensionality reduction, kernel methods); learning theory (bias/variance tradeoffs, practical advice); reinforcement learning and adaptive control.
Artificial Intelligence for Cybersecurity	Artificial intelligence (AI) is a game-changing approach to solving complex problems in cybersecurity. In this course, AI is proposed in the context of information security, providing use cases and practical examples that lend each concept a real-world context. The six main disciplines of AI and explains how to apply these disciplines to solve pressing security problems, such as the challenges of data at scale and speed in

7

	threat response. It covers machine learning techniques and their suitability for security issues, as well as the general limitations and risks of using AI for security. Plus, it shares how to best prepare your organization to apply AI-driven security.
Big Data Analytics and Security	This course demonstrates the analysis of big-data for information security. It will demonstrate how to analyze data which is applied to "massive network traffic datasets" in order to support real-time decision making for security threats in real-time distributed environments.
Signals and Control Systems	This course introduces the fundamentals of continuous and discrete time signal and system analysis to students. This course will cover linear system analysis including impulse response and convolution, Fourier series, Fourier transform, sampling, discrete time signal and system analysis, and Z-transforms. Topics include analysis and design of control systems using physical system models, State variables, steady-state error, time- and frequency responses, and control system stability.
Introduction to Database Technology	This course aims to introduce students to the internal design and properties of database systems, and thus development of application software. Topics include: emergence of databases, structure of data models, types of database systems, relational databases, also, conceptual, logical and physical structure of relational database, keys, functional dependency, normalization, introduction to Structured Query Language (SQL), database administration, concurrency control and databases security/protection and study cases.
Legal & Ethical Issues in Information Security	This course examines how ethics, rules and technology are employed in IT-based associations and organizations. The objectives of this course is to understand the issues arising from: access control, secrecy, privacy, and policy enforcement in addition to other ethical and legal dilemmas prevalent in current associations and organizations.
Fundamentals of Cyber Security	This course introduces the fundamentals concepts and topics of cyber-security to students. These concepts include cyber-security theory and basic techniques for optimizing security on personal computers and small networks. Learners will gain insight into the importance of Cyber-security and the integral role of cyber-security professionals. The interactive, self-guided format will provide a dynamic learning experience where users can explore foundational cyber-security principles, security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
Computer organization and Architecture	The course will focus on how basic logic blocks of a simple computer are designed. Topics covered include: basic Von Neumann computer architecture; an introduction to assembly language programming Data and information representation and processing, machine-level representation of programs, instruction set architecture, pipelining, optimization program performance, memory hierarchy, cache memories, virtual memory. Furthermore, the course will cover programmable logic devices (e.g., FPGAs)
Applications and Operating System Security	This course covers the advanced topics in operating system (OS) security. Topics include; Access control mechanisms, memory protections, and inter-process communications mechanisms. Students will learn the current state-of-the-art OS-level mechanisms and policies designed to help protect systems against sophisticated attacks. In addition, advanced persistent threats, including rootkits and malware, as well as various protection mechanisms designed to thwart these types of malicious activities, will be studied.
Introduction to	Wireless Communications is increasingly pervasive in society, from the smart phones that we use to embedded medical devices communicating in real-time to remote

Communications for Smart Devices	medical teams. This course provides aims to ensure students have both a systematic and deep understanding of all key aspects of a wireless communication system and its component elements and in particular for smart devices, including the propagation and communication challenges in different contexts - such as the highly mobile user, the connected sensor, or implanted devices. Furthermore, the course covers the basics of network protocols for smart devices, to provide an insider's perspective on the existing paradigms in terms of communication of smart and embedded sensor devices and presents the underlying protocols that are used for their communication. Additional Topics covered include sensing platforms, applications, wireless protocols for communication at various layers of TCP/IP stack, Arduino/Raspberry PI programming, and social aspects of IoT.
Programming Embedded Systems	The course covers the following areas: development environments for embedded software, resource aware programming, hardware programming, developing multi-threaded software, inter-process communication with shared memory and message passing, programming using real time operating systems, fault detection and testing, and fault tolerance and fault recovery. At the end of this course, students must be able to: Develop low-level embedded software using high level programming in e.g., C. Explain the most important features of real-time operating systems, and their use in embedded software. Use programming patterns that take into account limitations of embedded hardware platforms, e.g. memory size, processor capacity, and bandwidth. Discuss basic mechanisms for establishing fault tolerance and recovery. Explain basic approaches in validating the functionality of embedded software.
Introduction to Blockchain Technology	In this course, students will gain a thorough understanding of the basic ideas behind Blockchain distributed ledger technologies including an introduction to the necessary foundations in cryptography. The course will discuss Blockchain as a distributed ledger and introduce distributed consensus as a mechanism to maintain the integrity of the Blockchain. In this course you will be exposed to several cryptocurrencies that are deployed using Blockchain technology such as Bitcoin Blockchain and Ethereum Blockchain, also you will learn how to create, use, and deploy smart contracts.
Telecommunication Networks	This course provides an introduction to the principles & techniques of design, implementation, and analysis of communication networks which is the key technology for the modern ICT systems. Topics include: basis of voice, video, data and internet communications. Network topologies, architecture. Switching techniques, network design, basic queuing analysis, protocols. Local and wide area networks, cellular wireless networks, TCP/IP/UDP/DHCP protocols, routing techniques, multicasting techniques. Network security, Performance analysis and network simulation.
Introduction to Security of Smart Devices and Cyber-Physical Systems	In this class, the students will learn the introduction (EEE 4717) on the security of Internet-of-Things and Cyber-Physical Systems by gaining hands-on training on real IoT and CPS devices. Specifically, the students will have a chance to develop realistic security solutions utilizing actual IoT and CPS devices. Both key security concepts (e.g., confidentiality, authentication, integrity, access control, non-repudiation, and availability) and the state-of-the art security solutions will be reinforced and explored. This class is a project-based class and students will be able to implement and develop their security related projects on real devices.
Field Training 1	Students are expected to get a 120-hour working experience at an IT company and Others. Students will be jointly supervised by a faculty member and an IT professional. Students are expected to submit and present the major achieved competencies.

Field Training 2	Students are expected to get a 160-hour working experience at an IT company and Others. Students will be jointly supervised by a faculty member and an IT professional. Students are expected to submit and present the major achieved competencies.
Field Training 3	Students are expected to get a 240-hour working experience at an IT company and Others, as well as proposing a topic (project) to develop in the graduation project. Students will be jointly supervised by a faculty member and an IT professional. Students are expected to submit and present the major achieved competencies as well as the proposed graduation project.
Introduction to Graduation Project	In a joint (Faculty Member and computer engineers Specialist) supervision, students will work (background, feasibility study, identify the innovation and the added value in their product, platforms and system requirements, required competencies to develop, design and get ready to start the development project) on the project of their interest in groups of 2-3. Evaluation will be conducted jointly by computer engineers' professionals and faculty members.
Graduation Project	In a joint (Faculty Member and computer engineers Specialist) supervision, students will develop and present their products. Evaluation will be conducted jointly by computer engineers and faculty members.
Computer Graphics	Computer graphics are an intrinsic component of many modern software applications and are often essential to the success of these applications. The objective of this course is to familiarize students with fundamental algorithms and data structures that are used in today's interactive graphics systems as well as programming and architecture of high-resolution graphics computers. The principles and practice of computer graphics are described from their mathematical foundations to the modern applications domains of scientific visualisation, virtual reality, computer games and film animation. The course will include some practical experience of graphical software environments such as Java Graphics 2D, 3D and WebGL.
Computer Networks	The course covers an introduction to Internetworking, communicating applications, data transport, core Internet protocols (TCP, UDP, IP, ICMP), introduction to routing and forwarding, Ethernet and other physical technologies, common tools for network debugging, and introduction to data security. Furthermore, hands-on training will be provided for exploring the network, data transport in practice, and setting up a small network
Instrumentations and sensors Interfacing	This course introduces the theoretical understanding of various physical phenomena behind the operation of different types of sensors and microsystems, and then introduce the students the main concepts of designing of sensors with appropriate electronic interface as a complete system. Various types of sensors discussed during this course are magnetic, optical, bio, chemical, radiation, electrical and mechanical etc. In general the students are introduced to the current technology of sensors: electronic, photonic, microfluidics and new materials. The course emphasis is on the integration of electronics with sensors to provide a smart transducer or a system on a chip with multiple integrated devices.
Microcontrollers	This course introduces the main concepts of microcontrollers & microprocessors and in particular for smart devices. Topics related to microcontrollers include: integrated development environments (IDEs), architectures, and I/O interfaces. Hardware interfacing of signals: sensors, actuators, duty cycling, and AD/DA, conversions.
Software Project	Students, in teams, are expected t develop a software –based application to solve an industrial or service tools. Students will experience the software life cycle, and apply all software engineering topics while developing their tools.