Course Description

Academic Study Plan Cohort entering

2013-2014

<table>
<tr><td rowspan="2">Course</td><td>No.:</td><td>NET 201D</td><td>Credit hours:</td><td>3</td><td>Contact hours:</td><td>3,1</td></tr>
<tr><td>Name:</td><td colspan="2">Principles of Information and Technology Systems</td><td colspan="2">Instructor:</td><td></td></tr>
</table>

<table>
<tr><td>Text book or Reference</td><td>1. "Foundation of computer science" , by Behrouz Forouzan and Firouz Mosharraf.
2. "Fundamentals of Information Technology", Third Edition, ISBN: 978-81-7446 481-1,2010</td></tr>
<tr><td>Course Description</td><td>This course Develop an understanding of the components of computing and their relationships, significant impacts of IT disciplines on society, fundamentals of programming structures, basic modules and functions of operating system, enterprise and Internet business applications, and the basics of network architectures, protocols and security, basics on AI and expert systems.</td></tr>
<tr><td>Prerequisites or co-requisites</td><td>CS 110D</td><td>required, elective, or selected elective</td><td>Compulsory</td></tr>
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<table>
<tr><td rowspan="9">Outcomes</td><td>By the completion of this course, the student will be able to:</td></tr>
<tr><td>1. Recognize the basics of the components of computing and their relationships.</td></tr>
<tr><td>2. Recognize the fundamentals of programming structures, basic modules and functions of operating system</td></tr>
<tr><td>3. Recognize the basic modules and functions of operating system</td></tr>
<tr><td>4. Explain the basics of network architectures, protocols and security and the idea of cloud computing.</td></tr>
<tr><td>5. Explain the basics of AI and expert systems</td></tr>
<tr><td>6. State the enterprise and Internet business applications</td></tr>
<tr><td>7. State the basics of Mobile computing and Data warehousing.</td></tr>
<tr><td>8. Describe multimedia data, its representation.</td></tr>
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<table>
<tr><td>Topics</td><td>• Introduction to the course content, text book(s), reference(s) and course plan.
• Data Manipulation and CPU Architecture.
• Data representation and storage
• Operating Systems.
• Networking and the Internet + cloud computing</td></tr>
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	• Algorithms and Programming Languages. • Databases and enterprise information • Artificial Intelligence + expert systems • Software Engineering • Mobile computing. • Multimedia. • Data Warehousing				

Course	No.:	NET 221D	Credit hours:	3	Contact hours:	3,1
	Name:	Computers Network Fundamentals		Instructor:		

Text book or Reference:	Behrouz A. Forouzan " Data Communications and Networking", McGrew-Hill, fourth edition,2007

Course Description	This course provides an overview of basic networking concepts, including network architecture, design, the layering concept in networking and how data transferring between devices.

Prerequisites or co-requisites	CS 340D	required, elective, or selected elective	Compulsory

Outcomes	By the completion of this course, the student will be able to: 1.Compare between the OSI and TCP/IP model 2.Describe the layering concept 3.Understand the network topology 4.Calculate the throughput and network capacity. 5.Idetifiy the different types of medium with their differences 6.Calculate the error checking (CRC, Checksum) 7.Understand the protocol of flow control 8.Identify the IPV4 address space 9.Identify the difference between the classful and classes addressing 10.Performing the subnetting 11.Understanding the routing protocols (shortest path first) 12.TCP/ UDP 13.Idetifing the connection establishment 14.Idetifying connection establishment and connection release 15.Implemeitng the error control 16.Defining the multiplexing

Topics	• Introduction to the course content, text book(s), reference(s) and course plan.

•	Give a brief definition of computer networks.					
•	Introduction to Computer Networks: uses of computer Networks, types of connections, physical topology, PAN, LAN, MAN, WAN, network software.					
•	Physical layer: analog and digital signals, bandwidth and throughput, Fourier Analysis, twisted pair, coaxial cable, fiber optic, wireless transmission, baseband and passband transmissions.					
•	Data link layer: functions of the data link layer, framing, error detection (parity check, CRC, checksum), flow control (noisy and noiseless channels).					
•	OSI versus TCP/IP model: OSI layers and their functions, TCP layers, TCP versus UDP, comparison between OSI and TCP/IP models.					
•	Network layer: logical addressing, classful and classless addressing, IPV4, network routing algorithms: sink tree, shortest path, flooding, distance vector routing.					
•	Transport layer: elements of the transport layer (connection establishment, connection release, error control, multiplexing), UDP (ports, checksum, UDP operation), TCP(service, segment, TCP connection, TCP flow control, TCP error control, TCP congestion control).					
•	Application Layer: Brief introduction about the main protocols such as (HTTP, DNS, SMTP)					

Course	No. :	NET 222 D	Credit hours :	3	Contact hours:	3,1
	Name :	Communications and Networks fundamentals	Instructor :			

Text book or Reference	"Data and Computer Communications", by William Stalling, Prentice-Hall, The Latest Edition.
Course Description	Introduction to signals and systems; time & frequency domains; spectrum, bandwidth, data rate; transmission media & impairment constraints; modulation and encoding techniques; Multiplexing; Switching and routing; Ethernet technologies; Internet Protocol (IP).

Prerequisites or co-requisites :	PHY 202M	**required, elective, or selected elective**	Compulsory

Outcomes	Students who successfully complete this course will be able to: 1- Understand the fundamentals of communication and network systems. 2- Apply concepts and techniques from coding, and multiplexing 3- Understand the sources of noise in a communication system. 4- Having knowledge of various network protocols.

Topics	• Introduction to the course content, text book(s), reference(s) and course plan.
	• Types of Signals & its Properties. Continuous-Time & Discrete-Time Signals
	• Analog & Digital Signals, Periodic Signals, Even & Odd Signals, Real & Complex Signals, Exponential & Sinusoidal Signals
	• Time Shift Transformation, Unit Step and Unit Impulse Functions
	• Systems and Classifications of Systems Linear-Time-Invariant Systems Convolution Sum
	• Types of communications, Time domain and frequency domain, Spectrum, Bandwidth and Data Rate Transfer, and relations between them
	• Transmission Impairments: Attenuation, delay distortion, noise, Channel capacity, Nyquist Bandwidth, Shannon capacity Formula
	• Transmission media:
	o Guided media (twisted-pair, coaxial and optical fiber cables)
	o Unguided media (wireless)
	• Modulation and Encoding Techniques:
	o Digital Data to Analog Signals (ASK, FSK,PSK)
	o Digital Data to Digital Signals (NRZI, NRZL,AMI, Manchester)
	o Analog Data to Digital Signals, Nyquest Theory for Sampling
	• Data Multiplexing (TDM, FDM)
	• Transmission Types: Serial, and Parallel
	o Communication Types: FDX, HDX
	o Communication Methods: Synchronous and Asynchronous, Forwarding
	• Error Control: Error Detection, Error Correction Retransmission Technique: ARQ
	• Network Models Wired LANs and Wireless LANs Internetworking and Addressing

Course	No. :	NET 311D	Credit hours :	3	Contact hours:	3,1
	Name :	Information Security		Instructor :		

Text book or Reference	Cryptography and Network Security: Principles and practice', William Stallings Fifth edition, 2011.
Course Description	Develop an understanding of information assurance as practiced in computer operating systems, software and web applications, gain familiarity with common attacking techniques such as virus, Trojan, worms and memory exploits defenses against them, develop a basic understanding of cryptography, how it has evolved, and two key encryption techniques used today(DEA, RSA).

Prerequisites or co-requisites	NET 221 D	**required, elective, or selected elective**	compulsory

Outcomes	By the completion of this course, the student will be able to: 1. Describe Computer security concepts. 2. Describe OSI security architecture. 3. Explain information assurance as practiced in software and web applications. 4. Describe cryptography and how it has evolved. 5. Apply two key encryption techniques used today(DEA, RSA). 6. Develop a basic understanding of Message Authentication (MAC) 7. Apply Message Integrity (Secure Hash Algorithms: SHA-1) 8. Apply Digital signatures (ELGamal digital signature scheme and Digital Signature Standard) 9. explain of malicious software, viruses, viruses countermeasures, worms. 10. study ways of attaching a virus to a program. 11. explain the sources of viruses and how to countermeasure them. 12. List types of security policies, high and low level policy languages, operational issues. 13. explain security feature in Linux. 14. apply security feature in windows. 15. explain the vulnerabilities in programs. 16. explain Buffer Overflow ,Cross-site Scripting (XSS) and SQL Injection. 17. study cybercrime and computer crime, intellectual property (copyright). 18. explain the problem of intrusion (behavior and techniques). 19. classify intrusion detection techniques (statistical and rule-based) 20. explain password management.
Topics	• **Fundamental aspects:** Computer security concepts, OSI security architecture, security attacks, security services, security mechanisms. • **Security mechanisms:** Classical encryption techniques, block ciphers and Data Encryption Standard (DES), public key cryptography (RSA and ELGamal algorithms), cryptographic data integrity (SHA algorithm), digital signatures (ELGamal digital signature scheme and Digital Signature Standard) • **Attacks:** Types of malicious software, viruses, viruses countermeasures, worms • **Security policies:** Definition, types of security policies, high and low level policy languages, operational issues • **Operating system security:** Technical mechanisms (layering, abstraction, data hiding, process isolation, hardware segmentation), policy mechanisms (principles of least privileges, accountability), security models (state machine model, information flow

model, Bell-Lapadula model, non-interference model, access control matrix, Clarck Wilson model)

- **Software security:**

Vulnerability, sandboxing, control flow integrity

- **Computer forensic:**

cybercrime and computer crime, intellectual property (copyright, patent) hacking and intrusion

Course	No. :	NET 323 D	Credit hours :	3	Contact hours:	3,1
	Name :	Networks Protocols		Instructor :		

Text book or Reference	"Data Communication and Networking", by Behrouz A Forouzan, McGraw Hill, 2006 or the Latest Edition. "TCP/IP guide ", by Charles M. Kozierok, McGraw Hill, 2005 or the Latest Edition "Computer Networks", by Tanenbaum, Prentice-Hall, The Latest Edition.
Course Description	This course demonstrates the basics of Class-full addressing, classless addressing, and sub-netting; Delivery and routing of IP packets; Address resolution: ARP and RARP; IP protocol; Network troubleshooting: ICMP; Network design and performance; User datagram protocol (UDP); Transmission control protocol (TCP); Routing protocols: RIP, OSPF, and BGP. BOOTP, DHCP,DNS, and FTP.

Prerequisites or co-requisites	NET 221 D	required, elective, or selected elective	elective

Outcomes	By the completion of this course, the student will be able to: 1-Explain the difference between classful addressing and classless addressing 2-Compare the difference between the subnetting and suppernetting 3-Explain the attributes of IPv4 datagram 4-Explain mapping Logical to physical Address: ARP 5-Exemplify the ARP Packet 6-Enumerate the different cases of the services of ARP 7-Explain the proxy ARP technique 8-Explain the RARP and its problems 9-Analyze DHCP

Topics	• Introduction to the course content, text book(s), reference(s) and course plan. • Classfull addressing, classless addressing, and Sub-netting • Delivery and routing of IP packets • Routing protocols: RIP, OSPF, and BGP • Address resolution: ARP, RARP, BOOTP, and DHCP • IP protocol (IP)

	• User Datagram Protocol (UDP)
	• Transmission Control Protocol (TCP)
	• Domain Name System (DNS)
	• File Transfer Protocol

| Course | No. : | NET 324D | Credit hours : | 3 | Contact hours: | 3,1 |
| | Name : | Networks Management and Analysis | Instructor : | | | |

Text book or Reference	Network Management: Accounting and Performance Strategies" Benoit Claise, Cisco Press, ISBN-10: 1-58705-198-2, 2007
Course Description :	The course covers in detail the methodology of network analysis, architecture. The course addresses Network management and protocols such as SNPM, CMIP and RMON as well as traffic analysis and network performance evaluation software systems; Reliability concepts; Architectures for system observation and control; System utilization and traffic classification; Network management tools.

Prerequisites or co-requisites	NET 323D	**required, elective, or selected elective**	Compulsory

Outcomes	By the completion of this course, the student will be able to:
	1. Understand the methodology of network analysis.
	2. Understand Network management and protocols such as SNMP, CMIP
	3. know the SNMP structure
	4. know the SNMP versions
	5. know the SNMP SIM data coding format
	6. encode data using SIM rules
	7. know CMIP advantages
	8. compare between SNMP and CMIP
	9. Plan for security management
	10. Know the security management steps
	11. Analyze the results for security reasons
	12. use ping command
	13. understand the wireless concepts
	14. understand the mobile fundamental
	15. Understand the wired concepts.
	16. Understand the main concept for security

Topics	• Introduction to the course content, text book(s), reference(s) and course plan.
	• Network Management Principles
	• Simple Network Management Protocol (SNMP)
	• Management paradigms and protocols
	• Wireless & mobile
	• Wired
	• Security

Course	No. :	NET332D	Credit hours :	3	Contact hours:	3,1
	Name :	Wireless Networks and Mobile Communication Systems	Instructor :			

Text book or Reference	1. Wireless Communication and Networks" , by William Stalling , Prentice-Hall, The Latest Edition. 2. Wireless Communications: Principle and Practice", by T. S. Rappaport, Prentice-Hall, The Latest Edition.
Course Description	The course covers underlying and fundamental computer communication concepts which support modern mobile and wireless communication systems and networks. Some of these concepts deal with propagation effects, including loss, fading, mobile systems, including design principles of base units and mobile units; micro cells and pico-cells; cell division, including frequency use and reuse; concepts of FDMA, TDMA, and CDMA. The focus for wireless networks is on the physical and medium access layers of the network protocol stack. Wireless systems include satellite and cellular networks, wireless LANs (IEEE 802.11) and personal area networks (Bluetooth and Zigbee).
Prerequisites or co-requisites	NET 323D	**required, elective, or selected elective**	compulsory

Outcomes	By the completion of this course, the student will be able to: 1. Identify Wireless Networks and its elements. 2. Classification of Networks based on different criterion 3. Compare and Classify wired and Wireless Network 4. Plan ways to study a network 5. Study the network/Protocol architecture of networks 6. Study the Electromagnetic Waves and Spectrum 7. Understand Antenna fundamentals 8. Interpret/Recognize basic specifications from antenna spec sheets 9. Understand some of the attributes of analog and digital signals Time Period, Frequency, Wavelength and Bandwidth, Bit rate, Bit length. 10. Understand/Explain the key Factors/Parameters and tradeoffs for wireless system design(Bandwidth, Data Rate, Noise, Channel impairments, acceptable error rate. 11. Understand the different types of impairments present in wireless networks and analyze their impact on communication system performance.
Topics	• Introduction • "Antennas: definition, radiation patterns, antennas types. Antenna characteristics: gain, effective area, attenuation, free space loss, noise, Eb/N0, fading. • "Satellite Communications: parameters, satellite versus terrestrial communications, orbits, LEO,MEO, GEO, frequency bands, capacity allocation. • Channelization, TDMA,FDMA,CDMA • Spread spectrum Systems • Cellular Wireless Networks: Organization, frequency reuse, operations, power control, TDMA, GSM • IEEE802.11 Standard: architecture, Mac format, LLC, components, services, Mac protocols, physical layer, dynamic spread spectrum, frequency hopping. • Bluetooth: applications, piconet, radio layer, baseband layer, L2Cap layer. • IEEE 802.15:Bluetooth versus Zigbee, components of Zigbee, Zigbee network topology, device architecture, physical layer functionalities, network setup, beacon and non becon opeartions, mac layer. • "Wireless network devices: wireless network interface cards, access point, bridge, gateway Mobile Networks Fundamentals: Generations, Topologies, and Components

Course	No. :	NET 341D	Credit hours :	3	Contact hours:	3,1
	Name :	Networks Programming and Applications	Instructor :			

Text book or Reference	**Textbook**: Behrouz A.Forouzan, Data Communications and Networking 5th Edition
Course Description	NET 341D is an introduction to developing networks applications and programs. From the application view, this course explains the basic application protocols that are required to develop an application: HTTP, FTP, SMTP, POP, and DNS. From a programming point of view, this course is intended to explain how to write a code at the client and the server sides. NET 341D exploits JAVA which offers many networks libraries.
Prerequisites or co-requisites	NET 323D	required, elective, or selected elective	required

Outcomes	Students who successfully complete this course will be able to: 1- 1. Remember computer networks basics. 2. Describe HTTP. 3. Describe FTP. 4. Describe SMTP. 5. Describe POP. 6. Describe DNS. 7. Compare HTTP, FTP, SMTP, POP, DNS. 8. Explain HTTP persistent connection. 9. Explain HTTP nonpersistant connection. 10. Explain FTP commands. 11. Explain a SMTP session. 12. Explain DNS resolution techniques. 13. Describe sockets. 14. Use Java to write simple programs. 15. Use Java to write a UDP application 16. Use Java sockets for networks and to write a TCP application 17. Describe TCP socket options. 18. Use Java sockets for networks programming. 19. Describe JavaMail classes. 20. Use Java to send an e-mail. 21. Use Java to check an e-mail. 22. Use Java to send an e-mail attachment. 23. Explain a servlet structure. 24. Use Java servlets to generate HTML code . 25. Use Java servlets to generate an HTTP request and response. 26. Use Java servlets to read and send cookies.

Topics	1. Introduction to the course content text book(s), reference(s) and course plan
	2. Internet Applications: HTTP, FTP, SMTP, POP, DNS 3
	3. Network programming basics: socket concept 2
	4. Java Overview: IO, Threads, streams 2
	5. UDP programming 1
	6. TCP programming 2
	7. Mail programming 2
	8. Web programming using servlets

Course	No. :	NET 412D	Credit hours :	3	Contact hours:	3,1
	Name :	Networks Security Protocols		Instructor :		

Text book or Reference	'Cryptography and Network Security: Principles and practice', William Stallings Fifth edition, 2011		
Course Description	An introductory course, intended to cover the fundamental concepts and techniques of **Networks Security Protocols**. The student is expected to develop number of applications that demonstrate an understanding of the course.		
Prerequisites or co-requisites	**NET 323D**	**required, elective, or selected elective**	Compulsory

Outcomes	By the completion of this course, the student will be able to: 1- Use the different methods of attack. Understand and apply selected technologies used to ensure security. 2- Evaluate existing Network Security attacks Programs 3- use new types to prevent attacks 4- Describe the architectural models for TCP/IP Stack 5- evaluate different methods for Attacks through TCP/IP 6- Explain the Security Components 7- use Security through Firewall 8- Describe VPN 9- Describe the main architecture for IPSec 10- use different models for IPSec 11- use Combining Security Association 12- Describe DNS protocol stack 13- use the different types attach for DNS 14- explain the intrusion process 15- Explain types of intrusion detection systems 16- Describe current challenges of intrusion detection systems 17- use Secure Multipurpose 18- Describe Internet security Mail Exchange using S/MIME 19- Explain models for Secure socket layer (SSL) 20- Explain transport layer security (TLS).
Topics	• Foundation of Network Security: what network security is? goals of network security, secure network architecture, network security policies, network security components • Overview of TCP/IP: TCP/IP architectural models, TCP/IP possible attacks(packet sniffing, spoofing, process table attack). • TCP/IP security components: Firewall protection, types of firewalls (packet filter, proxy server, stateful filter), Firewall architectures (dual-homed host, screened host), VPN, advantages of VPNs, types VPNs, architecture of VPNs (point to point tunneling protocol, layer 2 forwarding), VPN models (Nas-initiated VPN, client-initiated VPN). • IPSec: architecture, authentication header, encapsulating security payload, combining security association, key management, benefits, limitations. • DNS: protocol stack (spoofing, ID hacking, cache poisoning), protection • Intrusion detection: definition, intrusion process, intrusion detection system, types of intrusion detection systems, challenges of intrusion detection systems, intrusion detection systems. • Application and transport layers security: (Pretty Good Privacy (PGP), Secure Multipurpose Internet security Mail Exchange (S/MIME), Secure HTTP, Secure socket layer (SSL), transport layer security (TLS).

Course	No. :	NET 431D	Credit hours :	3	Contact hours:	3,1
	Name :	Advanced Networks Services		Instructor :		

Text book or Reference	Data Communication and Networking", by Behrouz A Forouzan, McGraw Hill, 2006, The Latest Edition
Course Description	Outline some traditional networks services (DNS, HTTP, DHCP).Understand multimedia services, Understand real time services. Understand mobility services.
Prerequisites or co-requisites	**NET 332D**	**required, elective, or selected elective**	Compulsory

Outcomes :	Students who successfully complete this course will be able to: 1. Recognize the principles of Internetworking 2. Stating the operation of Internet Protocol. 3. Explain the addressing mechanisms 4. Describe IPv4 protocol. 5. Describe IPv6 protocol 6. Differentiate between Unicast, Unicast, and Multicast addressing in IPv6 7. Describe Flow Control in IPv6 8. Describe Error control in IPv6 9. Stating Routing Protocol 10. Differentiate between Connection Oriented and Connectionless protocols 11. Describe TCP protocol 12. Describe UDP protocol 13. Stating Virtual Private networks 14. Describe IPSec protocol. 15. State different applications of IPSec 16. State the benefits of IPSec. 17. Describe the funcions of IPSec 18. Describe Steaming. 19. Explain the digitization of Audio signals 20. Explain the digitization of Video signals 21. Explain Audio Compression 22. Differentiate between predictive encoding and perceptual encoding. 23. Explain Video Compression 24. Describe JPEG 25. Describe MPEG 26. Stating Approaches for Streaming Stored Audio/Video 27. Describe Streaming Live Audio/Video 28. Describe Real-Time Audio/Video 29. Differentiate between Jitter, Ordering, and Mixing 30. Describe Real-time Transport Protocol(RTP) 31. Describe Real-time Transport Control Protocol(RTCP) 32. Describe Session Initiation Protocol (SIP) 33. Stating SIP messages 34. Describe Caller Tracking 35. DescribeH.323 protocol 36. Recognizing Mobility 37. Describe the operation of Mobile IP protocol 38. Stating the Components of Mobile IP Networks. 39. Describe Agent Discovery 40. Describe ICMP Router Discovery Protocol (IRDP) 41. Describe Registration 42. Describe Tunneling 43. Describe Mobile IP Encapsulation

Course	No. :	NET437D	Credit hours: 2		Contact hours:	
	Name :	Graduation Project -I		Instructor:	Dr. Dr. M.A.HADI	

Text book or Reference	**Textbook**: **1-** Handbook of wireless networks and mobile computing', Ivan Stojmonovic, ISBN-0-471-41902-8, John Wiley Edition, 2002. **References:** List Essential References Materials (Journals, Reports, etc.) 1- Data Communications and Networking' Bahrouz A.Forouz , McGraw Hil , 2007 2- Cryptography and Network Security: Principles and practice William Stallings Prentice Hall 2011 3- Data and Computer Communications, William Stalling, Prentice-Hall, 2007.
Course Description	This course provides teamwork of students with a thorough guideline for survey and research to design, develop, and implement different fields covering the IT area.

Prerequisites or co-requisites	Passing successfully at least 90 credit hours and IS 350D	**required, elective, or selected elective**	**Required Course**

Outcomes	By the completion of this course, the student will be able to: 1. Provide the necessary background or context for the project and its importance. 2. Outline the problem they are working on, why it is interesting and what the challenges are. 3. Propose an appropriate solution for the project problem. 4. Conduct a related work survey. 5. Outline new information technologies such as mobile computing, and Data warehouses 6. Develop illustrative examples and programs to explain different IT systems 7. Operate a simple IT system. 8. Provide the requirements determination and analysis. 9. Provide system design, including the system architecture, implementation requirements and user interface design. 10. Operate a simple IT system. 11. Write a small project in a teamwork. 12. Demonstrate basics of an IT system

Topics	1- Registering and selecting topics.
	2- Registering and selecting topics.
	3- Providing the problem statement & significance and propose a solution.
	4- Providing the necessary background and related work survey.
	5- Topic presentation.
	6- Providing requirements determination and analysis.
	7- Designing the system architecture.
	8- Providing the implementation requirements (software and hardware that will be used).
	9- Designing the user interface of the system by prototyping.
	10- Finishing the proposal writing and submission

Course	No. :	NET438D	Credit hours :	2	Contact hours:	2
	Name :	Graduation Project II		Instructor :		

Text book or Reference	The choice of the books depends upon the project type, domain, and characterization.
Course Description	The aim of this module is to provide students with experience and appreciation of the process of performing projects in one of the streams of networks and communications associated with information technology, including the specification, design and development, and reporting processes. Students work together in teams under the supervision of a supervisor, and learn about the processes of teamwork. This involves a scientific project in an area (in Networking and Communications) which deals with the scientific challenges in the following or related areas: • Routing • Congestion • Integrated Services • Quality of Service • Secure network solutions • Mobility and energy related issues in wireless networks

Prerequisites or co-requisites	NET 437D	required, elective, or selected elective	compulsory

	By the completion of this course, the student will be able to:
	1. Identify proper work procedures or approaches for the project.
	2. Apply technical and scientific knowledge to a task.
	3. Choose between technical alternatives.
	4. Analyze, schedule and resource the task.
	5. Convert the conceptual schema (relational tables into physical schema).
	6. Translate functional requirements into functions and procedures
	7. Engage in design and Implementation.
	8. Develop the capacity to undertake lifelong learning.
Outcomes	9. Devise and carry out tests where necessary
	10. Provide a test plan, test cases and test results.
	11. Organize, compile and record all test results in an efficient manner.
	12. Analyze data.
	13. Evaluate and discuss the outcome of the project
	14. Function effectively as an individual and as a team member.
	15. Present the project outcome effectively using good presentation skills.
	16. Compile and present the project carried out in the form of a report.
	17. Communicate technical results, information and conclusions to others by means of poster and scientific paper.
Topics	• Developing the system based on the design and method proposed in the Graduation Project I. • Implementing the system. • Testing the system. • Designing poster. • Submission of project documentation and poster. • Presentation.

Course	No. :	**NET439D**	**Credit hours: 4**		**Contact hours:**	
	Name :	Internship		**Instructor:**		

Text book or Reference	**Textbook**: 1- "Practicum and Internship: Textbook and Resource Guide for Counseling and Psychotherapy", by John Boylan, Judith Scoot, Routledge, 2008.

Course Description	Internship course is an important component of the IT-Networks and Communication systems program. This course is designed to provide students' opportunity to gain a supervised practical experience in computer environment of an approved department, firm or agency in KSA. The students will gain a valuable on-site working experience. It further allows the students to develop skills like: communication, team work and problem solving, which will enable them in joining a competitive job market in their fields. Cooperative Training Office (CTO) should coordinate with students to apply internship. The student and CTO should also submit a written plan for approval before taking-up the internship. All internships are subject to approval by the Internship Coordinator of the college. Note: maximum number of students 35 per class.		
Prerequisites or co-requisites :	Passing successfully at least 90 credit hours	**required, elective, or selected elective**	Required Course

Outcomes	By the completion of this course, the student will be able to: 1. Understand professional organizational culture 2. Develop relevant professional competencies and professional relation ship 3. Use existing knowledge to solve some technical problems 4. Apply Classroom Theory 5. Prepare written report about the internship experience 6. Construct experience and confidence in expressing ideas. 7. Communicate in a professional manner. 8. Establish network of acquaintances to increase employment opportunities. 9. Understand the practices and protocols of the particular company and industry in which they are working. 10. Demonstrate professional demands (such as behavior, attitude, appearance, and punctuality) of the workplace. 11. Apply academic knowledge in a professional setting. 12. Communicate effectively in verbal and written forms. 13. Explain current trends and issues specific to the topic of her internship program

Topics	1- Routing. 2- Congestion 3- Integrated services. 4- High availability 5- Quality of service 6- Secure network solutions. 7- Mobility and energy issues for wireless networks.

ELECTIVE COURSES

<table>
<tr><td rowspan="2">Course</td><td>No.   :</td><td>NET 302 D</td><td>Credit hours :</td><td>2</td><td>Contact hours:</td><td>1,2</td></tr>
<tr><td>Name :</td><td colspan="2">Selected topics (1)</td><td colspan="2">Instructor :</td><td></td></tr>
</table>

Text book or Reference	1. Mark Aakhus, James E. Katz, Perpetual Contact: Mobile Communication, Private Talk, Public Performance, Cambridge University Press, 2002.
Course Description	By the end of this course, the students should be able to: 1. Understanding the basic principles of mobile radio. 2. Knowing the different Cellular structures and mobile radio network. 3. Understanding the basics of Diversity and Combining Techniques 4. Having acquired a good knowledge of Modulation Techniques and Multiple Access Techniques.
Prerequisites or co-requisites		**required, elective, or selected elective**	**selected elective**

Outcomes	By the completion of this course, the student will be able to: 1. Stating Frequency bands. 2. Stating Mobile Radio Frequencies 3. Stating the fundamentals of VHF Propagation 4. Describe the signal propagation in Free Space 5. Describe the signal propagation over reflecting surface 6. Describe the signal propagation over Irregular Terrain 7. Describe the signal propagation in Built-up Area 8. Describe Diversity reception 9. Describe Source coding 10. Describe channel coding. 11. Describe digital modulations. 12. Stating the basic functions of mobile communication systems 13. Describe multiple access systems 14. Stating transmission modes 15. Stating the utilization of frequency bands 16. Describe the organization of Cellular Networks. 17. Recognize the cell structure. 18. Stating the geographical coverage area. 19. Explain TDMA. 20. Explain FDMA. 21. Explain CDMA. 22. Stating GSM. 23. Stating 2G CDMA 24. Stating 2.5G Networks. 25. Describe 3G Networks 26. Recognize the main driver for 3G Networks. 27. Stating the difference between IEEE 802.11 and 3G Cellular. 28. Describe the Multimedia Message Service. 29. Stating the MMS applications. 30. Recognize 4G Networks. 31. Stating 4G wireless technologies. 32. Stating the difference between 3G and 4G wireless networks.

Topics	• Fundamentals of mobile radio • Structure of cellular network: cells and frequency reuse • Mobile radio propagation channels • Channel allocation techniques : TDMA, FDMA, CDMA • 3RD and 4th generation				

Course	**No. :**	NET 351 D	**Credit hours :**	**3**	**Contact hours:**	3,1
	Name :	**Networks Operating Systems**		**Instructor :**		

Text book or Reference	Network Operating Systems: Making the Right Choices Addison-Wesley Longman Publishing Co., Inc. Boston, MA, USA
Course Description	This course aims to explain how to install a secure, multi-user, client-based network operating system , Implement and administer operating system resources, Implement, share and NTFS permissions, Configure and troubleshoot workstation performance, Monitor a network, Implement, monitor, and troubleshoot operating system security and Configure, troubleshoot network connectivity.

Prerequisites or co-requisites	**NET 221D - NET 340D**	**required, elective, or selected elective**	elective

Outcomes	Students who successfully complete this course will be able to:
	1. Describe the network operating system NOS.
	2. Describe the Mechanisms for Network Operating Systems.
	3. Describe how NOS provides the LAN with access to other networks
	4. Describe the services and applications of NOS.
	5. Describe the role of the NOS in network computing.
	6. Describe How is the NOS likely to evolve.
	7. Describe What is client/server computing.
	8. Describe how to Install and deploy Windows 7
	9. Describe how to Install Windows 2008 server on networking hardware
	10. Explain terms associated with installing and configuring an NOS
	11. Describe how to work with Disks and Devices.
	12. Apply the Windows 2008 Registry.
	13. Explain how to install and configure a TCP/IP protocol stack.
	14. Apply Windows 2008 Server DHCP.
	15. Apply Exercises on Windows 2008 Domain Name Service.
	16. Apply exercises on Internet Information Server (web services).
	17. Describe the process of monitoring a network server.
	18. Explain the importance of backing up systems and data.
	19. Describe procedures for backing up systems and data.
	20. Describe the processes for updating network operating systems
	21. Describe terms associated with administering server resources.
	22. Explain IP Addressing.
	23. Apply Initial Network setup.
	24. Explain Linux System Administration.
	25. Explain how to install Software.
	26. Describe concepts associated with file system security.
	27. Describe procedures for sharing and securing server resources.

Topics	• Introduction to the course content, text book(s), reference(s) and course plan.
	• Basics of network operating system NOS.
	• How does the NOS provide the LAN with access to other networks and computer systems?
	• What is the role of NOS in network management?
	• What are application-programming interfaces (APIs) and how are they supported in the NOS?
	• What is network computing and what is the role of the NOS in it? How is the NOS likely to evolve? What is client/server computing?
	• Introducing Windows 7 and Windows 2008 architecture concepts.
	• Installing and deploying Windows 7.
	• Install Windows 2008 server on networking hardware, under VMWare Workstation.
	• Working with Disks and Devices, explore and exercise the Windows 2008 Registry.
	• Install and configure a TCP/IP protocol stack.
	• Explore Windows 2008 Server DHCP.
	• Exercise Windows 2008 Domain Name Service.
	• Exercise Internet Information Server (web services).
	• Managing and Monitoring Windows 7 Performance
	• Linux Installation, IP Addressing, Initial Network setup, Linux System Administration, Software installation

Course	No. :	NET352D	Credit hours : 3		Contact hours:	
	Name :	Real time and embedded systems		Instructor:	Dr. Amina Saleem

Text book or Reference	**Textbook**: 1. Real-time flow systems, Jane W.S.Liu, ISBN -10:0130996513, 2000 2. Real-Time Systems: Design Principles for Embedded Applications, Second Edition, ISBN 978-1-4419-8236-0, Springer, 2011. **References:** 1. PIC Microcontroller: A Introduction to Software & Hardware Interfacing", Han-Way Huang, Delmar Cengage Learning, 2007. ISBN 978-1-4018-3967-3
Course Description	The course covers the concepts, fundamental problems, and approaches in the design and analysis of real-time and embedded systems inherent in many hardware platforms. It addresses the issues related to the design and analysis of systems with real-time constraints (Synchronization and communication; Scheduling Real Time systems; Advanced scheduling; Simulation of a Real Time system). The students also learn the fundamentals of embedded system hardware, micro controller and microprocessor architecture and assembly language programming for the PIC Micro controller.

Prerequisites or co-requisites	CS340D	required, elective, or selected elective	Elective Course

Outcomes	Students who successfully complete this course will be able to: 1. Describe embedded systems and embedded systems with real time applications. 2. Understand technical, economic factors characterizing a real-time application to interpret demands that the system designer must cope with. 3. Understand the key characteristics of real time embedded systems: logical, functional and timing correctness and resource scheduling. 4. Classify real time systems. 5. Compare hard and soft real time systems. 6. Understand the functional and temporal requirements of real time systems. 7. Differentiate between real-time applications based on their timing attributes. 8. Study some typical real time embedded systems and their current and future trends. 9. Describes the general model of real-time systems. 10. Understand the real time system model (workload model, a resource model and algorithms). 11. Define the basic component of any real-time application system. 12. Describe the parameters that characterize application systems. 13. Study parameters that characterize the processors 14. Understand the concept of scheduling in real time systems. 15. Study the scheduling approaches for real time systems: clock-driven, weighted round robin and priority-driven. 16. Analyze the advantages and disadvantages of clock driven scheduling. 17. Analyze the merits and limitations of the priority driven scheduling algorithms. 18. Compare scheduling methods. 19. Classify priority-driven algorithms for scheduling periodic tasks on a processor. fixed priority and dynamic priority 20. Describe algorithms for Scheduling aperiodic and sporadic jobs. 21. Describe what is meant by real time networks 22. Enumerate key goals of Real-time Communication 23. Describe Hard and soft real time communication systems 24. Understand Real time network architecture 25. Study the Real time transport and internet protocol 26. Study Flow control for real time communication systems 27. Classify the flow control protocol. Explicit and Implicit flow control 28. Assess real time communication system needs 29. Understand scheduling in real time communications 30. Define Embedded systems 31. Understand the architecture of embedded systems 32. Analyze the design goals of embedded systems (Performance, cost, power consumption, size) 33. Describe some functional and non-functional requirements of embedded systems. 34. Study the key components of embedded system hardware. 35. Understand micro- processors and micro-controllers. 36. Understand the Key design requirements of micro-processors (energy efficiency, code density)

	37. Differentiate between microprocessors and micro-controllers.
	38. Enumerate the components of a micro-controller
	39. Describe the architectural characteristics of the Pic family of micro-controllers.
	40. Describe the peripherals devices of the PIC micro-controllers (Digital I/O, ADC, Memory)
	41. Study Instruction set for PIC Micro-controller
	42. Understand the PIC Interrupts, Interrupt processing, management and Peripheral interrupts.
	43. Understand the difference between High-level languages and machine language.
	44. Explain the Assembly language program structure (directives, instructions And comments)
	45. Use assembler directives to allocate memory blocks.
	46. Write programs loops to perform repetitive operations.
	47. Write assembly programs to perform simple arithmetic operations.
	48. Understand the concept of IDE (Integrated development environment).
	49. Study the MPLAB IDE development tool.
	50. Write; assemble some basic assembly programs for PIC.
	51. Use MPLAB IDE to enter programs and build executable codes and Software debugging.

Topics		1. Typical real-time applications: digital control, optimal control, tracking, and multimedia applications. 2. Reference model of real-time systems: workload model, resource model, and algorithms. 3. Hardware real-time systems scheduling: clock driven scheduling, priority driven scheduling, scheduling aperiodic tasks. 4. Real-time communication: real-time flow control, scheduling for switched networks, internet and transport protocols for real-time applications. 5. Introduction to embedded systems: definition and examples of embedded systems, design constraints. 6. Introduction to embedded systems: microcontroller and microprocessor architecture, memory (RAM, ROM, EPROM, EEROM, Flash memory), I/O, interruptions 7. Introduction to the assembly language: labels, instructions, operands, directives. 8. Assembly programming for PIC microcontroller: programming interfaces.				

Course	**No. :**	NET353	**Credit hours :**	**3**	**Contact hours:**	
	Name :	**Parallel Architectures**		**Instructor :**		Dr. Amina Saleem

Text book or Reference	**Textbook**: 1. Fundamentals of parallel computer architectures: multichip and multicore systems", Yan Solihin, ISBN-13-978-0-9841630-0-7, 2009. 2. Parallel Computer Architecture: A hardware/software approach, David E. Culler, Jaswinder Pal Singh, Anoop Gupta, Morgan Kaufmann publishers, 1999, ISBN: 1-55860-343-3. **References:** 1. John Hennessy and David Patterson, Computer Architecture: A Quantitative Approach, Morgan Kauffman Publisher.		
Course Description	This course covers fundamental and comprehensive concepts related to the design of parallel computer systems (including modern parallel architectures and alternatives), architecture for shared memory multi processors and multicore architectures. Topics include program issues with shared memory multiprocessors, memory hierarchy, cache coherence, synchronization, multicore organization choices and cache.		
Prerequisites or co-requisites	**CS 340D, CS 206D**	**required, elective, or selected elective**	Elective Course

Outcomes	Students who successfully complete this course will be able to: 1. Define parallel architectures. 2. Understand the technological, architectural trends, economic and application requirements that dictate the growth of parallel systems. 3. State some of the motivations behind the development of parallel systems 4. Understand some of the fundamental design issues of the parallel computer Systems such as Resource allocation, data access, performance and scalability. 5. Understand and Classify Parallelism. ILP, task level and program level parallelism. 6. Understand and illustrate the Taxonomy of Parallel computers and the Flynn taxonomy 7. Study the different types of Parallel architectures such as SIMD, MISD, MIMD 8. Understand the concept of memory hierarchies and its big impact on the Performance of applications. 9. Study the operation of memory hierarchy and analyze the range of Performance issues influencing its design. 10. Classify the components/levels of memory hierarchy such as register, Cache (SRAM), Memory (DRAM), Disk etc. 11. Understand the Cache memory, its organizations (Direct Mapped, Set associative and fully associative), and addressing and performance metrics. 12. Understand the concept of prefetching in multiprocessor systems and how it is used to improve the cache performance. 13. Understand the concept of shared memory, its advantages and disadvantages. 14. Classify the Shared Memory Multiprocessors Variations. Uniform and Non-Uniform Memory Access (UMA) Multiprocessors 15. Study the shared memory multi-processor organization. (Shared cache, shared bus and distributed shared memory). 16. Understand the type of hardware support required to construct a shared Memory multi-processor. 17. Assess the key technical challenges in the design of such machines (such as organization and implementation of the shared memory subsystem). 18. Understand issues for a shared memory architecture (Cache coherence, Memory consistency models, synchronization support) 19. Explain the cache coherence problem, cache coherence protocols, Implementations (snooping, directory) and assessing their behavior) 20. List and compare key characteristics of the bus based and shared cache Multi processors. 21. Understand cache coherence in bus-based multiprocessors. 22. Study the Bus-Snooping cache coherence protocol. 23. Analyze the impact of the cache design on Cache coherence performance. 24. Understand the different types of synchronization in parallel architectures such as (event and group synchronization) 25. List the components of a synchronization event. 26. Study some synchronization operations such as locks and barriers, their Performance criteria, implementation, illustration and drawbacks. 27. Compare different synchronization operations. 28. Understand the limitations of the Symmetric shared multi processors. 29. Understand the concept of scalable-shared memory systems.

	30. Study the implementation of distributed shared memory coherence protocols.
	31. Describe the advantages (reduce bandwidth demands) limitations and the Performance criterion of directory based protocol.
	32. Define the inter connection networks
	33. Describe the network characteristics such as topology, routing algorithm, Switching strategy, and flow control.
	34. Compare between different network topologies
	35. Analyze the impact of network characteristics on the performance and functionality of the communication system.
	36. Study the organizational structure of parallel computer networks.
	37. Describes the different classes of routing algorithms used in modern machines.
	38. Understand key properties of good routing algorithms (producing deadlock-free routes, maintaining low latency, spreading load evenly, and
	tolerating faults)
	39. Understand the multi core processors.
	40. Contrast single core and multi-core processors
	41. List some of the advantages and applications of multi-core processors.
	42. Study the multi-core memory hierarchy, issues, design space and constraints.
	43. Multi core memory hierarchy issues design space and constraints
	44. Cache coherence problem and its solution in multi-core architectures.
	45. Compare SMT (Simultaneous Multi-threading) and Multi-core systems

Topics	**Introduction to parallel architectures:** evolution, definition, motivation, Flynn's taxonomy of MIMD parallel computers, examples.
	Introduction to memory hierarchy organization: motivation for memory hierarchy, basic architectures of a cache, cache performance, prefetching.
	Shared memory multiprocessors: cache coherence problem, memory Consistency problem, synchronization.
	Shared memory multiprocessors: cache coherence problem, memory Consistency problem, synchronization.
	Bus based coherent multiprocessors: basic support for bus-based multiprocessors, cache coherence in bus-based multiprocessors, impact of cache design on Cache Coherence performance.
	Hardware support for synchronization: lock implementation, barrier implementation.
	Distributed shared memory multiprocessors: approaches to large-scale multiprocessors, building a directory-based coherence protocol, basic DSM cache coherence protocol, implementation correctness and performance.
	Interconnection network architecture: link and channel, network topology, Routing policies and algorithms, router architecture.
	Designing multicore architectures: multicore architecture, multicore Memory hierarchy organization, performance volatility.

Course	No. :	**NET 403**	**Credit hours :**	**4**	**Contact hours:**	**3,2**
	Name :	**Selected topics (2)**		**Instructor :**		

Text book or Reference	Ralf Steinmetz & Klara Nahrstedt, Multimedia Systems, Springer-Verlag, (ISBN:3540408673)
Course Description	Introductory course in multimedia computing and networking. Explores the interaction between multimedia data and the systems that need to support multimedia data such as audio and video. Topics that will be covered in the course include: compression technologies, multimedia formats such as JPEG and MPEG, multimedia streaming over reservation-based and best-effort networks, multicasting of multimedia data, and systems support for multimedia computing
Prerequisites or co-requisites		**required, elective, or selected elective**	**Elective Course**

Outcomes	Students who successfully complete this course will be able to: 1. Describe Audio Signals. 2. Describe Video Signals. 3. Stating Huffman Compression 4. Stating Run-Length Encoding. 5. Stating LZW Compression 6. Describe G.711. 7. Describe A-law. 8. Describe U-law. 9. Describe MP3. 10. Explain GIF. 11. Explain JPEG 12. Explain PPM 13. Explain M-JPEG. 14. Explain MPEG-1. 15. Explain MPEG-2. 16. Explain H.261. 17. Explain H.263. 18. Stating TCP/IP 19. Stating HTTP 20. Describe SIP 21. Describe H.323 22. Stating reservation based networks 23. Stating best effort networks 24. Stating Features of Multimedia Operating System. 25. Describe the real time process scheduling 26. Stating Multimedia Disk Scheduling
Topics	• Sound, image, and video signals • Lossless data compression techniques: Huffman, Run-Length Encoding, LZW • Audio compression techniques: G.711, A-law, U-law, MP3 • Image compression techniques : GIF, JPEG, PPM 2 Video compression techniques : M-JPEG, MPEG-1, MPEG-2, H.261, H.263 • Networking protocol review: TCP/IP, HTTP • Multimedia integration technologies: SIP, H.323 • Multimedia streaming: reservation based networks, best effort networks • Multimedia operating systems

Course	No. :	NET 425 D	Credit hours :	3	Contact hours:	3,1
	Name :	Satellite Communications		Instructor :		

Text book or Reference :	"Timothy Pratt, Charles W. Bostian, Jeremy E. Allnutt, "Satellite Communication Systems", John Wiley & Sons, The Latest Edition
Course Description	The course is intending to cover the fundamental concepts of satellite communications and orbital concepts. The student is expected to understand the basics of satellite communications, satellite system elements, key issues of satellite, handle error control for digital satellites, and grasp the propagation effects on satellite-earth links

Prerequisites or co-requisites :	NET 222D	**required, elective, or selected elective**	Elective

Outcomes	Students who successfully complete this course will be able to: 1- Describing satellite orbit 2. Explain Kepler's three lows 3. Compute orbital Period 4. Classify different orbital elements 5. Recognizing coordination elevation and azimuth angles 6. Describing orbital size, shape, orientation, and satellite location 7. Compare the role of different subsatellite systems 8. Compare between different transponders 9. Solve problems on antenna gain and diameters 10. Design link budget for satellite uplink/downlink 11. Differentiate between different frequency bands used by satellite 12. Differentiate between satellites in different altitudes 13. Recalling basic transmission theory 14. Classify different propagation effects (gases, rain, ionosphere, scintillations) 15. Compare between rain types 16. Compute rain attenuation 17. Recognize contour maps for rain rate 18. Explain digital transmission 19. Describe QPSK modulation technique 20. Recognize different multiple access techniques 21. Stating errors occurred and solutions 22. Classify different satellite applications

Topics	• Introduction to satellite - communications and its applications • Satellite systems elements • Satellite signal coding • Satellite link design • Orbits and launching methods • Beam angle and directivity • Altitude control • Frequency distribution • Radiation Pattern • Error control for digital satellite • Modulation and Multiplexing techniques • Multiple access • Propagation effects and their impact on satellite-earth link • Exploration of some applications of satellite systems (GPS, Mobile communication, WEB communications)

Course	No. :	**Net 426 D**	**Credit hours :**	**3**	**Contact hours:**	3,1
	Name :	Selected Topics (3)		**Instructor :**		

Text book or Reference	Designing Networks and Services for the Cloud: Delivering business-grade cloud applications and services", By Huseni Saboowala, Muhammad Abid, Sudhir Modali , Published May 16, 2013 by Cisco Press
Course Description	This course focuses on selected research topics in networks and communication systems. The course is structured as group of lectures to discuss one or more of the hot topics in the field plus a research seminar where students present research papers to their peers. Topics may include advanced concepts in data communication, networks, networks security, network protocols, wireless sensors networks, satellite networks, optical networks, distributed networks, mobile computing, cloud computing.

Prerequisites or co-requisites	NET 222D	**required, elective, or selected elective**	selected

Outcomes	Students who successfully complete this course will be able to: 1- Acquire many of the skills in the selected topics. 2- Acquire a solid foundation about architectural concepts of data communications and computer networking 3- master the knowledge about data communications and computer networking in the context of real-life applications 4- Understanding, evaluating critically, and assimilating new knowledge and emerging technology about computer networks. 5- Follow-up the scientific research in the area of specialization.

Topics	• Introduction to the course content, text book(s), reference(s) and course plan.
	• Introduction to Cloud Computing
	• History of Cloud Computing
	• Service models
	  o Infrastructure as a service (IaaS)
	  o Platform as a service (PaaS)
	  o Software as a service (SaaS)
	• Cloud clients
	• Cloud management
	  o Cloud management challenges
	  o Aspects of cloud management systems
	• Deployment models
	  o Private cloud
	  o Public cloud
	  o Community cloud
	  o Hybrid cloud
	  o Distributed cloud
	• Architecture
	  o The Intercloud
	  o Cloud engineering
	• Security in cloud computing
	• Applications of Cloud Computing

Course	No. :	NET 433 D	Credit hours :	3	Contact hours:	3,1
	Name :	Networks Design and Implementation	Instructor :			

Text book or Reference :	"Top-Down Network Design (3ed Edition) by Priscilla Oppenheimer, 2010
Course Description :	The course is intending to cover modern integrated networks, the types of traffic generated and their quality of service requirements. It provides an appreciation of performance issues in networks, and competence in the use of techniques to analyze and optimize performance.

Prerequisites or co-requisites :	NET 323D	**required, elective, or selected elective**	Elective

Outcomes	Students who successfully complete this course will be able to: 1. Recognize business goals and constrains. 2. Compare technical goals and different tradeoffs. 3. Explain differences for existing internetworks. 4. Understand the design of a network topology. 5. Classify different protocols for switches and routers 6. Implement network security strategy. 7. Describe LAN's hierarchical models, and secure models. 8. Recognize LAN's types. 9. Differentiate between different LAN's hardware. 10. State the WAN technology concepts. 11. Distinguish between WAN's connection options. 12. Understand the configuration of the frame relay 13. Stating the design models for the WLAN. 14. Compare between the WLAN's models. 15. Describe the traffic flow. 16. Check the traffic load. 17. Apply different networks using Wireshark or OPNET
Topics	• **Identifying customers' needs and goals:** analyzing business goals and constraints, analyzing technical goals and tradeoffs, analyzing existing internetworks • **Logical network design:** design a network topology, design models for addressing and numbering, selecting switching and routing protocols, developing network security strategy, developing network management strategy • **LAN design:** hierarchical models, redundant models, secure models, LAN types (large buildings and campus LANs, small remote sites), LAN hardware (repeaters, switches, bridges, routers). • **WAN:** WAN technology concepts (physical layer, data link layer, switching), WAN connection options (dedicated connection link options, circuit-switched connection options, packet switched connection options, Internet connection options, choosing a WAN link connection), frame relay (basic frame relay concepts, configuring a frame relay network) • **WLAN:** wireless design models, topologies, and infrastructures, service sets (base station, SSID distributed system, infrastructure, AD Hoc mode), WLAN design modes (site-to-site connections, point-to point, point-to-multipoint), wireless mesh networks, evolution of WLAN models. • **Network traffic**: traffic flow (terminal/host traffic, client server traffic, peer to peer traffic, server/server traffic, distributed computing traffic flow, traffic flow in Voice over IP), traffic load (calculating theoretical traffic load, estimating theoretical load by routing protocols, traffic behavior). • **Analysis and design tools:** Wireshark and OPNET 2

Course	No. :	NET 434 D	Credit hours :3		Contact hours:	3,1
	Name :	Internet Architecture		Instructor :		

Text book or Reference	Sam Halabi, Danny McPherson, "Internet routing architectures" ,2nd Edition, CISCO press, ISBN 1-57870-233-X Analyst Study Guide" ,2010
Course Description	The course is intending to cover internet design principles, internet routing design, and internet application protocols

Prerequisites or co-requisites	NET 323 D	**required, elective, or selected elective**	**Elective Course**

Outcomes	Students who successfully complete this course will be able to: 1. Recognize internet architecture 2. Stating internet and the layering principles 3. Explain about internet and end-to-end arguments 4. Summarizing modularity and layering in a network architectures. 5. Exemplify internet integrated design. 6. Describing of routing 7. Exemplify border gateway protocol V4. 8. Recognize tuning BGP capabilities. 9. Compare controlling routing inside the autonomous system 10. Evaluate the interaction of non BGP routers with BGP routers 11. Paraphrasing route reflectors, and IGP expansions 12. Stating the different protocols for the internet application layer 13. Compare different application layer protocols, MIME and SNTP

Topics	• **Original architecture of the Internet:** introduction, Internet and the layering principle, Internet and the end-to-end arguments • **Internet design principles:** modularity, integrated design, layering, modularity and layering in network architectures, end-to-end arguments • **Interdomain routing basics:** overview of routing, border gateway protocol V4 • **Internet routing design:** tuning BGP capabilities, redundancy, symmetry, and load balancing, controlling routing inside the autonomous system, interaction of non BGP routers with BGP routers, BGP policies • **Controlling large-scale autonomous systems**: route reflectors, IGP expansions • **Internet application layer protocols:** MIME, SNTP, SMTP, SNTP, Telnet

Course	No.:	NET 435D	Credit hours:	3	Contact hours:	3,1
	Name:	Wireless Sensor Networks	Instructor:			

Text book or Reference	-Ian F.kyildiz, and M.Can Vuran , Wireless sensor networks, 2010. -C. Poellabauer , Fundamentals of wireless sensor networks. Theory and practice, 2010 Wiley.
Course Description	This course provides an overview of basic networking concepts, including network architecture, design, the layering concept in networking and how data transferring between devices.

Prerequisites or co-requisites	NET 222D	**required, elective, or selected elective**	Elective

Outcomes	By the completion of this course, the student will be able to: 1. Recognize sensors platforms. 2. State the features of wireless sensor networks (WSN). 3. Describe wireless technologies for WSN 4. Explain the different applications of WSN 5. State different types of WSN. 6. State the current challenges for WSN. 7. State the research trends for WSN. 8. Describe Layers of the WSN Protocol stack. 9. Interpret CSMA technique 10. Describe MAC protocol 11. Describe SMAC protocol 12. Describe TRAMA protocol 13. Recognize routing mechanisms for Wireless sensor networks 14. Differentiate between Flat, Hierarchical, and geographic routing protocols. 15. Differentiate between flooding and gossiping protocols. 16. Describe SPIN routing protocol. 17. Describe Leach routing protocol. 18. Describe Pegasis routing protocol. 19. Explain Geographic routing. 20. Differentiate between Greedy and Face routing. 21. Describe GPRS routing protocol. 22. State the features of operating systems for WSN 23. Describe the components of tinyOs 24. Describe the interfaces of tinyOs, configurations, and wiring. 25. Describe the configurations of tinyOs. 26. Describe the wiring of tinyOs. 27. State challenges for time synchronization in WSN 28. Describe Global Positioning System 29. Describe NTP protocol 30. Describe TPSN protocol 31. State the general characteristics of IEEE 802.15.4 standard. 32. Describe the supported topologies of IEEE 802.15.4 standard. 33. Describe the physical layer of IEEE 802.15.4 standard. 34. Describe MAC layer of IEEE 802.15.4 standard. 35. State the challenges for localization algorithms in WSN. 36. Differentiate between range-based, range free localization techniques. 37. Describe Time of arrival (TOA) ranging technique 38. Describe one way TOA technique 39. Describe two way TOA technique 40. Describe Received Signal Strength RSS technique.

Topics	-Introduction to the course content, text book(s), reference(s) and course plan.
	-Sensor networks: sensor platforms, WSN architecture and protocol stack, applications (military, environmental, health, home, industrial), factors influencing WSN design (hardware constraints, fault tolerance, scalability, power consumption, topology, transmission media)
	-MAC protocols: challenges for MAC, CSMA, SMAC, and TRAMA.
	-Network layer: challenges for routing, data centric and flat architecture protocols (flooding, gossiping, SPIN), hierarchical (Leach, Pegasis), geographic routing, energy efficient routing protocols.
	-Location and positioning in wireless sensor networks: greedy and face routing protocols.
	-TinyOs concepts and programming: components, interfaces, configurations, and wiring.
	-Time synchronization in wireless sensor networks: challenges for time synchronization, Network Time Protocol, Timing Sync Protocol for WSN.
	-IEEE 802.15.4 standard: general characteristics, supported topologies, physical, and Mac layers overview.
	-Localization: challenges, ranging techniques, range based localization techniques, range free localization techniques**.**

Course	No. :	NET 436D	Credit hours:	3	Contact hours:	3,1
	Name :	Optical Networks		Instructor :		

Text book or Reference	Textbook: - Rajiv Ramaswani ,Kumar N. Sivarajan, Galen H. Sasaki, "Optical Networks. A practical perspective" , Morgan Kauffman publishers, 3rd Edition. References: - Optical Fiber Communication, Gerd Keiser, Mc-Graw Hill, Last edition.John R. Vacca, " Optical Networking. Best practices Handbook" , John Wiley & Sons publisher, 2007.
Course Description	The course covers underlying and fundamental light characteristics concepts. And demonstrates components, types, and communication of fiber optics which support modern wireless communication systems and networks. Some of the basic knowledge of some networks (SONET/SDH) has been described in this course. The focus for optical networking fundamentals is on the physical layer of the network protocol stack. The optical line terminal and optical line amplifier of WDM networks is studied in this course.

Prerequisites or co-requisites	NET 222D	required, elective, or selected elective	Elective

Outcomes	By the completion of this course, the student will be able to:
	1. describing light as an electromagnetic wave
	2. describing the polarization of light wave
	3. explain the interference effects on light wave
	4. Explain the basic elements of optical fiber transmission link
	5. Explain the fiber modes
	6. Stating the basic operating principles of single mode and multimode fibers.
	7. Describe the different Transmission constraints
	8. Compare between different types of propagation
	9. Stating the difference between the couplers, isolators and circulators
	10. Explain the principle of operation of multiplexers and filters
	11. Stating the advantages and disadvantages of optical amplifiers
	12. Compare between the different types of optical amplifiers
	13. Explain the different components of digital communication optical system
	14. Explain the transmitters and detectors, switches, wavelength converters.
	15. Explain the switches and wavelength converters.
	16. Describing the interaction between optical components and IP
	17. Explain light path routing solution,
	18. Explain the OSPF enhancements
	19. Stating the different types of IP links
	20. Discriminate between the control channels, data channels,
	21. Explain the integrated optical networks
	22. Recalling the modulation
	23. Explain the subcarrier modulation and multiplexing
	24. Stating spectral efficiency
	25. Explain the spectral efficiency
	26. Explain the error detection and correction.
	27. Explain the time division multiplexing,
	28. Differentiate between the VCAT and LCAS,
	29. Describe the SONET/SDH layers,
	30. Explain the SONET frame structure,
	31. Explain the SONET/SDH physical layer,
	32. Discriminate the elements of a SONET/SDH infrastructure
	33. Explain the optical line terminal.
	34. Distinguish between the different types of optical line amplifiers.
	35. Explain the Add/Drop multiplexers
	36. Explain the cross-connects.
Topics	- Light Characteristics: light as an electromagnetic wave, polarization, interference
	- Fiber Optics: Modes, Transmission constraints (fiber-optic cable modes, fiber optic glass, plastic optical-fiber, fluid-filled fiber optics, transmitting light on a fiber, light propagation in multimode fiber, single mode propagation)
	- Fiber Optics Components: couplers, isolators and circulators, multiplexers and filters, optical amplifiers, transmitters, detectors, switches, wavelength converters.

	- Optical networking fundamentals: interaction between optical components and IP, light path routing solution, OSPF enhancements/ IS-IS, IP links, control channels, data channels, integrated optical networks - Fiber Optics Communications: modulation, subcarrier modulation and multiplexing, spectral efficiency, demodulation, error detection and correction. - SONET/SDH Networks: multiplexing, VCAT and LCAS, SONET/SDH layers, SONET frame structure, SONET/SDH physical layer, elements of a SONET/SDH infrastructure - WDM Networks: optical line terminal, optical line amplifiers, Add/Drop multiplexers, cross-connects.

Course	**No. :**	NET 461 D	**Credit hours :**	**3**	**Contact hours:**	3,1
	Name :	Entrepreneurship and New Venture Creation in IT	**Instructor :**			

Text book or Reference	New venture creation :entrepreneurship for the 21 century,jefrry A.Timmons and Stephen Spinelli,Jr.McGraw-Hill
Course Description	Critical foundation for the study in investigation of business; basic knowledge and understanding of economic, sociological, psychological and managerial theories of enterprise creation and development with a particular (but not exclusive) focus on the creation of small nosiness; Theoretical and policy frameworks for the study of entrepreneurship, defined as new venture creation and innovative growth relating to different types of organizations.
Prerequisites or co-requisites	NET 201 D	**required, elective, or selected elective**	elective

Outcomes	Students who successfully complete this course will be able to: 1- Describe the role and skills of entrepreneur and cultivate an entrepreneurial mindset. 2- Explain principles and dynamics of various functions of business (e.g. marketing, accounting, operations and HRM) to create value added product and services 3- Identify, asses and evaluate business opportunities and construct a robust business plan 4- Describe the implications of various business ownership and financial structures. 5- Describe the various venture capital opportunities including (venture capitalist, angel investors, IPO in the stock market and conventional lending instructions). 6- Describe the role of CIO and CKO within a business structure
Topics	• Introduction to the course content, text book(s), reference(s) and course plan. • Entrepreneurship conceptual aspects • Entrepreneurial Characteristics Amidst Global Challenges • Entrepreneurial process & entrepreneurship development • The Opportunity: Creating, Shaping, Recognizing, Seizing • Preparing for an entrepreneurial career: • Crafting the Business Plan • Institutional infrastructure to promote entrepreneurship • Financing Entrepreneurial Ventures • Obtaining Venture and Growth Capital • Emerging trends in Entrepreneurship