Department of Computer Networks and Communications

I

First Semester (IT Core)			
Course #	**Course Title**	**Pre-Req.**	**Cr.**
IT101	IT Foundations	----	3
IT111	Programming I	----	4
GE111	English I	----	3
GS111	Calculus I	----	3
GE101	Arabic I	----	3
GE131	Political culture I	----	1
	Semester Credit Hours		**17**

Second Semester (IT Core)			
Course #	**Course Title**	**Pre-Req.**	**Cr.**
IT112	Programming II	IT111	4
IT121	Digital and Logic Design	IT101	3
GS112	Calculus II	GS111	3
GS141	General Physics I+Lab I	-	4
GE112	English II	GE111	3
GE132	Political culture II	GE131	1
	Semester Credit Hours		**18**

II

First Semester (Specialization)			
Course #	**Course Title**	**Pre-Req.**	**Cr.**
IT212	Data structures and algorithms	IT112	3
IT201	Discrete Math and Structures.	GS111 IT111	3
GS221	Probability and Statistics	GS112	3
GE231	Political culture III	GE132	1
CN261	Electric basics	GS141	3
CN281	Internet Programming	IT112	3
	Semester Credit Hours		**16**

Second Semester (Specialization)			
Course #	**Course Title**	**Pre-Req.**	**Cr.**
IT222	Computer Organization	IT221	3
IT271	Network Fundamentals	IT221	3
GE232	Political culture-IV	GE231	1
GE311	Technical writing	GE112	3
CN262	Theory of Signals and Systems	CN261	3
CN271	Intro. to Stochastic & Random process	GS221	3
	Semester Credit Hours		**16**

III

First Semester (Specialization)			
Course #	**Course Title**	***Pre-Req.***	**Cr.**
IT341	Database systems	IT212	3
IT322	Operating systems	IT222	3
CN321	Network Protocols	IT271	3
CN311	Networks Lab 1	IT271	1
CN382	Advanced Internet Programming	CN281	3
CN371	Digital Communications	CN262 CN271	3
	Semester Credit Hours		**16**

Second Semester (Specialization)			
Course #	**Course Title**	***Pre-Req.***	**Cr.**
IT342	Security principles and practices	IT271	3
IT301	Computing ethics& society	IT101	3
CN331	Wireless and Mobile Communications	CN371 CN321	3
CN322	Network lab 2	CN311 CN321	1
CN312	Network operating systems software	IT322 CN322	1
	Dept Elective I		3
	Semester Credit Hours		**14**

IV

First Semester (Specialization)			
Course #	**Course Title**	***Pre-Req.***	**Cr.**
IT492	Internship	*90 Cr. Hrs*	3
CN498	Introduction to Project	*90 Cr. Hrs*	3
CN483	Mobile Commerce	IT342 CN281	3
CN473	Networks Lab 3	CN322	1
	Dept Elective II		3
	Breadth Elective I		3
	Semester Credit Hours		**16**

Second Semester (Specialization)			
Course #	**Course Title**	***Pre-Req.***	**Cr.**
IT499	IT Capstone Project	CN498	4
CN413	Network Planning and Deployment	CN321 CN473	3
CN441	Network Security	CN322 IT342	3
CN484	Mobile Computing	CN382 CN483	3
	Dept Elective III		3
	Breadth Elective II		3
	Semester Credit Hours		**19**

*Total Number of Hours Achieved = **132** Hrs.*

- **Computer Networks and Comm. courses: Compulsory courses (43 credits)**

C.N	Course Name	Credits	Pre-requests
CN261	Electric basics	3	GS141
CN281	Internet Programming	3	IT112
CN262	Theory of Signals and Systems	3	CN261
CN271	Intro. to Stochastic & Random process	3	GS221
CN321	Network Protocols	3	IT271
CN311	Networks Lab. (lab 1)	1	IT271
CN382	Advanced Internet Programming	3	CN281
CN371	Digital Communications	3	CN262, CN271
CN331	Wireless and Mobile Communications	3	CN321, CN371
CN322	Network lab 2	1	CN321, CN311
CN312	Network operating systems software	1	IT322, CN322
CN498	Introduction to Project	3	90 Cr. Hrs
CN441	Network Security	3	IT342, CN322
CN473	Network lab 3	1	CN322
CN413	Network Planning and Deployment	3	CN321, CN473
CN483	Mobile Commerce	3	IT342, CN281
CN484	Mobile Computing	3	CN382 , CN483
	Total	43	

- **Computer Networks and Comm. elective courses: Select (9 credits)**

C.N	Course Name	Credits	Pre-requests
CN414	Network Management and Evaluation	3	CN473
CN415	Network optimization	3	CN321
CN443	Authentication and Payment Protocols	3	CN483
CN451	Network Programming	3	CN382
CN472	Multimedia Communications	3	CN441
	Optical Communication Systems	3	CN371
CN475	Satellite Communications Principle	3	CN371 , CN331
CN491	Current issues in IT	3	90 credits
CS451	Intelligent Systems	3	IT201,IT211
CS471	Distributed Systems	3	IT322

- **Breadth Electives**

Students must select **two** courses from the other departments, only **one** course from the same department.

- **Note**: students of CN department should note that:

  - **(GS291 Business Basics)** is a **Breadth Elective** course for CN students
  - **(IT211 Programming III)** is a **Department Elective** course for CN students

Information System students must complete a total of 132 credits.

Courses Descriptions

CN261	* Electric Basics
3 Lecture hours per week, 3 Credits	*Prerequisite(s) : GS141*
Contents:	
Introduction to electric voltage, current, power. Basic passive circuit elements, circuit analysis techniques, KVL, KCL. AC and DC analysis. First order and second order circuits transient and steady state response/Active circuit elements i.e. op-amp.	

CN262	* Theory of Signals and Systems
3 Lecture hours per week, 3 Credits	*Prerequisite(s) : CN261*
Contents:	
The concept of signals and systems, both continuous and discrete-time; signal manipulation; signal symmetry and orthogonality; system linearity and time invariants; system impulse response and step response; frequency response, sinusoidal analysis, convolution, and correlation; sampling in time and quantizing in amplitude; Laplace transform; Fourier analysis, filters; analysis of discrete time signals and systems using z-transforms; inverse transformation procedures.	

CN271	* Stochastic and random process
3 Lectures + 1 Lab. hours per week, 3 Credits	*Prerequisite(s) : GS221*
Contents:	
Introduction to probability: Axioms, sample spaces, events, and set operations, sample spaces with equally likely outcomes. Conditional probability, independence, and Bayes' theorem, Random variables, probability mass and probability density. Expected values. Collections of random variables, joint and marginal probability, correlation and regression. Confidence intervals. Introduction to random processes, stationarity and ergodicity, Poisson process, birth-death process, and queues.	

CN281	* Internet Programming
3 Lectures + 1 Lab. hours per week, 3 Credits	*Prerequisite(s) : IT112*
Contents:	
This is an introductory course of web application development; this includes the web design methods (i.e. WISDOM, Storyboard, Flowcharts…etc) and some important design issues (usability and accessibility). In addition, the course should cover the basic fundamental issues of client/server architectures. The students should study tools and techniques for building Internet websites, including HTML, CSS, JavaScript, XML, XSLT, and some basic fundamental of server scripting languages (PHP, ASP.NET, JSP and servlet).	

CN311	* Networks Lab. I
2 Lab. hours per week , 1 Credit	*Prerequisite(s) : IT271*
Contents:	
Network terminology and protocols, Local-area networks (LANs), Wide-area networks (WANs), Cabling (cabling tools), Ethernet, Internet Protocol (IP) addressing, Network standards.	

CN312	* Network Operating Systems Software
3 Lab. hours per week, 1 Credit	*Prerequisite(s) : IT322, CN322*
Contents:	
Fundamental concepts of system administration. Design and administration of network servers and workstations. Focus on basic network concepts such as user account administration, resource allocation, security issues, and Internet service management. Lecture and laboratory.	

CN321	* Network Protocols
3 Lecture hours per week, 3 Credits	*Prerequisite(s) : IT271*
Contents:	
Computer Networks and the Internet, TCP/IP Reference Model, Network Layer and Routing; IPv4, IPv6, ARP, ICMP, DNS and NAT. Routing Principles and Protocols. Transport Layer; Transport Services, TCP and UDP. Fundamentals of Network Programming.	

CN322	* Network Lab 2
2 Lab. hours per week, 1 Credit	*Prerequisite(s) : CN311, CN321*
Contents:	
Introduction to Data Center room, introduction to switching technology, CLI using and management and working with FTP server, VLANs, Mac filter “switch security", Wireless (configure Access point 802.11b/g), Last mile technology (VDSL), back to back G.SHDSL, VPN, VOIP	

CN331	* Wireless and Mobile Communications
3 Lecture hours per week, 3 Credits	*Prerequisite(s) : CN321, CN371*
Contents:	
Introduction to wireless communication systems and networks. Cellular Wireless Networks and System Principles, Antennas and Radio Propagation, Signal Encoding and Modulation techniques, Spread spectrum, UTRA Spreading and Modulation, Coding and Error Control, Multiple access techniques. 1G, 2G, and 2.5G wireless systems (AMPS, GSM, GPRS, EDGE, etc.), The UMTS network and radio access technology, Wireless LANs, IEEE 802.1. VOIP, VOIP QoS issues. Mobile ad-hoc networks (MANets), The future of mobile communications.	

CN371	* Digital Communications
3 Lecture hours per week, 3 Credits	*Prerequisite(s) : CN262, CN271*
Contents:	
Introduction to basis of binary baseband digital modulation techniques, Introduction to TDM, quantization encoding (PCM, DM, DPCM). Digital carrier modulation schemes: ASK, FSK, PSK, DPSK, MSK. Introduction to M-ary baseband digital systems, QPSK, QAM, performance and comparison. Digital Hierarchy (SDH). Quantization noise.	

CN382	*Advanced Internet Programming
3 Lectures + 1 Lab. hours per week,3 Credits	*Prerequisite(s) : CN281*
Contents:	
This course will take students through the most important advance issues in internet programming, including concurrent programming, web distributed databases, security, collaborative computing, distributed object-oriented architectures, and network publishing. In addition, Web services issues and rational, XSLT, and XML processing, inc XML schema. Web services architecture inc. case studies. The course should cover in greater details the server side scripting (i.e. PHP, ASP.NET or JSP/Servlet); TCP/IP socket programming, CORPA and RMI.	

CN413	* Network Planning and Deployment
3 Lecture hours per week, 3 Credits	*Prerequisite(s) : CN321, CN473*
Contents:	
Network design for both wired and wireless communications. The design level of logical network design including topology, addressing models, protocol selection, security and management strategies. The physical network design involves selecting appropriate technologies. Testing and optimizing the overall design.	

CN414	Network Management and Evaluation
3 Lecture hours per week, 3 Credits	*Prerequisite(s) : CN473*
Contents:	
Reliability concepts; Architectures for system observation and control; System utilization; Protocols for network management, CMIP and SNMP; Network mananggement, CMIP and SNMP; Network management and performance evaluation software systems.	

CN415	Network optimization
3 Lecture hours per week, 3 Credits	*Prerequisite(s) : CN321*
Contents:	
Fundamental optimization techniques. Network Optimization: Shortest paths. Network flow: Maximum Flow, Minimum Cost Flow. Graph Coloring. Matching. General Modeling. Piecewise-linear. Knapsack. Set Packing/Covering/Partitioning. Assignment. Scheduling. Traveling salesman problem. Introduction to Dynamic Programming. Search Heuristics	

CN441	* Network Security
3 Lecture hours per week, 3 Credits	*Prerequisite(s) : IT342, CN322*
Contents:	
A comprehensive treatment of network security. Topics include remote access security, DMZ, firewalls, VPNs, PKI architecture, X.509 Public key infrastructure, web security, S-HTTP, SSL, TTLS, intrusion detection systems, extrusion detection systems, electronic mail seuciry, PGP, PEM, S/MIME, routing protocol security, wireless network security, traffic analysis tools and alert tools. Smart Card Security; GSM and mobile communications security; AusCERT and Global Security Coordination.	

CN443	Authentication and Payment Protocols
3 Lecture hours per week, 3 Credits	*Prerequisite(s) : CN483*
Contents:	
The Secure Socket Layers (SSL) Protocol : motivation, basic operation, session establishment, session caching, and basic performance analysis; The transport Layer Security Protocol (TLS) and SSL; The Secure Electronic Transactions (SET) payement Protocol: motivation, basic operation, SET cryptographic operations, and basic performance analysis.	

CN451	Network Programming
3 Lectures + 1 Lab. hours per week,3 Credits	*Prerequisite(s): CN382*
Contents:	
Introduction to distributed systems, Client/Server – Structures, Middleware. Internet – applications. Client/Server – Programming, Multimedia-Network (A/V Streaming, RTP, QoS), Remote Procedure Call (RPC). Web Services. Lab. (Analysis Internet applications with SNIFFER, Client/Server – Programming with Windows Sockets, Web Services with Microsoft .NET)	

CN472	Multimedia Communications
3 Lecture hours per week, 3 Credits	*Prerequisite(s) : CN441*
Contents:	
Fundamental technologies for video communications and networking: How to efficiently represent and process video signals, and how to deliver video signals over networks. Topics to be covered include: introduction to video systems, Fourier analysis of video signals, properties of the human visual system, motion estimation, basic video compression techniques, video communication standards, and video transport over the Internet , voice-over-IP and wireless networks.	

CN473	*Network lab 3
2 Lab. hours per week, 1 Credit	*Prerequisite(s) : CN322*
Contents:	
Command-line interface configuration of Routers, router configurations, Routing protocol configuration (RIP v2, OSPF), Vlan, NAT and access control lists (ACLs), Firewall Policies and inspection and VPN tunneling.	

CN474	Optical Communication Systems
3 Lectures + 1 Lab. hours per week,3 Credits	*Prerequisites : CN371*
Contents:	
Overview of optical communication systems, Review of optics, Characteristics of optical fibers. Optical waveguides, Optical sources and transmitters, Optical detectors and receivers, Optical amplifiers, Noise and detection, Dispersion in optical communication systems, Optical link design.	

CN475	Satellite Communications Principle
3 Credits	*Prerequisite(s) :* CN371 , CN331
Contents:	
This course provides in depth a strong background of modern satellite communications techniques and fundamentals, the course will discuss satellite basic transmission, coding, and satellite services techniques, and an overview of commercial and military satellite orbits and transponders. As well the course will provide a brief knowledge or introduction to radar systems technique	

CN483	* Mobile commerce
3 Lecture hours per week, 3 Credits	*Prerequisite(s) : IT342, CN281*
Contents:	
E-Business, E-Commerece, M-Education, Wireless Data Communication, 3A(Anywhere, Anytime and Any device), 3G, WAP, XML, WML, Smartcards, Business Applications: Banking, Fiance, Hospitality, Manufacturing, facility management, Customer Relationship Management (CRM), Sale Force Automation (SFA), Field Force Automation (FFA), Retail and Distribution, Data Synchroniyation, Mobile Security, Ciphers, Cryptosystems, Digital Signature , PKI, CA, SSl, SET.	

CN484	Mobile Computing
3 Lectures+1 Lab. hours per week,3 Credits	*Prerequisite(s):* CN382 , CN483
Contents:	
This module provides an overview of mobile computing technology as it exists today and reviews the promises of tomorrow. Included is a discussion on (a) wireless network advances for circuit switched and packet switched technologies, (b) wireless wide area network (WWAN) compared to wireless local area network (WLAN), (c) mobile network summary, (d) Bluetooth Piconet, (e) wireless personal digital assistants (PDAs) along with "success stories of users increasing productivity", (f) cellular data networks and their evolution (CDMA, GSM, TDMA, PDC), and (g) 1G, 2G, 2.5G, 3G technologies (international mobile telephone, enhanced data rates for global evolution, wideband CDMA, synchronous time division, IP networks), and finally the course will cover the development cycle of mobile application using Mobile.NET or JavaME.	

CN491	Current issues in IT
2 Lecture hours per week, 3 *Credit*	*Prerequisite(s):* 90 credits.
Contents:	
In-depth up-to-date studies of latest advances in selected topics in computer networking. The topics vary by semester. Issues related to security, Ad hoc networks, mobility, QoS, multimedia transport over wireless will also be discussed.	

CN498	* Introduction to Project
3 Credits	*Prerequisite(s) :90* **credits**
Contents:	
This course is a preparation to the Project IT499 and by the end of the course, the student should present his project Idea, goal and the plan for the work. This course includes project may be undertaken individually or in small groups.	