Course Title: Computer Networks
Course no: CSC-301   **Full Marks**: 70+10+20
Credit hours: 3   **Pass Marks**: 28+4+8
Nature of course: Theory (3 Hrs.) + Lab (3 Hrs.)

Course Synopsis: Discussion on types of networking techniques, Internet, IPV.

Goal: This course introduces concept of computer networking and discuss the different
          layers of networking model.

Course Contents:

Unit 1.   **33 Hrs.**

   1.1 Computer Network: Introduction to networking, computer network, Internet, the
       network edge: end system, clients, server, connection oriented and connectionless
       service, network core, network access and physical media, ISPs and back bone.

   1.2 Protocol Layers: Introduction, layered architecture, The Internet protocol stack,
       network entities and layers.

   1.3 Application Layer: Introduction, principles of application layer protocols, the web
       and HTTP, file transfer, Domain Name Service [DNS]: Working of DNS, DNS
       records, DNS messages.

   1.4 Transport Layer : Introduction, relationship between transport layer and network
       layer, transport layer in the Internet, multiplexing and demultiplexing,
       connectionless transport, reliable data transfer: Building a reliable data transfer
       protocol, pipelined reliable data transfer protocol, **Go-Back-N (GBN), selective
       repeat (SR)**, **connection oriented transport : TCP** , TCP connection, TCP
       segment structure, time estimation and time out, flow control, Principle of
       congestion control: Tha causes and costs of congestion, approaches to congestion
       control.

   1.5 Network Layer : Introduction, network service model, datagrams and virtual
       circuit service, routing principles: A link state routing algorithm, the distance
       vector routing algorithm, hierarchical routing, The Internet protocol (IP): IPV4
       addressing, datagram format, IP datagram fragmentation, Internet Control
       Message Protocol [ICMP], Network address translator, routing in the Internet,
       IPV6, Multicasting routing.

Unit 2.   **12 Hrs.**

   2.1 Link Layer and Local Area Networks: Introduction, Data link layer: the services
       provided by the link layer, error detection and error correction techniques,
       multiple access protocols, LAN addresses and Address Resolution Protocol,
       Ethernet, Wireless Links: IEEE 802.11b, Bluetooth, point to poin protocol (PPP),
       Asynchronous Transfer Mode (ATM), frame relay.

2.2 Multimedia Networking: Introduction, multimedia networking application, streaming audio and video.

2.3 Network Management: Introduction, The infrastructure for network management.

Laboratory works: Developing the network system in the small scale.

Text Books: Computer Networking; A Top Down Approach Featuring The Internet, 2nd Edition, Kurose James F., Ross W. Keith PEARSON EDUCATON ASIA

Homework Assignment: Assignment should be given from the above units in throughout the semester.

Computer Usage: No specific

Prerequisite: C, Digital logic

Category Content: Science Aspect: 50%
Design Aspect: 50%

Course Title: Simulation and Modeling
Course no: CSC-302   **Full Marks**: 70+10+20
Credit hours: 3   **Pass Marks**: 28+4+8

Nature of course: Theory (3 Hrs.) + Lab (3 Hrs.)

Course Synopsis: This course provides the discrete and continuous system, generation of random variables, analysis of simulation output and simulation languages.

Goal: This course will provide students the concepts of simulation.

Course Contents:

Unit 1. Introduction to Simulation   6 Hrs.

Continuous and discrete systems, System simulation, Real time simulation, Types of Simulation Models, Steps in simulation Study, Phases of a simulation study, Advantages of simulation, Limitations of the Simulation Technique, Areas of applications

Unit 2. Simulation of Continuous Systems   5 Hrs.
Queuing system, Markov chains, Differential and partial differential equations

Unit 3. Random Numbers   10 Hrs.

Random Numbers, Random Number Tables, Pseudo Random Numbers, Generation of Random Number, Testing Numbers for Randomness, Uniformity Test, Chi-square test, Testing for auto correlation, Poker Test

Unit 4. Verification and Validation of Simulation Models   6 Hrs.

Model building, verification and Validation, Verification of Simulation Models, Calibration and Validation of Models

Unit 5. Analysis of Simulation Output   8 Hrs.

Estimation methods, Simulation run statistics, Replication of runs, Elimination of internal bias

Unit 6. Simulation Languages   10 Hrs.

Basic concept of Simulation tool, Discrete systems modeling and simulation, Continuous systems modeling and simulation, Data and control, Hybrid simulation, Feedback systems: typical applications.

Text Books: Jerry Banks, John S. Carson, Barry L. Nelson, David M. Nicol "Discrete - Event system simulation", Pearson education.

References: G. Gorden, "System Simulation", Prentice Hall of India M. Law and R.F. Perry, "Simulation: A problem-solving approach", Addison Wesley publishing company.
M. Law and W.D. Kelton, "Simulation Modeling and analysis", McGraw Hill, 1991.

Laboratory works: Laboratory exercises using simulation and modeling packages and student also develop their own simulation software.

Course Title: Design and Analysis of Algorithms
Course no: CSC-303   **Full Marks**: 90+10
Credit hours: 3   **Pass Marks**: 36+4

Nature of course: Theory (3 Hrs.)

Course Synopsis: Methods and tools for analyzing different algorithms. Different approaches of designing efficient algorithms like divide and conquer paradigm, greedy paradigm, dynamic programming. Algorithms pertainig various problems like sorting, searching, shortest path, spanning trees, geometric problems etc. NP-complete problems.

Goal: Competency in analyzing different algorithms encountered. Ability to conquer the problem with efficient algorithm using the algorithm development paradigms.

Course Contents:

Unit 1.   **10 Hrs.**

   1.1   Algorithm Analysis: worst, best and average cases, space and time complexities. Mathematical background: asymptotic behavior, solving recurrences.

   1.2   Data Structures Review: linear data structures, hierarchical data structures, data structures for representing graphs and their properties. Search structures: heaps, balanced trees, hash tables.

Unit 2.   **14 Hrs.**

   2.1   Divide and Conquer: Concepts, applications, sorting problems(quick, merge), searching (binary), median finding problem and general order statistics, matrix multiplications.

   2.2   Greedy Paradigm: Concepts, applications, Knapsack problem, job sequencing, Huffman codes.

   2.3   Dynamic Programming: Concepts, applications, Knapsack problem, longest common subsequence, matrix chain multiplications.

Unit 3   **21 Hrs.**

   3.1   Graph Algorithms: breadth-first and depth-first search and their applications, minimum spanning trees (Prim's and Kruskal's algorithms), shortest path problems (Dijkstra's and flyod's algorithms), algorithm for directed acyclic graphs (DAGs).

   3.2   Geometric Algorithms: Concepts, polygon triangulation, Convex hull computation.

3.3 NP Completeness: Introduction, class P and NP, cooks theorem, NP complete problems: vertex cover problem.

3.4 Introductions: Randomized algorithms concepts, randomized quick sort, approximation algorithms concepts, vertex cover problem.

Textbook: T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, **Introduction to Algorithms,** 2nd Edition, MIT Press, 2001 ISBN: 0-262-530-910.

Reference: G. Brassard and P. Bratley, **Fundamentals of Algorithmics,** Prentice-Hall, 1996 ISBN: 0-13-335068-1.

Prerequisites: Good programming concepts (any language), Data structures and their properties, mathematical concepts like methods of proof, algorithmic complexity, recurrences, probability.

Assignments: This course deals with wide range of problem domain so sufficient number of assignments from each unit and subunit should be given to the students to familiarize the concepts in depth.

Lab: The motive of this course is to provide good theoretical and mathematical background of algorithms and their analysis, however it is advisable to provide programming assignments that aid the students learn the behavior of the algorithms.

Course Title: Knowledge Management
Course no: CSC-304   **Full Marks**: 90+10
Credit hours: 3   **Pass Marks**: 36+4

Nature of course: Theory (3 Hrs.)

Course Synopsis: Study of knowledge intensive organization, knowledge management
                    issues.

Goal: This course introduces fundamental concept of knowledge and different
            managerial issues in managing the knowledge.

Course Contents:

Unit. 1   **16 Hrs.**

   1.6   Introduction of Knowledge Management: Knowledge and its importance,:
          Definition of Knowledge, Knowledge management, From information to
          knowledge.

   1.7   The Knowledge Edge: A common theme, Intellectual Capital, Drivers of
          Knowledge Management, Knowledge-centric drivers, Technology drivers,
          Organizational structure based drivers, Personnel focused drivers, Process
          drivers, Economic drivers, Creating the knowledge edge.

   1.8   From Information to Knowledge: Different between knowledge and
          information, from data to knowledge, Types of knowledge, the three
          fundamental steps, Knowledge management systems and existing technology.
          Business and knowledge.

Unit 2:   **20 Hrs.**

   2.4   Implementing Knowledge Management: The 10 step knowledge management
          road map, Infrastructure evaluation, Knowledge management system analysis,
          Deployment, Metrics for performance evaluation.

   2.5   The Leverage Infrastructure: Leveraging the Internet, Aligning knowledge
          management and business strategy.
   2.6   Knowledge Management System Analysis, Design & Development:
          Infrastructural foundation, Knowledge audit and analysis, Designing the
          knowledge management team, Creating knowledge management system blue
          print, Developing the knowledge management system.

Unit 3:   **9 Hrs.**

   3.1   Knowledge Management System Development: Prototyping & development,
          Reward structure.

3.2   Metrics for Knowledge Work: Traditional Metrics, Pitfalls in choosing metrics.

3.3   Code Optimization: The principal sources of optimization, Optimization of basic blocks, loops in flow graphs.

Laboratory works: Developing small scale KM project.

Text / References books: The Knowledge Management Tool Kit, Amrit Tiwana, Pearson Education Asia

Homework Assignment: Assignment should be given from the above units in throughout the semester.

Computer Usage: No specific

Prerequisite: C, Management Information System

Category Content: Science Aspect: 60%
Design Aspect: 40%

Course Title: Microprocessor Based Design
Course no: CSC-305   **Full Marks**: 70+10+20
Credit hours: 3   **Pass Marks**: 28+4+8

Nature of course: Theory (3 Hrs.) + Lab (3 Hrs.)

Goal: The course objective is to apply the knowledge of microprocessor with other digital/analog system and interfacing to design a complete system.

Course Contents

Unit 1. Interfacing Concept   **4 Hrs.**

Interfacing, Interfacing Types, Address Decoding, I/O Mapping, Memory Mapping, I/O Memory Mapping, Registers and Input/output Registers, PC Interfacing Techniques.

Unit 2. Digital Interfacing   **12 Hrs.**

Input/output and Microcomputer, Simple input, Simple output, Programmable Parallel Ports, Handshaking, Single handshaking IO, Double handshaking IO, Introduction to Programmable Peripheral Interface 8255 A, Functional Block Diagram, Different Modes of Operations, Introduction to Programmable Interval Timer 8253 and Difference between 8253 and 8254, Functional Block Diagram, Different Modes of Operation, Keyboard Interfacing, Alphanumeric Display Interfacing, Microcomputer ports Interfacing to high-power devices.

Unit 3. Interrupts & Interrupt Controller   **6 Hrs.**

Interrupt Vector Tables, Types of Interrupts, Assembly Language program and Interrupt Procedure Hardware interrupts and Applications, Examples of Various ISR, Introduction to Programmable Interrupt Controller 8259, Functional Block Diagram, Operations of Interrupt, Programming of 8259

Unit 4. Analog Interfacing   **5 Hrs.**

Operational Amplifier Basics, Sensors and Transducers, Digital to Analog Conversion and Analog to Digital Conversion – Basics, Operations, Specification, Applications and Interfacing, A Microcomputer Based Industry-Process Control System.

Unit 5. Serial and Parallel Data Communication   **6 Hrs.**

Synchronous and Asynchronous Data Communication, Parity and other error control, Baud rates, Serial Interface Device, Serialization, RS 232 Interface Pin Description, Simplex Connection, Duplex Connection, Full Duplex Connection, Connection Between DTE to DTE, Connection to Printers and Zero Modem.

Unit 6. Microcontroller & Interfacing   **8 Hrs.**

General Microcontroller Concept, Pin Configuration, I/O Port Structure, Memory Organization, Special Function Registers, External Memory, Reset Operations, Instruction Set, Timer Operation, Serial Port Operation, Interrupt Design and Processing, Assembly Instructions and Programming.

Unit 7. Grounding and Shielding   **4 Hrs.**

Outline for grounding and shielding, Single point grounding and grouped loop, Noise, noise coupling mechanism and prevention, Filtering and smoothing, Different kinds of shielding mechanism, Protecting against electrostatic discharge, Line filters, isolators and transient suppressors

Laboratory works: Assembly language based programming. PPI, ADC and various interfacing with RS232, Printer Port should be experimented. At the semester end, individual project work based on microcontroller for industry process control should be done.

Lab exercise may comprise some of the followings:

1. Assembly language programming
2. Simple data transfer using PPI
3. Handshake transfer using PPI
4. Interfacing of A/D converter using PPI
5. Interfacing of A/D using Micro controller
6. Interfacing of A/D converter using Printer port
7. Demonstration of other interfacing techniques and devices
8. Writing an interrupt Service Routine

Text / Reference books:

1. D. V. Hall, **Microprocessors and Interfacing - Programming and Hardware**, McGraw Hill
2. K. J. Ayala, **The 8051 Microcontroller: Architecture, Programming and Applications**, West Publishing
3. K.R. Fowler, "*Electronic Instrument Design*", New York Oxford, Oxford University Press.
4. E.O. Duebelin, "**Measurement System Application and Design**" Tata McGraw Hill, New Delhi

Course Title: Applied Logic
Course no: CSC-306   **Full Marks**: 70+10+20
Credit hours: 3   **Pass Marks**: 28+4+8

Nature of course: Theory (3 Hrs.) + Lab (3 Hrs.)

Course Synopsis: This course contain the main feature of different logics.

Goal: The course objective is to provide the basic concepts and techniques of the logics used in computer science.

Course Contents:

Unit 1. Introduction   4 Hrs.

Introduction to Logic, Nature of Argument, Truth and Validity, Symbolic Logic, Statements, Conditional Statements, Statement Forms

Unit 2. Deduction and Deductive Systems   6 Hrs.

Formal Proof of Validity, The Rule of Replacement, The Rule of Conditional Proof, The Rule of Indirect Proof, Proofs of Tautologies, Formal Deductive Systems, Attribute of Formal Deductive Systems, Logicist Systems

Unit 3. Propositional Logic   6 Hrs.

Syntax of Propositional Logic, Semantics of Propositional Logic, Calculations, Normal Form, Applications

Unit 4. Predicate Logic   8 Hrs.

Predicate Logic, Order of Predicate Logic, Syntax of Predicate Logic, Semantics of Predicate Logic, Consequences, Calculations, Normal Form

Unit 5. Resolution & Proofs   10 Hrs.

Resolution, Resolution in Propositional Logic, Unification of Clauses, Resolution in Predicate Logic, Horn Clauses, Proof in Propositional Logic and Predicate Logic, Axiomatic Systems, Adequacy, Compactness, Soundness.

Unit 6. Program Verification   5 Hrs.

Issue of Correctness, Partial Correctness, Hoare Proof, Total Correctness.

Unit 7. Some Other Logics   6 Hrs.

Intuitionistic Logic, Lukasiewicz Logic, Probabilistic Logic, Fuzzy Logic, Default Logic, Autoepistemic Logic.

Laboratory works: Laboratory exercises should be conducted in any logic
programming language like LISP or PROLOG.

Text / Reference books:

1. Arindama Singh, **Logics for Computer Science**, Prentice Hall of India
2. Irving M. Copi, **Symbolic Logic**, 5th Edition, Prentice Hall of India

Course Title: E-Governance
Course no: CSC-307   **Full Marks**: 70+10+20
Credit hours: 3   **Pass Marks**: 28+4+8

Nature of course: Theory (3 Hrs.) + Lab (3 Hrs.)

Course Synopsis: This course contains concepts of E-Governance policies and data
                         warehousing / data mining.

Goal: To provide the knowledge of good governance using information and
           communication technologies and case studies of different countries.

Course Contents:

Unit 1. Introduction   **4 Hrs.**

E-Governance: Needs of E-Governance, Issues in E-Governance applications and the
Digital Divide; Evolution of E-Governance, Its scope and content; Present global
trends of growth in E-Governance: Other issues.

Unit 2. Models of E-Governance   **10 Hrs.**

Introduction; Model of Digital Governance: Broadcasting/ Wilder Dissemination
Model, Critical Flow Model, Comparative Analysis Model, Mobilization and
Lobbying Model, Interactive-service Model/Government-to-Citizen-to-Government
Model (G2C2G); Evolution in E-Governance and Maturity Models: Five Maturity
Levels, Characteristics of Maturity Levels, Key areas, Towards Good Governance
through E-Governance Models.

Unit 3. E-Governance Infrastructure and Strategies   **6 Hrs.**

E-readiness: Digital System Infrastructure, Legal Infrastructural Preparedness,
Institutional Infrastructural Preparedness, Human Infrastructural Preparedness,
Technological Infrastructural Preparedness; Evolutionary Stages in E-Governance.

Unit 4. Data Warehousing and Data Mining in Government   **5 Hrs.**

Introduction; National Data Warehouses: Census Data, Prices of Essential
Commodities; Other areas for Data Warehousing and Data Mining: Agriculture,
Rural Development, Health, Planning, Education, Commerce and Trade, Other
Sectors.

Unit 5. Case Studies   **20 Hrs.**

Nepalese Context: Cyber Laws, Implementation in the Land Reform, Human
Resource Management Software; India: NICNET, Collectorate, Computer-aided
Administration of Registration Department (CARD), Smart Nagarpalika, National
Reservoir Level and Capacity Monitoring System, Computerization in Andra

Pradesh, Ekal Seva Kentra, Sachivalaya Vahini, Bhoomi, IT in Judiciary, E-Khazana, DGFT, PRAJA, E-Seva, E-Panchyat, General Information Services of National Informatics Centre; E-Governance initiative in USA; E-Governance in China; E-Governance in Brazil and Sri Lanka.

Text / Reference books:

1. E-Governance: Concepts and Case Studies, C.S.R. Prabhu, Prentice-Hall of India Private Limited, 2004.
2. Backus, Michiel, e-Governance in Developing Countries, IICD Research Brief, No. 1, March 2001.

Course Title: Concepts of Wireless Networking
Course no: CSC-308   **Full Marks**: 70+10+20
Credit hours: 3   **Pass Marks**: 28+4+8

Nature of course: Theory (3 Hrs.)

Course Synopsis: This course contains the concept of wireless networking technology.

Goal: To provide the concept and working principle for wireless communication and networking.

Course Contents:

Unit 1. Introduction   4 Hrs.

History of wireless communication, Challenges in wireless communication networking, Wireless communication standards.

Unit 2. Wireless Channel Characterization   6 Hrs.

Multipath propagation environment, Linear time-invariant channel model, Channel correlation function, Large-scale path loss and shadowing, Small-scale multipath fading.

Unit 3. Bandpass Transmission Techniques   7 Hrs.

Introduction, Signal space and decision regions, Digital modulation, Power spectral density, Probability of transmission error.

Unit 4. Receiver Techniques for fading Dispersive Channels   5 Hrs.

Overview of channel impairment mitigation techniques, Diversity, Channel equalization.

Unit 5. Fundamental of Cellular Communications   8 Hrs.

Introduction, Frequency reuse and mobility management, Cell cluster concept, Cochannel and adjacent channel interference, Call blocking and delay at the cell-site, Other mechanism for capacity increase, channel assignment strategies.

Unit 6. Multiple Access Technologies   5 Hrs.

Multiple access in a radio cell, Random access, Conflict-free multiple access technologies, Spectral efficiencies.

Unit 7. Mobility Management in Wireless Networks   5 Hrs.

Introduction, Call admission control (CAC), Handoff management, Location management for cellular networks, Location management for PCS networks, Traffic calculation.

Unit 8. Wireless/Wireline Internetworking   **5 Hrs.**

Introduction, Mobile IP, Internet protocol (IP), Transmission control protocol (TCP), Network performance, Wireless application protocol (WAP), Mobile AD HOC networks.

Text / Reference books:

1. Wireless Communications and Networking, Jon W. Mark and Weihua Zhuang, Prentice-Hall of India Private Limited, 2005.
2. Principles of Wireless Networks, Pahlavan, Prentice-Hall of India Private Limited, 2005.

Course Title: International Business Management
Course no: MGT-309   **Full Marks**: 90+10
Credit hours: 3   **Pass Marks**: 36+4

Nature of course: Theory (3 Hrs.)

Course Synopsis: Examination and analysis of international business in its historical, theoretical, environmental, and functional dimensions. Topics include the nature and scope of international business; the institutional, socio-cultural, political, legal, ethical, and economic environments; trade, foreign investment, and development; transnational management, including global operations, strategic planning, human resources, marketing, and finance; and international business diplomacy and conflict resolution.

Goal: To develop the student's understanding of international business and the globalization of the economy. Students will learn fundamental concepts and procedures, which will help them analyzing the international opportunities.

Unit 1. Introduction to International Business   4 Hrs.

Unit 2. Global business Environment   7 Hrs.

The cultural environment, The political and legal environment, The economic environment

Unit 3. Global Trade and Investment   8 Hrs.

International trade theory, Government influence on trade, Regional economic integration, Foreign direct investment, International business negotiations and diplomacy

Unit 4. Financial Environment   4 Hrs.

Foreign exchange market, Determination of exchange rates

Unit 5. Choosing Where to Operate   4 Hrs.

Country evaluation and selection, Collaborative strategies, Control strategies

Unit 6. Management of Business Functions   8 Hrs.

Marketing, Export and import strategies, Global manufacturing, Global supply chain management

Unit 7. International Finance, Accounting and Taxation   6 Hrs.

Basic concepts of multinational companies, Multinational finance function, Multinational accounting and tax functions

Unit 8. International Human Resource Management   **4 Hrs.**

Textbooks: Daniels, John D., Radebaugh, Lee H. and Sullivan, Daniel P., **International Business Environments and Operations**, Pearson Education (Singapore), India, 2004 ISBN: 81-297-0411-0

References: Czinkota, Ronkainen, and Moffett, **International Business,** 4th Edition, Dryden 1996.
Hill, Charles, **International Business: Competing in the Global Marketplace**, 3rd Edition, Irwin.
Bennett, Roger, **International Business**, 2nd Edition, Pearson Education
Sharan, Vyuptakesh, **International Business: Concept, Environment and Strategy**, Pearson Education

Homework
Assignments: Home works shall be given to the students with emphasis on small cases.

Course Title: International Marketing
Course no: MGT-310   **Full Marks**: 90+10
Credit hours: 3   **Pass Marks**: 36+4

Nature of course: Theory (3 Hrs.)

Course Synopsis: Introduction to global marketing environment and related issues.

Goal: This course helps developing understanding of important international marketing
terms and concepts and the students ability to think and communicate in creative,
innovative and constructive ways about the concepts within international
marketing.

Unit 1. Introduction to Global Marketing   **4 Hrs.**

Marketing concept, Concept and importance of global marketing, Forces affecting
global marketing

Unit 2. Global Economic Environment   **4 Hrs.**

Economic system – Market allocation, command allocation and mixed system,
Market development stages, Marketing and economic development, Trade patterns –
Merchandise and services trades, International trade alliances, World Trade
Organization (WTO), Regional trade group/agreements

Unit 3. Social–Cultural Environment and Global Marketing   **4 Hrs.**

Basic understanding of society and culture, Impact of social and cultural environment
in marketing industrial and consumer product

Unit 4 Political and Legal Environment of Global Marketing   **4 Hrs.**

Political environment – Nation state and sovereignty, political risk, taxes dilution of
equity control and expropriation, Legal environment – International law, intellectual
property, antitrust, bribery and corruption and dispute settlement

Unit 5. Global Information System and Marketing Research   **3 Hrs.**

Sources of market information, Marketing research

Unit 6. Segmentation, Targeting and Positioning   **4 Hrs.**

Market segmentation, Global targeting, Global product positioning

Unit 7. Global Marketing Strategy   **3 Hrs.**

Sourcing: Exporting and importing, Market expansion strategies

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Unit 8. Product and Pricing Decisions   **5 Hrs.**

Basic concepts of products, Product positioning and product design considerations, Basic concepts of pricing, Environmental influence on pricing decisions, Global pricing objectives and strategies

Unit 9. Global Channel and Logistics   **4 Hrs.**

Basic concepts of global marketing channels, Basic concepts of physical distribution and logistics

Unit 10. Global Advertising and E-Marketing   **4 Hrs.**

Global advertising and branding, Basic concepts of e. marketing

Unit 11. Management of Global Marketing   **4 Hrs.**

Textbooks: Keegan, Warren J., **Global Marketing Management**, Prentice-Hall of India, New Delhi, 2003, ISBN: 81-203-2066-2

References: Cateora, Philip R. and Graham, John L., **International Marketing**, Burr Ridge, Illinois: McGraw-Hill Publishers, 2005 ISBN: 0-07-283371-8

Homework
Assignments: Home works shall be given to the students with emphasis on small cases.

Course Title: Computer Hardware Design
Course no: CSC-312   **Full Marks**: 90+10
Credit hours: 3   **Pass Marks**: 36+4

Nature of course: Theory (3 Hrs.)

Course Synopsis: To introduce students to theoretical and practical concepts relevant
                       to the structure and design of modern digital computers. The course
                       covers computer architecture from gate-level logic through processor
                       design to multiprocessor and network issues.

Goal: This course will make the student able to design the hardware components.

Course Contents:

Unit 1. Introduction, Computer Abstractions and Technology   2 Hrs.

   Hierarchical approach to understanding & designing a complex system, Software,
   Hardware, Computer components, Processor: Control, Data path. Memory, Input &
   output, Components of retail price in the computer industry, Overview of computer
   hardware, IO, Computer processors; CISC, RISC, DSP, Hybrid, Measuring
   performance. Execution time, Operations per second, Throughput, Real-time
   computing and performance metrics

Unit 2. Digital Logic Design   6 Hrs.

   Gates, truth tables, and logic equations, Combinational logic and basic components.
   PLAs and ROMs, Memory elements. Finite state machines

Unit 3. Data Representation, Manipulation and Addressing   6 Hrs.

   Signed and unsigned numbers, Addition and subtraction. Design of ALUs.
   Multiplication. Floating-point representation, Addressing: An application of unsigned
   integers: Byte-addressed memory, Byte ordering conventions, Big-endian, Little-
   endian, Pointers: Address vs. contents, Signed representations of integers

Unit 4. Basic Processor Design   12 Hrs.

   Design of the datapath of an ALU that executes the add, sub, and, or instructions,
   Control signals for the ALU, State elements and clocking,
   Block view of a single-clock-cycle processor datapath, Control of the single-clock-
   cycle implementation, Control of the multiple-clock-cycle implementation,
   Exceptions and interrupts, Karnaugh maps, Multiplexors, Adders, Decoders, Data
   paths. Single-cycle, control. Multi-cycle control, Microprocessor design:
   Microprogramming, Hardwired programming. Parallel processors, SIMD computers--
   Single Instruction Stream, Multiple Data Streams, MIMD Computers--Multiple
   Instruction Streams, Multiple Data, Streams; Programming MIMDs, MIMDs

connected by a single bus, MIMDs connected by a network, Future directions for parallel processors, Programming for parallel processors in a higher-level language

Unit 5. Sequential Logic Circuits   5 Hrs.

Outputs and next state as vectors of Boolean functions of inputs and present state, Latches: Set and reset latches, SR latch, CSR latch, JK latch, D latch, Master-slave D flip-flop, Lightning introduction to finite state machines

Unit 6. Pipelining   5 Hrs.

A pipelined data path, Pipelined control, Visualization of pipelined data flow, Pipeline diagrams, Gantt charts, Data hazards, Compiler elimination of data hazards, Hardware control for data hazards: Reducing data hazards: Forwarding, Branch hazards, Performance of pipelined systems, Programming for a pipelined processor in a higher-level language

Unit 7. Memory Hierarchies   3 Hrs.

Hardware implementations of 1-bit memory, DRAM, SRAM, ROM, Hardware implementations of multiple-bit memory, DRAM, SRAM, ROM, SRAM and DRAM chip and system architectures, System bus architectures (processor to/from memory), Hierarchical memory systems, The processor-memory speed gap, Interleaved memory, Caches, Direct-mapped caches, Fully associative caches Set-associative caches, Virtual memory, A common framework for memory hierarchies

Unit 8. Multiprocessors   2 Hrs.

Single-bus networks, Cache consistency, Networks and clusters.

Unit 9. Introduction to Assembly Language   4 Hrs.

Instructions, The fetch-execute cycle, Format of an assembly-language program, Comments, Directives, Data declarations in SPIM, Executable instructions, Survey of differences between SAL (Simple Abstract Language), human-coded MIPS assembly language, and true MIPS assembly language, Load-store architectures, Addressing modes, MIPS addressing modes and the corresponding formats in assembly language and object code, Implementation of I/O, Arrays, Usage of arithmetic and logical instructions in SAL, Branch instructions in SAL and SPIM, Stacks, Support for procedures in computer hardware, Alternatives to the MIPS approach

Textbooks: David A. Patterson and John L. Hennessy. "**Computer Organization and Design: The Hardware/Software Interface**"

References: M. M. Mano "**Digital logic Design**"
Prerequisite(s):

Fundamentals of design methodology and descriptive tools; performance and cost; overview of instruction set issues; processor implementation techniques; memory hierarchy; input/output; parallel computer systems, introduction to formal computer aided design tools and simulations.

Course Title: Introduction to Cryptography
Course no: CSC-313   **Full Marks**: 70+10+20
Credit hours: 3   **Pass Marks**: 28+4+8

Nature of course: Theory (3 Hrs.) + Lab (3 Hrs.)

Goal: The course objective is to familiarize basic concepts of cryptography so as the students can use their understanding for information security purpose.

Course Contents:

Unit 1. Introduction   **4 Hrs.**

Security, Attacks, Attack Types, Viruses, Worms, Trojan Horses, Classical Cryptography

Unit 2. Basics of Modern Cryptography   **5 Hrs.**

Plaintext, Ciphertext, keys, simple ciphers, public key cryptography, digital signatures

Unit 3. Conventional Encryption / Secret Key Cryptography   **10 Hrs.**

Cryptography, Cryptanalysis, Cipher Structure, Encryption Algorithms, Data Enncryption Standard (DES), International Data Encryption Algorithm (IDEA), Advanced Encryption Standard (AES), Modes of Operation, Symmetric Block Ciphers, Cipher Block Chaining (CBC), Multiple Encryption DES

Unit 4. Public Key Cryptography   **6 Hrs.**

Basic Number Theory, Factorization, Diffie-Hellman Key Exchange, Public Key Cryptography Algorithms, RSA.

Unit 5. Digital Signatures   **4 Hrs.**

One-time signatures, Digital Signature Standard (DSS).

Unit 6. Hashing and Message Digests   **6 Hrs.**

Hashes, Motivation and applications. Cryptographically Secure Hashing, Secure Hash Algorithm (SHA), Encryption with Message Digest (MD), MD5.

Unit 7. Authentication and Public Key Infrastructure (PKI)   **5 Hrs.**

Overview of Authentication Systems (Password, Address, Cryptographic), Security Handshake Pitfalls, Authentication Standards, Kerberos, PKI Trust Models.

Unit 8. Network Security   **5 Hrs.**

IP Security, Web Security, Secure Socket Layer (SSL), Transport Layer Security (TLS), Different versions of SNMPs, PGP.

Text / Reference books :

1. D. R. Stinson. *Cryptography: Theory and Practice.* CRC Press
2. William Stallings, *Network Security Essentials-Applications & Standards*, Pearson.
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