CMP 241 Computer Graphics (3 – 1 – 2)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

1. To provide the knowledge of basic techniques used in Computer Graphics Systems.
2. To provide the knowledge of 2D and 3D algorithms used in Computer Graphics Systems

Course Contents:

1. Introduction **2 hrs**

1.1 Introduction
1.2 History of Computer Graphics
1.3 Application of Computer Graphics

2. Graphics Hardware **6 hrs**

2.1 Interactive Input Devices
2.2 Display Devices and Hard Copy Devices
2.3 Raster and Random Systems and Architectures
2.4 Video Controller
2.5 Use of Digital to Analog Converter and Frame Buffer Organization
2.6 Color Monitors

3. Two Dimensional Algorithms **7 hrs**

3.1 Line Drawing Algorithms
3.1.1 DDA
3.1.2 Bresenham's Algorithm
3.2 Circle Generation Algorithm
3.3 Ellipse Generation Algorithms
3.4 Area Filling-Scan Line Algorithm
3.5 Boundary Fill Techniques
3.6 Flood Fill Techniques

4. Two Dimensional Geometric Transformations and Viewing **8 hrs**

4.1 Basic Transformations
4.2 Other Transformations
4.3 Homogeneous Co-ordinate systems
4.4 Composite Transformations
4.5 Windowing Concepts
4.6 Viewing Pipeline
4.7 Window to View port Transformation

4.8 Line Clipping Algorithm: Cohen-Sutherland
4.9 Polygon Clipping: Sutherland-Hodgeman

5. Three Dimensional Graphics Systems **7 hrs**

5.1 3D Co-ordinate System and 3D Transformations
5.2 3D Representations
5.3 Polygon Surfaces
5.4 Cubic Spline and Beizer Curve
5.5 Non-Planer Surface: Bezier Surface
5.6 Fractal Geometry Method
5.7 3D Viewing Transformation
5.8 Projection Methods: Parallel and Perspective
5.9 Clipping in 3D

6. Visible Surface Detection **5 hrs**

6.1 Hidden Surfaces and their Removal Techniques
6.2 Back-Face Detection
6.3 Depth Buffer Method
6.4 A- buffer method
6.5 Scan Line Method
6.6 Area Subdivision Method
6.7 Depth Sorting Method

7. Illumination and Shading **6 hrs**

7.1 Illumination Theory
7.2 Ambient Light
7.3 Reflections: Diffuse, Specular
7.4 Surface Shading methods
7.4.1 Constant Shading
7.4.2 Gouraud Shading
7.4.3 Phong Shading
7.4.4 Fast Phong Shading
7.5 Color Models: RGB, CMYK

8. Graphical Languages **4 hrs**

8.1 Need for Machine Independent Graphical Languages
8.2 Graphical Languages: PHIGS, GKS
8.3 Graphics Software Standard
8.4 Overview of Graphics File Formats
8.5 Data Structure in Computer Graphics
8.6 Introduction to OpenGL

Laboratory:
Implementation of various 2D and 3D graphics algorithms covered in the course using C/C++ and OpenGL.

Text Book:

Donald Hearn and M. Pauline Baker: *Computer Graphics*, Prentice-Hall.

References:

1. James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, *Comp*
   Graphics: Principles and Practice in C, Addison-Wesley.
2. Mason Woo, Jackie Neider, Tom Davis, Dave Shreiner, *Open GL Programming G*
   Third Edition, The Official Guide to Learning OpenGL, Version 1.2, Open
   Architecture Review Board, LPE Pearson Edition Asia.

CMP 335 Computer Networks (3 – 0 - 2)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

This course provides the overall communication infrastructure including wired and wireless media for computer networking, models of network. It also highlights the operation of layer-wise network communication, different addressing mechanisms, routing algorithms, security in the computer network and overview of server configuration for complete networking systems.

Course Contents:

1. Introduction to Computer Network — **3 hrs**

1.1. Definition, merits, Demerits
1.2. Network Models
  1.2.1. PAN, LAN, Campus Area Network (CAN), MAN, Country Area Network (CAN*), WAN, GAN.
  1.2.2. Topological Models (star, bus, distributed bus, mesh, tree, hybrid, ring)
  1.2.3. Client/Server, Peer-to-Peer & Active Network Model

2. Reference Model — **4 hrs**

2.1. Protocols and Standards
2.2. Interfaces and Services
2.3. OSI Layers
2.4. TCP/IP layers
2.5. Comparison of OSI & TCP/IP
2.6. Networking hardware: NIC, Hub, Repeater, Switches, Bridge, Router

3. Physical Layer — **4 hrs**

3.1. Guided Media: Copper, Fiber cabling and its capacity standards
3.2. Unguided Media: Bluetooth, Wi-Fi/Wireless-LAN, Satellite Communication Basics (Micro waves, Radio waves)
3.3. Circuit/packet/message switching
3.4. ISDN Signaling & Architecture
3.5. Network Performance: Bandwidth, Throughput, Latency, Bandwidth-Delay Product, Jitter

4. Data Link Layer — **8 hrs**

4.1. LLC and MAC sub-layer overview
4.2. Physical (MAC) addressing overview
4.3. Framing
4.4. Flow control (stop and wait, go-back-N, selective-repeat-request)
4.5. Error Control Mechanisms
  4.5.1. Error Detection: Parity Check, CRC

4.5.2. Error Correction: Hamming code
4.6. Channel Access
4.6.1. ALOHA Systems
4.6.2. CSMA, CSMA/CD
4.7. 802.3 Ethernet, Fast Ethernet, Gigabit Ethernet
4.8. 802.4 Token Bus, 802.5 Token Ring
4.9. Virtual Circuit Switching: Frame Relay, ATM & X.25

5. Network/Internet Layer Protocols and Addressing — 8 hrs
5.1. Logical addressing
5.1.1. IPv4 addressing, subnetting, supernetting, CIDR. VLSM
5.1.2. IPv6 addressing overview
5.1.3. IPv4 and IPv6 header protocol format
5.1.4. IPv4 & IPv6 feature comparison
5.2. Routing Algorithm overview
5.2.1. Classful and Classless Routing
5.2.2. Adaptive and non-adaptive routing
5.2.3. Distance vector and link-state routing
5.2.4. Interior and exterior routing
5.2.5. Unicast & multicast routing
5.2.6. Routing Algorithms: RIP, OSPF, BGP

6. Transport Layer and protocols — 4 hrs
6.1. Port addressing overview
6.2. Process to process delivery: multiplexing and de-multiplexing
6.3. TCP services, features, segment headers, well known ports & Handshaking
6.4. UDP Services, features, segment Headers, well known ports
6.5. Concept of Socket programming: TCP & UDP socket

7. Congestion Control & Quality of services — 3 hrs
7.1. Congestion Control: Open loop and Closed Loop
7.2. Traffic Shaping (leaky bucket and token bucket)
7.3. TCP congestion control

8. Application Layer, Servers & Protocols — 5 hrs
8.1. Domain addressing, DNS server & Queries
8.2. HTTP, FTP & proxy server overview.
8.3. DHCP principles.
8.4. E-mail server Protocol: SMTP, POP, IMAP

9. Network management and Security — 6 hrs
9.1. Introduction to Network management.
9.2. SNMP
9.3. Principles of cryptography (Symmetric key: DES, Asymmetric key: RSA)
9.4. Key Exchange Protocols (Diffie-Hallman, Kerberos)
9.5. VPN
9.6. Overview of IPSEC
9.7. Firewall & its types

Laboratory Work:

1. Network commands testing: ping-pong, netstat, nslookup, ipconfig/ifconfig, tracert/traceroute…
2. Setting up Client/Server network system in Microsoft and Linux environment
3. UTP CAT6 cabling: Straight and Cross wiring, testing and verification
4. Internet Packet header analysis using TCPDUMP/WIRESHAK
5. Router Configuration, use of packet tracer or other simulator software
6. OSPF configuration & practices
7. Web, Proxy, FTP server configuration
8. Implementation of Router ACL, Proxy Firewall, IPTables.
9. Case Study: Network Design Standards (eg: building Network design with servers including NCR)

Text Book:

Behrouz A. Forouzen, "Data Communication and Networking", 4th Edition, Tata McGgaw Hill.

References:

1. A.S. Tanenbaum, "Computer Networks", 3rd Edition, Prentice Hall India, 1997.
2. W. Stallings, "Data and Computer Communication", Macmillan Press, 1989.
3. Kurose Ross : Computer Networking: A top down approach, 2nd Edition, Pearson Education

CMP 481 Information Systems (3 – 0 – 2)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	100	20	100

Course Objectives:

The objective of this course is to introduce and apply the knowledge of computer based information systems. It also provides the concept to the student in designing and setting up complex information system.

Course Contents:

1. Information System **3 hrs**

1.1. Classification and evolution of IS
1.2. IS in functional area.
1.3. Information system architecture
1.4. Qualities of information systems
1.5. Managing Information System resources
1.6. Balanced Scorecard – case studies

2. Control, Audit and Security of Information System **3 hrs**

2.1. Control of information system
2.2. Audit of information system
2.3. Security of information system
2.4. Consumer layered security strategy
2.5. Enterprise layered security strategy
2.6. Extended validation and SSL certificates
2.7. Remote access authentication
2.8. Content control and policy based encryption
2.9. Example of security in e-commerce transaction

3. Enterprise Management Systems **8 hrs**

3.1. Enterprise management systems (EMS)
3.2. Enterprise Software: ERP/SCM/CRM
3.3. Information Management and Technology of Enterprise Software
3.4. Role of IS and IT in Enterprise Management
3.5. Enterprise engineering, Electronic organism, Loose integration vs. full Integration, Process alignment, Frame work to manage integrated Change, future trends.

4. Decision Support and Intelligent Systems **7 hrs**

4.1. DSS, operations research models
4.2. Group decision support systems

4.3. Enterprise and executive decision support systems
4.4. Knowledge Management, Knowledge based Expert system
4.5. AI, Neural Networks, Virtual reality, Intelligent Agents
4.6. Data mining, Data ware Housing, OLAP, and OLTP
4.7. Anomaly and fraud detection

3 hrs

5. Planning for IS
5.1. Strategic information system
5.2. Tactical information system
5.3. Operational information systems

9 hrs

6. Implementations of Information Systems
6.1. Change Management
6.2. Critical Success Factors
6.3. Advanced Balanced scorecard
- Advanced strategic foundations development
- Advanced objective & strategy map development
- Advanced performance management
- Implementation & visualization
- Strategic initiative prioritization & management
- Advanced scorecard alignment & cascading
- Dashboard

6 hrs

7. Web Based Information System and Navigation
7.1. The structure of the web
7.2. Link Analysis
7.3. Searching the web
7.4. Navigating the web
7.5. Web uses mining
7.6. Collaborative filtering
7.7. Recommender systems
7.8. Collective intelligence

6 hrs

8. Scalable and Emerging Information System Techniques
8.1. Techniques for voluminous data
8.2. Cloud computing technologies and their types
8.3. Map Reduce and Hadoop systems
8.4. Data management in the cloud
8.5. Information retrieval in the cloud
8.6. Link analysis in cloud setup
8.7. Case studies of voluminous data

Practical:
The practical exercise shall include following three types of projects ondesigning of information system

1. E-commerce based information system for online transaction processing

2. Web uses mining or collaborative filtering based processing system
3. Scalable and emerging information system
4. Balanced scorecard, Strategy Map

References:

1. Information Systems Today Leonard Jessup and Joseph Valacich, Prenticehall, 2007
2. Managing with Information System, J.Kanter, PHI, Latest edition
3. An Introduction to Search Engines and Web Navigation, M. Levene, Pearson Education.
4. Data-Intensive Text Processing with Map Reduce, Jimmy Lin and Chris Dyer, Morgan and Claypool, 2010.
5. The Cloud at Your Service, Jothy Rosenberg and Arthur Mateos, Manning, 2010
6. Balanced scorecard: Robert S. Kaplan, David P. Norton
7. Strategy Maps: Converting intangible assets into tangible outcomes, Robert S. Kaplan, David P. Norton
8. Strategy Focused organization: Robert S. Kaplan, David P. Norton

CMP 456 Intelligent System (3 – 0 – 2)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

This course provides basic knowledge of intelligent system. Moreover, this course enables students to design and build small-scale real world intelligent systems for a variety of application domains.

Course Contents:

1. **Introduction to AI** **4 hrs**
   - 1.1 Introduction and Importance of AI
   - 1.2 AI and related fields.
   - 1.3 Brief history of AI
   - 1.4 Applications of Artificial Intelligence
   - 1.5 Definition and importance of Knowledge
   - 1.6 Learning.

2. **Agent, Search and Game Playing** **6 hrs**
   - 2.1 Black –Box Model of Agent,
   - 2.2 Intentionality and Goals
   - 2.3 Games, Search, Heuristics, Pruning,
   - 2.4 Strategies Rules
   - 2.5 Making Simple Game –Playing Agents For TTT
   - 2.6 Evaluation Functions, Utilitarian, Decision Making, Planning ,Internal Representation

3. **Pattern Recognition** **5 hrs**
   - 3.1 Classification Problems
   - 3.2 Evaluating Classifiers
   - 3.3 Nearest Neighbor Methods
   - 3.4 Training ,Testing and Validation
   - 3.5 Over fitting and Complexity

4. **Neural Network** **5 hrs**
   - 4.1 Biological neural Networks
   - 4.2 Perceptrons, Multilayer and Recursive nets
   - 4.3 Gradient Descent
   - 4.4 Back Propagation

5. **Probabilistic Methods** **5 hrs**
   - 5.1 Introduction to Probabilistic Reasoning,

5.2 Bayes and Markov Networks,DBN's and HMM's

6. Genetic Algorithm 5 hrs

6.1 Introduction
6.2 Genetic Algorithm
6.3 Procedure of genetic algorithm
6.4 The Working of Genetic algorithm
6.5 The logic behind genetic algorithm
6.6 Evolutionary Programming

7. Expert System 7 hrs

7.1 Introduction
7.2 Expert system, Feature, Characteristics, Development, Architecture
7.3 Goals and Basic activities and advantage
7.4 Stages in the Development of an Expert system
7.5 Probability –based Expert System
7.6 Expert system tools

8. Swarm Intelligence 8 hrs

8.1 Introduction
8.2 Background of Ant Intelligent System
8.3 Importance of the Ant colony paradigm
8.4 Ant Colony System
8.5 Development of the Ant Colony System
8.6 Application of Ant colony intelligence
8.7 The working of Ant colony Systems
8.8 Particle Swarm Intelligent System

Laboratory Work:

Laboratory exercises should be conducted in either LISP or PROLOG or Matlab (with computer vision and pattern recognition toolbox)

1 Coding Game Playing Agents ½
2 Basic Pattern Recognition in Matlab
3 Creating and Training HMMS
4 Simple GA's in Matlab and dedicated packages
5 Basic of neural network

Text Books:

1. Padhy N.P. Artificial Intelligence and Intelligent System
2. Stuart Russel and Peter Norvig, *Artificial Intelligence A Modern Approach*, Pearson

References:

1. D. W. Patterson, *Artificial Intelligence and Expert Systems*, Prentice Hall, 2001.
2. Richard Duda,Peter Hat,and Davi Stork ,Pattern Classification(2nd ED),Wiley,2000
3. Daniel Jurafsky and James Martin,Speech and Language processing(2nd Ed.)Prentice Hall 2008

4. Ivan Bratko, *PROLOG Programming for Artificial Intelligence*, Addison Wesley, 2001.
5. Leon Sterling, Ehud Shapiro, *The Art of PROLOG: Advanced Programming Techniques*, Prentice Hall, 1996.

CMP 321 Object Oriented Design and Modeling through UML (3-1-3)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

- To explain and illustrate the fundamental concepts of object orientation
- To introduce basic concepts of object-oriented analysis and design.
- To study the main features of the software development process in an object-oriented framework.
- To provide exposure to Visual Object Oriented Modeling languages, specifically UML (Unified Modelling Language).
- To develop skills on verifying, and validating a given specification presented in UML
- To develop a specification and implementation using UML from a given system requirements description.

Course Contents:

1. **Object Oriented Fundamentals** **10 hrs**
   - 1.1. Introduction
   - 1.2. Object Oriented Analysis and Design
   - 1.3. Defining Models
   - 1.4. Case Study
   - 1.5. Requirement Process
   - 1.6. Use Cases
   - 1.7. Object Oriented Development Cycle
   - 1.8. Overview of the Unified Modeling Language: UML Fundamentals and Notations
2. **Object Oriented Analysis** **12 hrs**
   - 2.1. Building Conceptual Model
   - 2.2. Adding Associations and Attributes
   - 2.3. Representation of System Behavior
3. **Object Oriented Design** **14 hrs**
   - 3.1. Analysis to Design
   - 3.2. Describing and Elaborating Use Cases
   - 3.3. Collaboration Diagram
   - 3.4. Objects and Patterns
   - 3.5. Determining Visibility
   - 3.6. Class Diagram
4. **Implementation** **9 hrs**
   - 4.1. Programming and Development Process
   - 4.2. Mapping Design to Code
   - 4.3. Creating Class Definitions from Design Class Diagrams

4.4. Creating Methods from Collaboration Diagram
4.5. Updating Class Definitions
4.6. Classes in Code
4.7. Exception and Error Handling

Laboratory Exercises:
Laboratory Exercise will include implementing all the UML diagrams and handling a object oriented design and modeling activity in a ACSE Environment. UML pattern design and modeling will be taken up with the help of *Rational Studio 2000* or any other CASE tools.

Text Book:
Larman, C., *Applying UML and Patterns*, Pearson Education Asia, ISBN: 81-7808-396-1

References:

1. Stevens, P., Pooley, R., *Using UML: Software Engineering with Objects and Components*, Addision-Wesley, 1999, ISBN: 981-2359-15-X
2. Fowler, M., Scott, K., *UML Distilled: Applying the Standard Object Modeling Language*, Addison-Wesley, 1997, ISBN: 981-4053-59-7
3. Booch, G., Jacobson, I., Rumbaugh, J., *The Unified Software Development Process*, Addison-Wesely, 1998, ISBN: 981-235-873-0
4. Booch, G., Jacobson, I., Rumbaugh, J., *The Unified Modeling Language User Guide*, Addison-Wesely, 1998, ISBN: 981-4053-31-7
5. Jacobson I., *Object-Oriented Software Engineering – A Use Case Driven Approach*, , Addison-Wesely, 1998, ISBN: 981235994X
6. Richter C., *Designing Flexible Object-Oriented Systems with UML*, Techmedia, 2000, ISBN: 81-7635-398-1
7. Booch, G., *Object-Oriented Analysis & Design*, Pearson Education Asia, 2000, ISBN: 81-7808-156-3

CMP 390 Project II (0 – 0 - 4)

Evaluation:

	Theory	Practical	Total
Sessional	-	100	100
Final	-	-	-
Total	-	100	100

Objectives:

1. To provide the practical knowledge of project undertaking by focusing on planning, requirements elicitation, design, development and implementation of a project.
2. To provide the knowledge of Programming tools currently used in the market by carrying out a project.
3. To teach students to work and solve problem in a team environment
4. To provide the knowledge to formulate project documentation and oral presentation for his/her project.

Procedures:

The project course requires students to get themselves involved in a group consisting of generally 3-4 members and work jointly in a team, on a proposed task under the direct supervision of the faculty members of their respective department. The project may be selected in consultation with the industries and they shall be software and or electronic hardware based. The project may be done using any programming language or any platform and it may be any type of application e.g. Scientific Applications, Information Systems, Web Applications, Games, Simulations etc but it must find its practical usage in daily life and it should be relevant, as possible, to the local industry environment and its demands.

The project must be started at the beginning of the semester, span throughout the semester and finished by the end of that very semester. The project should be undertaken preferably by group of 3-4 students who will jointly work and implement the project. Term work will be jointly assessed by a panel of examiners as appointed by head of the institution. Oral examination will be conducted by internal and external examiners as appointed by the college.

Project Work Phases:

The entire project work shall be divided in to three phases and evaluation shall be done accordingly:

First Phase:

The students are required to form a team comprised of 3-4 team members and come up with a conceptual framework for their project work which must be documented in the form of a Proposal and presented in front of an examiner in a formal presentation lasting for about 10 minutes, on the date prescribed by the college or concerned department.

30% of the marks shall be based on the following criteria:

Evaluation Criteria:

Task Accomplished (20%)

- Feasibility Study
- Requirements Analysis and Specification
- Project plan

- Creativity, Innovativeness and Usefulness of the Idea

Documentation (10%)
- Proposal Report
- Estimations
- Time Line

Second Phase:
The students are required to show the progress of their work and the work done so far must be justifiable. They must have finished the design phase including the overall system/architectural design and validation scheme. 50% of total mark shall be based on the following criteria:

Evaluation Criteria:
Task Accomplished (40%)
- System/Architectural Design
- Depth of Project work
- Progress
- Level of achievement
- Group/Team Effort
- Ability to propose solutions

Documentation (10%)
- Report organization
- Completeness and consistency of the report
- Validation Criteria
- Organization and analysis of data and results

Third Phase (20%):
All students must have finished all phases of their project work including requirements analysis, design, coding, testing on time by the time they come for the Final Project Presentation.
Students must come up with a visible output of the product that they have developed and perform an oral defense of their work in the presence of an external examiner (external to the department or from industries). The final presentation should be conducted on the last week of final semester term as far as practicable.

Evaluation (20%):
- Presentation
- Completeness, Consistency and Final Output of the Project
- Viva
- Final Project Report