Computer Graphics
EG3101CT

Year: III **Total: 6 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: 1 hour/week
Practical: … hours/week
Lab: 2 hours/week

Course description:
This course deals with graphics hardware, two dimensional and three-dimensional graphics, fundamentals of animation techniques; graphical user interface design, web graphics design and graphics design packages.

Course objectives:
After completion of this course students will be able to:
1. Acquire the knowledge of computer graphics.
2. Familiarize with hardware involved in graphics.
3. Familiarize with the algorithms to generate two-dimensional and three-dimensional graphical objects and animations.

Course Contents:

Theory

Unit 1. Introduction [3 Hrs.]
- 1.1. History of Computer Graphics
- 1.2. Application of Computer Graphics
- 1.3. CAD and CAM

Unit 2. Graphics Hardware [8 Hrs.]
- 2.1. Input Hardware
  - 2.1.1. Keyboard, Mouse (mechanical & optical), Light pen, Touch panel (Optical, Sonic, and Electrical), Digitizers (Electrical, Sonic, Resistive), Scanner, Joystick
- 2.2. Output Hardware
  - 2.2.1. Monitors
  - 2.2.2. Monochromatic CRT Monitors
  - 2.2.3. Color CRT Monitors
  - 2.2.4. Flat Panel Display Monitors
- 2.3. Hardcopy Devices
  - 2.3.1. Plotters
  - 2.3.2. Printers
- 2.4. Raster and Vector Display Architectures, Principles and Characteristics

Unit 3. Two Dimensional Algorithms and Transformations [10 Hrs.]
- 3.1. Mathematical Line Drawing Concept
- 3.2. Line Drawing Algorithms
  - 3.2.1. Digital Differential Analyzer (DDA)
  - 3.2.2. Bresenham's Line Drawing Algorithm
- 3.3. Mid-point Circle Drawing
- 3.4. Mid-point Ellipse Drawing Algorithm
- 3.5. Review of Matrix Operations – Addition and Multiplication
- 3.6. Two-dimensional Transformations
  - 3.6.1. Translation

3.6.2. Scaling
3.6.3. Rotation
3.6.4. Reflection
3.6.5. Shearing
3.7. Two-Dimensional Viewing Pipeline

Unit 4. Three-Dimensional Graphics [16 Hrs.]

4.1. Three-dimensions transformations
4.1.1. Translation
4.1.2. Scaling
4.1.3. Rotation
4.1.4. Reflection
4.1.5. Shearing
4.2. Three-dimensional Viewing Pipeline
4.3. Three-dimensions Projections
4.3.1. Concept of Projection
4.3.2. Projection of 3D Objects onto 2D Display Devices
4.3.3. Three-dimensional Projection Methods
4.3.3.1. Parallel Projection Method
4.3.3.2. Perspective Projection Method
4.4. Three-dimensional Object Representations
4.4.1. Polygon Surfaces
4.4.2. Polygon Tables
4.5. Introduction to Hidden Line and Hidden Surface Removal Techniques
4.5.1. Object Space Method
4.5.2. Image Space Method
4.6. Introduction to Illumination/ Lighting Models
4.6.1. Ambient Model
4.6.2. Diffuse Model
4.6.3. Specular Model
4.7. Introduction to Shading/ Surface Rendering Models
4.7.1. Constant Shading Model
4.7.2. Gouraud Shading Model
4.7.3. Phong Shading Model

Unit 5. Web Graphics Designs and Graphics DesignPackages [5 Hrs.]

5.1. Introduction to graphics file formats
5.2. Principles of web graphics design – browser safe colors, size, resolution, background, anti-aliasing
5.3. Type, purposes and features of graphics packages
5.4. Examples of graphics packages and libraries

Unit 6. Virtual Reality [3 Hrs.]

6.1. Introduction
6.2. Types of Virtual Reality
6.2.1. Non-immersive Virtual Reality
6.2.2. Semi-immersive Virtual Reality
6.2.3. Fully-immersive Virtual Reality
6.2.4. Augmented Virtual Reality
6.2.5. Collaborative Virtual Reality

6.3. Applications of Virtual Reality

Practical: **[30 Hrs.]**

As a part of the laboratory exercise, the students should implement all the algorithms studied in different chapters. At the end, students are required to integrate the codes they have written in earlier practical sessions to create a small project.

The lab contains few sessions dedicated to introduce the students to some of the popular professional graphics packages and CAD packages and explore their features. The course/lab instructor recommends packages to use.

Some algorithm implementation sessions may include:

1. Implementation of Digital Differential Analyzer (DDA), a line Drawing Algorithm.
2. Implementation of Bresenham's Line Drawing Algorithm.
3. Implementation of mid-point Circle Drawing Algorithm.
4. Implementation of mid -point Ellipse Drawing Algorithm.
5. Implementation of basic 2D transformation.
6. Implementation of basic 3D transformation.
7. Implementation of basic projections.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	3	6
2	Graphics Hardware	8	15
3	Two Dimensional Algorithms and Transformations	10	20
4	Three-Dimensional Graphics	16	25
5	Web Graphics Designs and Graphics Design Packages	5	8
6	Virtual Reality	3	6
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. D. Hearn and M. P. Baker, "Computer Graphics", PHI Edition
2. T. I. James, D. Foley, A. Van Dam, S. K. Feiner, and J. F. Hughes, "Computer Graphics, Principles, and Practice", PHI Edition

Data Communication and Computer Network

EG3102CT

Year: II **Total: 7 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: 3 hours/week

Course description:

This course is designed to understand computer networks and digital data communications with a focus on Internet protocols: Application layer architectures (client/server, peer-to-peer) and protocols (HTTP-web, SMTP-mail, etc), Transport layer operation: (reliable transport, congestion and flow control, UDP, TCP); Network layer operation - (routing, addressing, IPv4 and IPv6), Data Link layer operation (error detection/correction, access control, Ethernet, 802.11, Physical Layer operation. Similarly, selected topics such as: network security (Network attack, cryptography, VPN, firewall).

Course objectives:

After completion of this course students will be able to:

1. Gain a good understanding of the architecture of computer networks.
2. Identify and understand various hardware devices and software used in computer networks.
3. Learn different types of protocols used for transmission of data.
4. Use routing and addressing.
5. Setup small home/office networks.

Course Contents:

Theory

Unit 1. Introduction [4 Hrs.]

1.1. Definition, Advantages and disadvantages, applications
1.2. Communication system: Analog and digital, Block diagram
1.3. Network as platform, Internet architecture, Trends in networking
1.4. Data Transmission: Analog and digital transmission
1.5. Transmission impairment

Unit 2. Network Architecture and Hardware/Software [9 Hrs.]

2.1. Network topologies
2.2. Network types: PAN, LAN, MAN, WAN, Intranet, Internet, Extranet
2.3. Layered network architecture, protocols, interfaces, services
2.4. OSI reference model
2.5. TCP/IP model
2.6. Network workstation and server: Hardware and software requirements
2.7. Client server and peer-to-peer model
2.8. Network devices: Repeater, Hub, NIC, Bridge, Switch, Router, Gateway

Unit 3. Physical Layer [4 Hrs.]

3.1. Channel bandwidth and throughput; Propagation time; transmission time
3.2. Transmission media:
  3.2.1. Guided: Coaxial, twisted-pair, fiber-optic
  3.2.2. Unguided: radio waves, microwaves, infrared, satellite

3.3. Introduction of Frame Relay, ATM, ISDN, PSTN and X.25

Unit 4. Data link Layer [6 Hrs.]

4.1. Introduction and function of data link layer and its issues
4.2. Framing
4.3. Flow Control issues at data link layer
4.4. Piggybacking and Sliding Window Protocol
4.5. Error Control issues at data link layer
4.6. Error Detection Method and Error Correction Method
4.7. Data Link Layer Protocol: HDLC, PPP

Unit 5. LAN Architectures/standards [4 Hrs.]

5.1. Introduction of LAN standards and architecture
5.2. Media access control, MAC address
5.3. ALOHA, FDDI, VLAN, CSMA/CD, Token ring, Token bus and IEEE 802.3, 802.4, 802.1(wireless LAN)

Unit 6. Network Layer [8 Hrs.]

6.1. Internetworking
6.2. Circuit switching and packet switching
6.3. Addressing issues at network layer
6.4. IP address, Different classes, Private and Public address
6.5. Subnet mask and sub-netting: Classless addressing; Network Address Translation (NAT)
6.6. Routing and its necessity; static and dynamic routing; interior and exterior routing
6.7. Dynamic routing and Static routing
6.8. Network layer protocols
6.9. Introduction to IPV6 and its necessity

Unit 7. Transport Layer [4 Hrs.]

7.1. Transport layer issues:
  7.1.1. Congestion control
  7.1.2. Flow control
  7.1.3. Quality of service
7.2. Transport layer addressing sockets, Port
7.3. Segmentation and reassembly
7.4. Connection oriented and connectionless service
7.5. TCP, UDP

Unit 8. Application Layer [4 Hrs.]

8.1. Application layer and its function
8.2. Electronic mail: SMTP, POP3, IMAP
8.3. File transfer: FTP, PUTTY, WinSCP
8.4. Web: HTTP, HTTPs
8.5. Dynamic host configuration protocol (DHCP)
8.6. DNS, WWW

Unit 9. Network Security [2 Hrs.]

9.1. Properties of Secure Communication

9.2. Network attacks: Active and Passive attacks
9.3. Cryptography: Symmetric Key and public key, Digital signature
9.4. Firewalls
9.5. Virtual private network

Practical: **[45 Hrs.]**

In practical, students should be able to set up small networks. They should be able to configure network hardware and network software. Following lab exercises may be helpful.

1. Configuration of network interface card and various network devices like hub, switch, router, etc.
2. Cabling: Construction of straight- through and cross-over cable and verify the physical layer connectivity.
3. Configuration of workstation PC
4. Setup peer-to-peer networking and verify it
5. Configuration of server for client server networking; also verify it.
6. Familiarization with basic network commands: Observing IP address and MAC address, Setting IP address and default gateway in PC, Verifying network layer connectivity
7. Configure the PC to obtain IP from DHCP, Release the leased IP, Renew IP (for this there should a DHCP server) -6 and 7 merge
8. Create multiple networks and route packets across multiple networks using static routing
9. Dynamic routing (e.g. RIP) and default route
10. Configure HTTP, FTP, DHCP server and verify it
11. Configuration of DNS and e-mail server
12. Design of local area network (LAN)
13. Case study: Organizational visit to study existing network system

Note: Use packet Tracer software for performing the above practical lab works

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Network Architecture and Hardware/software	9	16
3	Physical Layer	4	7
4	Data link Layer	6	11
5	LAN Architectures/standards	4	7
6	Network Layer:	8	14
7	Transport Layer	4	7
8	Application Layer	4	7
9	Network Security	2	4
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References

1. Behrouz Forouzan, “Data Communications and Networking”, Edition 5, Tata McGraw-Hill., 2012.

2. Andrews S. Tanenbaum, David J Wetherall, “Computer Networks”, Edition 5, Pearson Education, 2012.
3. William Stallings, “Data & Computer Communications”, PHI, Edition 6, 2012.
4. Jerry Fitzgerald, Alan Dennis, “Business Data Communications & Networking”, John Wiley & Sons Inc, 2010.

Operating System

EG3103CT

Year: III **Total: 5 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: hours/week

Practical: hours/week

Lab: 2 hours/week

Course description:

This course includes the basic concepts and core structure, functions and design principles of operating system. It consists of the various functions of operating system like process and memory management, file and I/O Management, Deadlock Management and Security. The course gives ideas in designing the operating system and its services.

Course objectives

After completion of this course students will be able to:

1. Describe the functions of operating system.
2. Explain design of the operating system and its components.
3. Demonstrate and simulate the algorithms used in operating system.

Course Contents:

Theory

Unit 1. Introduction [6 Hrs.]

1.1. Operating system and its functions
1.2. Evolution of Operating System
1.3. Types of Operating System
1.4. Operating System Components
1.5. Operating System Services: System Call, Shell
1.6. Example of Operating System: Unix, Linux, Windows, Handheld OS

Unit 2. Process Management [10 Hrs.]

2.1. Process Vs Program, Process States, Process Models, Process Control Box
2.2. Process Vs Thread, Thread Models, Multithreading
2.3. Process Scheduling Criteria, Algorithms and Goals
  2.3.1. Batch System: FIFO, SJF, SRTN
  2.3.2. Interactive System: RR, HRRN
2.4. Critical Section, Race Condition, Mutual Exclusion
2.5. Producer Consumer Problem

Unit 3. Memory Management [10 Hrs.]

3.1. Concept of Multiprogramming
3.2. Memory Management functions
3.3. Multiprogramming with fixed partition
3.4. Multiprogramming with variable partition
3.5. Internal Vs External fragmentation
3.6. Memory Allocation: First Fit, Worst Fit, Best Fit
3.7. Concept of Paging and Page fault

Unit 4. Deadlock Management [8 Hrs.]

4.1. Deadlock Concept
4.2. Deadlock Conditions

4.3. Deadlock Handling Strategies:
  4.3.1. Deadlock Prevention
  4.3.2. Deadlock Detection
  4.3.3. Deadlock Avoidance
  4.3.4. Recovery from Deadlock
4.4. Banker's Algorithm

Unit 5. File and Input/output Management [6 Hrs.]

5.1. File: Naming, Structure, Types, Access, Attributes, Operations, Directory Systems
5.2. File System Layout
5.3. Implementing Files: Contiguous allocation, Linked List Allocation, Linked List Allocation using Table in Memory, Inodes
5.4. Principle of I/O Hardware and Software
5.5. Disk Formatting, Disk Arm Scheduling, Stable Storage, Error Handling

Unit 6. Security [5 Hrs.]

6.1. Security Goals
6.2. Security Attacks
6.3. Active and Passive Attacks
6.4. Cryptography Basics
6.5. Access Control List
6.6. Protection Mechanisms

Practical: [30 Hrs.]

1. Installation of Virtual Machine, Linux and Windows [4 Hrs.]
2. Linux Basic Commands [2 Hrs.]
3. Implementation of Process Scheduling Algorithms [8 Hrs.]
4. Process Creation, Termination [4 Hrs.]
5. Inter process communication [4 Hrs.]
6. Implementation of Banker's Algorithm [4 Hrs.]
7. Implement some Memory Management Schemes [4 Hrs.]

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	6	11
2	Process Management	10	18
3	Memory Management	10	18
4	Deadlock Management	8	13
5	File and I/O Management	6	11
6	Security	5	9
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Andrew S. Tanenbaum, "Modern Operating Systems", 3rd Edition, PHI
2. Stalling William, "Operating Systems", 6th Edition, Pearson Education
3. Silbcrschatz A.,Galvin P., Gagne G., "Operating System Concepts", 8th Edition, John Wiley and Sons

Cloud Computing

EG3101IT

Year: III **Total: 5 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: hours/week

Practical: hours/week

Lab: 2 hours/week

Course description:

This course offers detailed concept, applications, principles and implementation of cloud computing. It includes introduction, Cloud Computing Architecture, Cloud Virtualization, Cloud Programming Models, Cloud security and applications. It does not entirely focus on theoretical concept but also strongly focuses on practical skill-based learning.

Course objectives:

After completion of this course students will be able to:

1. Use theoretical as well as practical knowledge of cloud computing
2. Design, Implement and manage the issues of cloud computing
3. Gain practical knowledge on Cloud security and applications

Course Contents

Theory

Unit 1. Introduction **[6 Hrs.]**

1.1. Overview and evolution of Cloud Computing
1.2. Characteristics of Cloud Computing
1.3. Types of cloud and its services
1.4. Applications of cloud computing
1.5. Cloud Storage
1.6. Cloud services requirements
1.7. Cloud infrastructure
1.8. Cloud adoption

Unit 2. Cloud reference and deployment models **[8 Hrs.]**

2.1. Platform as service
2.2. Software as a service
2.3. Infrastructure as service
2.4. Public clouds
2.5. Private clouds
2.6. Community cloud
2.7. Hybrid clouds

Unit 3. Cloud Virtualization technology **[8 Hrs.]**

3.1. Overview of Virtualization techniques
3.2. Types of Virtualizations
  3.2.1. Full virtualization
  3.2.2. Para Virtualization
3.3. Virtualization benefits
3.4. Server virtualization
3.5. Hypervisor management software
3.6. VMware features and infrastructure
  3.6.1. Virtual Box
  3.6.2. Thin client

Unit 4. Cloud security **[6 Hrs.]**

4.1. Introduction to Security
4.2. Cloud Security challenges and Risks
4.3. Software-as-a-Service Security
4.4. Security Monitoring
4.5. Security Architecture Design
4.6. Data Security
4.7. Application Security
4.8. Virtual Machine Security
4.9. Identity Management and Access Control

Unit 5. Cloud platforms **[8 Hrs.]**

5.1. Web services
5.2. App Engine
5.3. Azures Platform
5.4. Aneka
5.5. Open challenges
5.6. Scientific applications
5.7. Business and Consumer applications

Unit 6. Cloud applications **[9 Hrs.]**

6.1. Migration to the cloud
6.2. Software Licenses
6.3. Cloud cost model
6.4. Cloud applications for service level
6.5. Web application design
6.6. Privacy design
6.7. Cloud for IoT
6.8. Amazon Web Services for IoT

Practical: **[30 Hrs.]**

1. Install Virtualbox/VMware Workstation with different operating system such as linux or windows OS
2. Install Google App Engine.
3. Develop simple web applications.
4. Find a procedure to transfer the files from one virtual machine to another virtual machine.
5. Install Hadoop single node cluster and run simple applications like wordcount.
6. Implement SAAS security.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	6	11
2	Cloud reference and deployment models	8	14
3	Cloud Virtualization technology	8	14
4	Cloud security	6	11
5	Cloud platforms	8	14
6	Cloud applications	9	16

	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Dr. Kumar Saurabh, Cloud Computing
2. Raj Kumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing
3. David S. Linthicum, Cloud Computing and SOA Convergence in your enterprise
4. Barrie Sosinsky, Cloud Computing Bible
5. Saurabh, K. (2011). Cloud Computing – Insights into New -Era Infrastructure, Wiley India.

Software Development

EG3102IT

Year: III **Total: 5 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: … hour/week

Practical: … hours/week

Lab: 2 hours/week

Course description:

This course aims to guide the students in both the theoretical and practical aspects of developing computer solutions for real-world problems. One will study the tools and techniques used in analysis and design of software systems, and apply those tools within a recognized software development methodology and within the context of a case study.

Course objectives:

After completion of this course students will be able to:

1. Explain the theory and foundations of software development.
2. Apply the concept of different phase of system development life cycle while designing a software.
3. Draw the Context diagram, DFD and ER Diagram of a system.
4. Apply fact-finding and problem-solving skills.

Course Contents:

Theory

Unit 1. Introduction **[10 Hrs.]**

1.1. Software Development Fundamentals
- 1.1.1. General definition
- 1.1.2. Program versus software
- 1.1.3. Software process
- 1.1.4. Software characteristics
- 1.1.5. Software applications
- 1.1.6. Some terminologies
  - 1.1.6.1. Deliverables and milestones
  - 1.1.6.2. Product and process
  - 1.1.6.3. Measures, metrics and measurement
  - 1.1.6.4. Software process and product metrics
  - 1.1.6.5. Generic and customized software product
- 1.1.7. Roles of management in software development
  - 1.1.7.1. People, product, process and project

1.2. Introduction to System

1.3. Information System and its types

1.4. System development Life cycle

1.5. System development models
- 1.5.1.1. The waterfall model
- 1.5.1.2. Spiral model
- 1.5.1.3. Prototyping model
- 1.5.1.4. Introduction to Agile Development

1.6. Role and attributes of system analyst

1.7. Tools Used by System Analyst

Unit 2. Development Tools **[8 Hrs.]**

2.1. Introduction to DFD and context diagram

2.2. Describing a system with context diagram and DFD
2.3. Levels in DFD (upto level 2)
2.4. Physical and Logical DFD with example
2.5. Introduction to ER Diagram
2.6. Describing a system with ER Diagram

Unit 3. Feasibility Analysis **[4 Hrs.]**
3.1. Cost-benefit analysis technique
3.2. Return of Investment (ROI)
3.3. Payback Period
3.4. Feasibility Report
3.5. System Proposal and its components

Unit 4. Software Project Planning **[5 Hrs.]**
4.1. Size estimation
4.2. Cost estimation
4.3. Project Scheduling
4.4. The constructive cost model (COCOMO)
4.5. COCOMO II
4.6. Software risk management

Unit 5. Input –Output Design **[4 Hrs.]**
5.1. Input form Design
5.2. Input Screen Design
5.3. Menu Design
5.4. Output Design

Unit 6. Software Reliability **[4 Hrs.]**
6.1. Basic Concepts
6.2. Software quality
6.3. Software reliability model
6.4. Capability Maturity Model (CMM)

Unit 7. Software Testing **[5 Hrs.]**
7.1. Software Verification and Validation
7.2. Testing process
7.3. Black box or functional testing
7.4. White Box Testing or Structural testing
7.5. Levels of testing: unit, integration, system, user acceptance testing
7.6. Testing tools

Unit 8. Software Maintenance **[5 Hrs.]**
8.1. Introduction
8.2. Maintenance process
8.3. Maintenance model
8.4. Estimation of maintenance costs
8.5. Documentation

Practical **[30 Hrs.]**
1. The practical should contain all features mentioned above.

Project Work:

Visit well-established organization and perform as follows and submit the report.

a) Define problem.

b) Do requirement collections and perform feasibility analysis.

c) Mention the life cycle model preferred.

d) Show your planning for the project.

e) Specify the design followed.

f) Mention its reliability.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	10	18
2	Development Tools	8	14
3	Feasibility Analysis	4	7
4	Software Project Planning	5	9
5	Input –Output Design	4	7
6	Software Reliability	4	7
7	Software Testing	5	9
8	Software Maintenance	5	9
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Sommerville, Ian. Software Engineering, Addison-Wesley, ISBN 0-201-17568-1
2. Jones, Roger. Software Engineering.
3. Pressman, Roger S. Software Engineering: A Practitioner's Approach, McGraw Hill International Edition, 6th edition.
4. Ghezzi, Jayazeri and Mandrioli. Fundamentals of Software Engineering, PrenticeHall
5. Pfleeger Shari. Software Engineering: The Production of Quality Software, Macmillan, ISBN 0-02-395115-X, 2nd Edition
6. V. Rajaraman, "Analysis and design of information Systems"
7. Elias M. Awad, "Systems Analysis and design"
8. Vinod Kumar Garg and S. Srinivasan, "Workbook on Systems analysis and design"

Geographical Information System
(Elective I)
EG3103IT.1

Year: III **Total: 7 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: 1 hour/week
Practical: 0 hours/week
Lab: 3 hours/week

Course description:
This course is designed to introduce students a computer-based GIS, Geographic Information Systems, and its applications to spatial data management as a tool to understand the world by describing and explaining the human relationship to the physical environment.

Course objectives:
After completion of this course students will be able to:
1. Explain GIS, development and components of GIS.
2. Explain data capturing techniques.
3. Analyze spatial and non- spatial data.

Course Contents:

Theory

Unit 1. Introduction **[4 Hrs.]**
- 1.1. Historical Background
- 1.2. Scope and application areas
- 1.3. Benefits and importance
- 1.4. Functional components
- 1.5. GIS in Organizations
- 1.6. Elements of GIS

Unit 2. Coordinate System **[4 Hrs.]**
- 2.1. Geographic coordinate system
- 2.2. Map Projections
- 2.3. Commonly used map projection system
- 2.4. projected coordinate system

Unit 3. Data Models **[7 Hrs.]**
- 3.1. Introduction, Common Spatial Data Models
- 3.2. Vector Data, Raster Data
- 3.3. Other Data Models:
  - 3.3.1. TINs
  - 3.3.2. Object Data Model
  - 3.3.3. 3-d Data Model
- 3.4. Data and File Structure

Unit 4. Maps, Digitization and Output **[10 Hrs.]**
- 4.1. Map concept
  - 4.1.1. map elements
  - 4.1.2. map layers

4.1.3. map scales and representation
4.1.4. Map Boundaries and Spatial Data

4.2. Digitizing
4.2.1. The Digitizing Process
4.2.2. Digitizing Errors
4.2.3. Node and Line Snapping

4.3. Reshaping
4.3.1. Line Smoothing and Thinning
4.3.2. Scan Digitizing, Editing Geographic Data
4.3.3. Features Common to Several Layers

4.4. Coordinate Transformation:
4.4.1. Control Points
4.4.2. The Affine Transformation
4.4.3. Other Coordinate Transformations
4.4.4. Caution When Evaluating Transformations
4.4.5. Projection Vs Transformation.

4.5. Output: Maps, Digital Data, Metadata

Unit 5. Capturing Data **[5 Hrs.]**

5.1. Different methods of data capture
5.2. Data preparation
5.3. Conversion and integration
5.4. GPS
5.5. Remote Sensing

Unit 6. Spatial Analysis and Terrain Analysis **[9 Hrs.]**

6.1. Introduction
6.2. Selection and Classification
6.3. Proximity Functions and Buffering
6.4. Overlay: Raster Overlay, Vector Overlay
6.5. Terrain Analysis:
6.5.1. Introduction
6.5.2. Slope and Aspect
6.5.3. Hydrologic Functions, Profile Plots, Contour Lines
6.5.4. Viewsheds, Shaded Relief Maps

Unit 7. Spatial Data Infrastructure **[6 Hrs.]**

7.1. SDI concepts and its current trend
7.2. The concept of metadata and clearing house
7.3. Critical factors around SDIs

Practical: **[45 Hrs.]**

1. Handle GIS devices
2. ArcGIS installation
3. Explore interactive GIS, create map layouts, Reuse a custom map layout
4. Build a file geodatabase, Use Arc Catalog utilities, modify an attribute table, Join tables
5. Examine metadata, Work with map projections, learn about vector data formats, Explore sources of vector maps

6. Digitize polygon features, use advanced edit tools, digitize point features, Digitize line features
7. Map Designing using tools

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Coordinate system	4	7
3	Data Models	7	12
4	Map, Digitization and output	10	18
5	Capturing Real World	5	9
6	Spatial Analysis & Terrain Analysis	9	16
7	Introduction to Spatial Data Infrastructure	6	11
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. De By R, Knippers R.A, sun Y. Principles of geographic information systems: An introductory textbook, international institute for Geoinformation science and Earth observation, the Netherlands
2. Paul B, GIS Fundamentals: A First Text on Geographic Information Systems Fifth Edition,
3. Chang K.T. Introduction to Geographic Information System

Management Information System

(Elective I)

EG3103IT.2

Year: III **Total: 7 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: 0 hours/week

Lab: 3 hours/week

Course Description:

The main aim of this course is to introduce the Management of Information Systems (MIS). Managing information systems has become a task for all levels of managers and all function areas of the business. This MIS course is designed to familiarize students with the concepts related to the utilization of information technology in business organizations. This course will focus on technical and managerial aspects of information technology adoption in the organization. This course should provide the student with knowledge of the core principles of MIS, focusing on breadth rather than depth of knowledge. In this course has included case studies, group assignments, and related software exercises that will provide an opportunity to apply MIS concepts to real-world applications.

Course Objectives:

After completing this course, the student will able to:

1. Explain the significance of information systems in organizations, Strategic management processes and the implications for the management.
2. Describe different types of management information systems.
3. Identify the basic technologies used in the field of Management Information System.
4. Explain the developments of electronic commerce and the role of Internet.
5. Describe the processes of developing and implementing information systems.
6. Familiarize with ethical and social issues related to information system.

Course contents:

Theory

Unit 1. Foundation of Information System [7 Hrs.]

1.1. Introduction to information system
1.2. Role of information system in Business
1.3. Components of Information Systems
1.4. Types of information systems
1.5. Effectiveness and efficiency criteria in information system

Unit 2. An overview of Management Information Systems [6 Hrs.]

2.1. Structure of a Management information system
2.2. Structure of a Management information system
2.3. MIS versus Data processing
2.4. Decision Making In MIS
2.5. MIS & Information Resources Management

Unit 3. Concept of Planning [8 Hrs.]

3.1. Concept of organizational planning

3.2. The Planning Process
3.3. Computational support for planning
3.4. The importance of planning
3.5. Business applications of information technology
3.6. Information System for Business Operations (SDLC)
3.7. Information System for Strategic Advantage
3.8. Decision Support Systems and its benefits and characteristic

Unit 4. Managing Information Technology [5 Hrs.]

4.1. Enterprise & global management
4.2. Security & Ethical challenges
4.3. Planning & implementing changes
4.4. Information Technology Trends

Unit 5. MIS in functional areas of business [7 Hrs.]

5.1. Accounting information systems
5.2. Geographical information systems
5.3. Human resource information systems
5.4. Inventory information systems
5.5. Manufacturing information systems
5.6. Marketing information systems
5.7. Quality information systems

Unit 6. Information Security [6 Hrs.]

6.1. Security threats and vulnerability
6.2. Controlling security threat and Vulnerability
6.3. Management security threat in e-Business
6.4. Disaster management
6.5. MIS and Security Challenges
6.6. Firewall

Unit 7. Knowledge Based Systems [3 Hrs.]

7.1. Artificial intelligence
7.2. Expert systems
7.3. Neural networks

Unit 8. Office Information System [3 Hrs.]

8.1. Nature of office
8.2. Types of office information systems
8.3. Client server computing

Practical: [45 Hrs.]

Project Work:

Students should complete at least one MIS Project on the following Topics by including the above contents.

1. Restaurant Information System
2. College Management System

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***

1	Foundation of Information System	7	12
2	An overview of Management Information Systems	6	11
3	Concept of planning	8	14
4	Managing Information Technology	5	10
5	MIS in functional areas of business	7	12
6	Information Security	6	11
7	Knowledge Based Systems	3	5
8	Office Information System	3	5
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Brian (2004). *Introduction to Information System*. New York: MCGRAW HILL.
2. Murdick (1971). *Information System for Modern* Management New Jersey:PHI.
3. Jawadekar,S.S(2019). *Management Information System* (6th ed). India: MC GRAW HILL.

Data Mining
(Elective I)
EG3103IT.3

Year: III **Total: 7 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: 1 hour/week
Practical: … hours/week
Lab: 3 hours/week

Course description:
This course covers fundamental aspects of data mining. It deals with data mining and warehouse construction process, data mining models, techniques and various applications of data mining.

Course objectives:
After completion of this course students will be able to:
1. Explain the basic aspects of data mining and techniques.
2. Explain the data collection, cleaning, and aggregation issues.
3. Utilize statistical techniques for analyzing data.

Course Contents:

Theory

Unit 1. Introduction **[2 Hrs.]**
- 1.1. Data Mining
- 1.2. Data Mining and Knowledge Discovery Process
- 1.3. Importance of Data Mining

Unit 2. Data Pre-Processing **[7 Hrs.]**
- 2.1. Data Objects and attribute types
- 2.2. Statistical description of data
- 2.3. Data Preprocessing Concepts
- 2.4. Data Preprocessing
  - 2.4.1. Data Cleaning
  - 2.4.2. Data Integration
  - 2.4.3. Data Reduction
  - 2.4.4. Data Transformation

Unit 3. OLAP and Multidimensional Data Analysis **[8 Hrs.]**
- 3.1. OLAP Tool and operations
- 3.2. Online Transaction Processing (OLTP)
- 3.3. OLAP vs OLTP
- 3.4. OLAP servers
- 3.5. OLAP Architectures
  - 3.5.1. Relational OLAP
  - 3.5.2. Multidimensional OLAP
  - 3.5.3. Hybrid OLAP
  - 3.5.4. DOLAP

Unit 4. Basic process in Data Warehouse **[4 Hrs.]**
- 4.1. ETL (Extraction, Transform and Load) process

4.2. Importance of ETL
4.3. ELT (Extract, Load and Transform) Process
4.4. Difference between ETL and ELT

Unit 5. Mining Frequent Pattern and Associations [6 Hrs.]

5.1. Frequent patterns, Market basket analysis, Frequent Item sets, Support and Confidence, Association Rules
5.2. Finding Frequent Itemset (Apriori Algorithm)
5.3. Limitation and improving Apriori Algorithm

Unit 6. Data Mining Models [12 Hrs.]

6.1. Statistical Data Analysis Methods
  6.1.1. Histogram, Mean, Median, Mode, Variance and Standard deviation, Max, Min, Linear regression
  6.1.2. Boxplot Analysis
  6.1.3. Histogram Analysis
  6.1.4. Scatter plot
  6.1.5. Maximum Likelihood Method
  6.1.6. Bayesian Method
6.2. Cross Validation
6.3. Classification
  6.3.1. Decision Tree classifier
  6.3.2. ID3 Algorithm
  6.3.3. Entropy and Information gain
  6.3.4. Tree Pruning
6.4. Artificial Neural Network (ANN)
  6.4.1. Supervised Learning and Unsupervised Learning
  6.4.2. Perceptron
  6.4.3. Back Propagation in neural networks
6.5. Clustering
  6.5.1. SVM
  6.5.2. Partitioning method (K-means and K-medoids clustering)
  6.5.3. Hierarchical methods (Agglomerative Approach and Divisive Approach)

Unit 7. Data Mining Applications [6 Hrs.]

7.1. Techniques for mining large databases
  7.1.1. Text Mining
  7.1.2. Web Mining
  7.1.3. Visual data Mining
7.2. Data mining standards
7.3. Privacy and security issues

Practical: [45 Hrs.]

1. Select interesting data sets
2. Represent selected data in suitable form.
3. Extract feature and select necessary features.
4. Use data cleaning techniques.
5. Use descriptive statistical methods.
6. Implement K-means and k-medoids clustering algorithms K-means by using Weka

7. Implement decision tree classifier using Weka

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	2	4
2	Data Pre-processing	7	12
3	OLAP and Multidimensional Data Analysis	8	14
4	Basic process in Data Warehouse	4	7
5	Mining Frequent Pattern and Associations	6	11
6	Data Mining Models	12	21
7	Data Mining Applications	6	11
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Jiawei Han, Micheline Kamber, Jian Pei; *Data Mining: Concepts and Techniques*, Morgan Kaufman Publication, 3rd Edition
2. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar, *Introduction to DataMining*, Pearson Publication, First Edition
3. Charu C. Agrawal, *Data Mining: The Textbook*, Springer Nature Publication, First Edition
4. Alex Berson and Stephen J. Smith, *Data Warehousing, Data Mining & OLAP*, Tata McGraw Hill, 1st Edition.

Minor Project

EG3104IT

Year: III **Total: 3 hours /week**

Part: I **Lecture: … hours/week**

Tutorial: … hour/week

Practical: 3 hours/week

Lab: … hours/week

Course description:

This course provides students with an idea of how to transform the theoretical knowledge gained in earlier semesters into practical applications. The students will build a real-life project during this course using the knowledge gained in earlier semesters.

Course objectives:

After completing this course, the students will be able to:

1. Learn and gain the knowledge about the programming tool they used to implement the real-life project.
2. Plan, design, develop and implement the real-life problem as a project.
3. Formulate project documentation and oral presentation for his/her final year project.

Project Overview:

1. Group formation (3-4 persons / group)
2. Project concept development
    a. Finding Project concept
    b. Scope of project
    c. Completion time
3. Proposal preparation and presentation-2 weeks
4. Mid-term defense (should complete literature review, methodology, project design and project progress report)-8 weeks after the proposal acceptance
5. Final defense (should deliver complete project and report)-4 weeks after mid-term defense
6. Project documentation (must follow project documentation guide line given by supervisor or the department)
7. Submission of hard cover project document to department-1 week after final defense

The project should:

1. Be intended to develop an IT solution to a practical problem
2. Be carried out using an engineering approach
3. Emphasize design
4. Be carried out in a group (3-4 person/group)
5. Normally result in the production of a piece of software
6. Include technical documentation based on documentation guideline.
7. Be fully described from inception to completion in a written report produced to a good level of professional competence

Procedure:

1. Explain the minor project concept in a class by project teachers.
2. Preliminary selection of topic.
3. Discussion with department regarding the feasibility/practicality of the project (e.g. cost, usefulness, market).

4. Finalization of topic.
5. Submission of the detail proposal (Extensive literature review).
6. After approval by project teachers, start of minor project work in laboratory /home.
7. Monitoring of the work progress by project teachers and report to department.
8. A mid-term progress report should be submitted by the student on the date fixed by department.
9. Presentation of mid-term progress of the minor project along with report.
10. Final presentation of minor project should be conducted by the department and should be evaluated by the project teachers in the presence of other teachers in the related field, not involved in minor projects, but from the same department.
11. Students must submit a group report in the format prescribed below.

Requirements for report writing:
Font Name: Times New Roman
Top Margin: 1 inch
Left Margin: 1 inch
Right Margin: 1 inch
Bottom Margin: 1 inch
Gutter: 0.25 inch (left)
Header and Footer: 0.5 inch
Line Spacing: Single
Paragraph Spacing: 8 pt.
Font Size: 12 pt. (for normal text)
Follow following standard for headings

1. Heading1 (16pt, Bold)
1.1. Heading2 (14pt, Bold)
1.1.1. Heading3 (13pt, Bold)
1.1.1.1. Heading4 (12pt, Bold)

Arrangement of Contents in a report:
The sequence of contents in a major project report is as follows

1. Cover Page
2. Title Page
3. Certificate of Approval
4. Acknowledgment
5. Executive Summary

- Executive Summary should be one-page synopsis of the project report and it must clearly give the overview of the project.

6. Table of Contents

- The table of contents should list all material following it as well as any material which precedes it.

7. List of Figures (if any)

- The list should use exactly the same captions as they appear below the figures in the text.

8. List of Tables (if any)

- The list should use exactly the same captions as they appear above the tables in the text.

9. List of Symbols (if any)

- The list should provide the detail of the symbols used in the report.

10. Abbreviations (if any)
- Abbreviation list should provide the details of the abbreviations used in the report in alphabetical order.

11. Main body
    - 11.1. Chapter 1: Project Overview (Introduction, Objectives and Scope, Project Features,
      Feasibility, System Requirement)
    - 11.2. Chapter 2: Literature Review
    - 11.3. Chapter 3: Design and Methodology (e.g. System Design, methods used, tools, data source)
    - 11.4. Chapter 4: Result and Analysis
    - 11.5. Chapter 5: Conclusion, Recommendation and Limitations

12. References
- The reference material should include the author name, title, year. Do not mention the references of the websites in the report.

13. Appendices (if any)
- Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme. Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc. Tables and References appearing in appendices should be numbered and referred to appropriate places just as in the case of chapters.

Page numbering: The preliminary parts (Acknowledgement, Executive Summary, Table of Contents, List of symbols, List of figures, List of tables) are numbered in roman numerals (i, ii, etc.). The first page of the first chapter (Introduction) onwards will be numbered in Arabic numerals 1 2 3 etc. at the bottom.

Figure and Table numbering: It is useful and convenient to number the figures also chapter-wise. The figures in chapter 4 will be numbered as Figure 4.1: Figure Name. This helps you in assembling the figures and putting it in proper order. Similarly, the tables are also numbered as Table 4.1: Table Name. All figures and tables should have proper captions. Usually the figure captions are written below the figure and table captions on top of the table.

Evaluation Scheme:
The marks should be evaluated by project teachers as well as other teachers in the related field on the basis of:

S.N.	Topic	Marks Distribution
1	Proposal Defense	10
2	Mid-term progress report/presentation	20
3	Final project report/presentation	70 (project coordinator =10 supervisor =20 external examiner =40)
	Total	**100**

Detailed evaluation scheme:

S.N.	Topic	Marks Distribution

1	Presentation skill	20%
2	Team work	10%
3	Understanding of project work and related theory	20%
4	Project demonstration	20%
5	Project Applications	10%
6	Documentation	20%
	Total	**100%**