



MANONMANIAM SUNDARANAR UNIVERISTY,  
TIRUNELVELI-12

## SYLLABUS

### UG - COURSES – AFFILIATED COLLEGES

Course Structure for B.Sc. Computer Science

(Choice Based Credit System)

(with effect from the academic year 2020-2021 onwards )



| Semester-VI |                       |  |              |        |
|-------------|-----------------------|--|--------------|--------|
| Part        | Subject Status        | Subject Title  | Subject Code | Credit |
| III         | Core                  | Operating System   |              | 4      |
| III         | Core                  | Software Engineering and Testing   |              | 4      |
| III         | Core                  | Computer Graphics and Visualization  |              | 4      |
| III         | Core                  | Introduction to Digital Image Processing   |              | 4      |
| III         | Major Practical - VII | Computer Graphics Lab  |              | 2      |
| III         | Major Elective - II   | 1. Internet of Things (IoT)<br>2. Information Technology Service Management (ITSM)<br>3. Neural Networks |              | 4      |
| III         | Project               | Digital Image Processing using Sci Lab/<br>Math Lab  |              | 4      |



**Total Marks: 100 Internal Exam: 25 marks + External Exam: 75 marks**

**A. Scheme for internal Assessment:**

Maximum marks for written test: **20 marks**

**3 internal tests**, each of **1 hour** duration shall be conducted every semester.

To the average of the **best two** written examinations must be added the marks scored in. The **assignment** for 5 marks.

The break up for internal assessment shall be:

Written test- 20 marks; Assignment -5 marks Total - 25 marks

**B. Scheme of External Examination**

**3 hrs.** examination at the end of the semester

A – Part : 1 mark question two - from each unit

B – Part : 5 marks question one - from each unit

C – Part : 8 marks question one - from each unit

➤ **Conversion of Marks into Grade Points and Letter Grades**

| S.No | Marks  | Letter Grade | Grade point (GP) | Performance   |
|------|--------|--------------|------------------|---------------|
| 1    | 90-100 | O            | 10               | Outstanding   |
| 2    | 80-89  | A+           | 9                | Excellent     |
| 3    | 70-79  | A            | 8                | Very Good     |
| 4    | 60-69  | B+           | 7                | Good          |
| 5    | 50-59  | B            | 6                | Above Average |
| 6    | 40-49  | C            | 5                | Pass          |
| 7    | 0-39   | RA           | -                | Reappear      |
| 8    | 0      | AA           | -                | Absent        |

➤ **Cumulative Grade Point Average (CGPA)**

$$CGPA = \frac{\Sigma (GP \times C)}{\Sigma C}$$

- **GP** = Grade point, **C** = Credit
- CGPA is calculated only for Part-III courses
- CGPA for a semester is awarded on cumulative basis

➤ **Classification**

- First Class with Distinction : CGPA  $\geq$  7.5\*
- First Class : CGPA  $\geq$  6.0
- Second Class : CGPA  $\geq$  5.0 and  $<$  6.0
- Third Class : CGPA  $<$  5.0



# OPERATING SYSTEM

## Objectives:

- To acquire the fundamental knowledge of the operating system architecture and components and to know the various operations performed by the operating system.
- Understand the basic working process of an operating system.
- Understand the importance of process and scheduling.
- Understand the issues in synchronization and memory management.

## Unit I

**Introduction:** What Operating system do? – Computer System Organization – Computer System Architecture – Operating System Structures- Operating System Operation. System Structures: Operating System Services – System Calls – System Programs – Operating System Design and Implementation- Operation System Generation- System Boot.

## Unit II

**Process Concept:** Process Concept- Process Scheduling –Operation on Processes- Inter Process Communication- Example of IPC System – Communication in Client – Server system.

**Process Scheduling :** Basic concept-Scheduling criteria- Scheduling algorithm- Thread scheduling- Multiple Processor Scheduling-Real Time CPU Scheduling- Operating system example- Algorithm evaluation.

## Unit III

**Synchronization:** Background - The Critical section problem-Peterson's solution - Semaphores – Classic problems of Synchronization. **DeadLocks:** System model- Deadlock Characterization- Methods for handling deadlocks- Deadlock Prevention- Deadlock Avoidance-Deadlock detection - Recovery from deadlock.

## Unit IV

**Memory Management:** Background – Swapping - Contiguous Memory allocation – Segmentation – paging. **Virtual Memory Management :** Background - Demand paging - Copy and Write-page replacement-Allocation of Frames - Thrashing.

## Unit V

**File System :** File Concept-Access Method-Directory and Disk Structure--File Sharing- Protection. **Implementing File System:** File System Structure - File System implementation- Directory implementation-Allocation Methods - Free Space Management. **Mass Storage Structure:** Overview of Mass Storage Structure-Disk



Structure - Disk Scheduling - Disk Management.

**Text Book:**

1. Operating System Concepts – Abraham Silberscartz, Peter Baer Galvin, and Greg Gange. Addison Wesley Publishing Company – Ninth Edition.

**Reference Books:**

1. Operating System: Internal and Design Principles – Fifth Edition, William Stallings, PHI Learning Private Limited.
2. Understanding Operating Systems: Ida M. Flynn, Ann McIver McHoes.

## SOFTWARE ENGINEERING AND TESTING

**Objectives:**

- To acquire the fundamental knowledge of Software Engineering and to know the various testings performed

**Unit-I**

**Introduction:-** Evolution – From an Art form on Engineering Discipline: Evolution of an Art into an Engineering Discipline. – Software Development of Projects: Program versus Product– Emergence of Software Engineering: Early Computer Programming – High Level Language Programming – Control Flow-based Design – Data Structure Oriented Design – Object Oriented Design.

**Software Life Cycle Models:-** A few Basic Concepts – Waterfall Model and its Extension: Classical Waterfall Model – Iterative Waterfall Model – Prototyping Model – Evolutionary Model. – Rapid Application Development (RAD): Working of RAD. –Spiral Model.

**Unit-II**

**Software Project Management:-** Responsibilities of a Software Project Manager- Project Planning- Project Estimation Techniques-Risk Management. **Requirements Analysis and Specification:-** Requirements Gathering and Analysis – Software Requirements Specifications (SRS):Users of SRS Document – Characteristics of a Good SRS Document – Important Categories of Customer Requirements – Functional Requirements – How to Identify the Functional Requirements? – Organisation of the SRS Document.



**Unit-III**

**Software Design:-** Overview of the Design Process: Outcome of the Design Process – Classification of Design Activities. – How to Characterize a good Software Design?

**Function-Oriented Software Design:-** Overview of SA/SD Methodology – Structured Analysis – Developing the DFD Model of a System: Context Diagram – Structured Design – Detailed Design.

**Unit-IV**

**User Interface Design:-** Characteristics of a good User Interface - Basic Concepts – Types of User Interfaces – Fundamentals of Components based GUI Development: Window System. **Coding and Testing:-** Coding – Software Documentation – Testing: Basic Concepts and Terminologies – Testing Activities. – Unit Testing – Black-box Testing: Equivalence Class Partitioning – Boundary Value Analysis-White-box Testing.

**Unit-V**

**Software Reliability and Quality Management:-** Software Reliability: Hardware versus Software Reliability. – Software Quality – Software Quality Management System – ISO 9000: What is ISO 9000 Certification? – ISO 9000 for Software Industry – Shortcomings of ISO 9000 Certification. – SEI Capability Maturity Model: Level 1 to Level 5. **Software Maintenance:-** Characteristics of Software Maintenance: Characteristics of Software Evolution – Software Reverse Engineering.

**Text Book**

1. Fundamentals of Software Engineering Fifth Edition by Rajib Mall – PHI Learning Private Limited 2018.

**Reference Books**

1. Software Engineering 2nd Edition by K L James PHI.
2. Software Engineering 9th Edition by Ian Sommerville - Pearson Education Asia.

**COMPUTER GRAPHICS AND VISUALIZATION****Objectives:**

- To acquire the fundamental knowledge of Computer Graphics and Visualization.
- To understand the Algorithms in Computer Graphics

**Unit I**

**Overview of Graphics System:** Video Display Devices – Input Devices - Hard Copy



Devices – Graphics Software. **Output Primitives:** Points and Lines –Line drawing algorithms – DDA algorithm- Bresenham’s line algorithm- Circle drawing algorithms: properties of circles – Midpoint Circle algorithm – Filled Area primitives.

## Unit II

**Attributes of Output Primitives:** Line attributes – Curve attributes – Character attributes. **Two- Dimensional Geometric Transformation:** Basic Transformations – Matrix Representations and homogenous coordinates – Composite and other Transformations.

## Unit III

**Two-Dimensional Viewing:** The viewing pipeline, Viewing co-ordinate reference frame – Window to view port co-ordinate transformation – Two-dimensional viewing function. **Clipping Operations:** Point clipping – Line clipping (only Cohen-Sutherland line clipping) – Polygon Clipping (only Sutherland-Hodgeman polygon clipping).

## Unit-IV

**Interactive Input Methods:** Input of graphical data – Input functions – Three dimensional display methods.

**Three Dimensional Geometric and Modeling Transformations:** Translation - Rotation - Scaling

## Unit-V

**Three Dimensional Viewing:** Viewing Pipeline, Projections. Visible-surface deduction methods: Back-face Detection - Depth buffer method. **Color Models and Color Applications** – RGB color model – YIQ color model – CMY color model – HSV color model.

## Text Book:

Computer Graphics C version, Second Edition, Donald Hearn, M.Pauline Baker, Pearson Publications

## Reference Books

1. Computer Graphics, Multimedia and Animation - Malay K. Pakhira – PHI.
2. Computer Graphics - Udit Agarwal - S. K. Kataria & Sons, 2009.
3. Express Learning - Computer Graphics and Multimedia-ITL Education Solution Ltd.
4. Computer Graphics-A programming Approach 2/e-Steven Harrington-Mc Graw Hill Education Private Limited.



# INTRODUCTION TO DIGITAL IMAGE PROCESSING

## Objectives:

- To acquire the fundamental knowledge of introduction to Digital Image Processing.
- To understand the features present in Digital Image Processing.

## Unit – I

**Introduction & Fundamentals** : Definition of Image and Digital Image Processing - Examples of Digital Image Processing - Fundamental Steps in Digital Image Processing - Components of an Image Processing System - Visual Perception - Image Acquisition - A Simple Image Model - Zooming and Shrinking of Digital Image

## Unit – II

**Image Enhancement in Spatial Domain** : Introduction - Mathematical Analysis of Enhancement in Spatial Domain - Basic Gray Level Transformation - Histogram Processing - Histogram Equalization - Histogram Matching - Image Enhancement using Arithmetic and Logical Operation - Basic Transformations - Basics of Spatial Filtering

**Image Enhancement in Frequency Domain** : One Dimensional Fourier Transform and its Inverse - Two Dimensional Fourier Transform and its Inverse - Basics of Filtering in Frequency Domain - Basic Frequency Domain Filters - Homomorphic Filtering.

## Unit – III

**Color Image Processing** : Introduction - Advantages of Color Image Processing - Categories of Color Image Processing - Color Fundamentals - Primary Colors - Secondary Color - Primary and Secondary Colors for Pigments - Characteristics that are Used for Differentiating Different Colors - Color Models - Conversions between Color Models - Pseudo Color Image Processing - Color Transformation - Color Image Smoothing and Sharpening - Color Segmentation

## Unit – IV

**Image Compression** : Introduction - Mathematical Analysis - Types of Data Redundancies - Image Compression Model - Compression Strategies.

**Morphological Image Processing** : Introduction - Basic Concept of Set Theory - Logic Operations Involving Binary Images - Dilation and Erosion - Opening and Closing

## Unit – V

**Features and Image Segmentation** - Introduction - Classification of Features - Features



of an Image - Attributes of Features - Process of Feature Extraction - Image Segmentation - Thresholding - Region Based Segmentation

**Text Book:**

Digital Image Processing - Abhishak Yadav and Poonam Yadav - University Science Press

**Reference Books:**

1. Digital Image Processing, S Jayaraman, S Esakkirajan, T Veerakumar, McGraw-Hill Education Pvt. Ltd., 2e, 2020
2. Digital Image Processing, 4e, Rafael C Gonzalez, Richard E Woods, Pearson, 2018
3. Digital Image Processing – Sridhar S – 2e – Oxford University Press, 2016

## COMPUTER GRAPHICS LAB

**Objectives:**

- To acquire skills in programming computer graphics
- To acquire skills in multimedia concepts

**Each exercise should be completed within two hours.**

**It is compulsory to complete all the exercises given in the list in the stipulated time.**

1. Write a program to draw a line using DDA algorithm
2. Write a program to draw a circle using Bresenham's algorithm.
3. Write a program to draw a line using Bresenham's algorithm.
4. Write a program to scale an image.
5. Write a program to rotate an image.
6. Write a program to translate an image.
7. Write a program for bouncing a ball and moving with sound effect.
8. Write a program to display as many balls in the frame in random position.
9. Write a program to display an image as tiled and cascaded according to the user's option.
10. Write a program so that it should first display the image as the size of applet then it should be reduced and again it should reduced and so on and finally the image should disappear

## DIGITAL IMAGE PROCESSING USING SCILAB / MatLab

**Objective:**





- To get knowledge about the basic programs on Digital Image Processing
- 1) Perform 2D Linear Convolution, Circular Convolution between two 2D matrices.
  - 2) Perform Discrete Fourier Transform(DFT), Discrete Cosine Transform(DCT) of 4x4 gray scale image.
  - 3) Perform Brightness enhancement, Contrast Manipulation, Image negative of an image.
  - 4) Perform threshold operation on an image.
  - 5) Perform Edge detection using different edge detectors.
  - 6) Perform Dilation and Erosion operation.
  - 7) Perform Opening and closing operations
  - 8) Read a colour image and separate the image into red, blue and green planes.

**Reference:**

- 1) Scilab Textbook Companion for Digital Image Processing, S. Jayaraman, S. Esakkirajan And T. Veerakumar, 2016  
([https://scilab.in/textbook\\_companion/generate\\_book/125](https://scilab.in/textbook_companion/generate_book/125))

## INTERNET OF THINGS

**Objective:**

- To give a brief idea about IOT working
- To make the students understand the Architecture of IOT

**UNIT I:**

Fundamentals of Internet of Things: Introduction – Characteristics of IoT – The Physical Design of IoT – Iot Architecture an Components – Logical design of IoT – Communication Models – IoT Communication API – IoT Architecture and Protocols – Introduction –Fog based Architecture of IoT – Near Field Communication – Wireless Sensor Networks – IoT Network protocol stack – IoT technology stack – Blue tooth – Zig Bee – and 6LowPAN.

**UNIT II:**

Programming Framework for IoT: Interoperability – Programming Paradigm – Assembly – Introduction to Arduino Programming – Introduction to Python Programming – Introduction to Raspberry Pi .Virtualization: Introduction – Types – Virtualization and IoT – Embedded Virtualization.

**UNIT III:**

IoT Application Area: Introduction – Homes – Health care – Agriculture – Military



applications – Politics – Constructions – Other application areas . Cloud an IoT : Introduction – Cloud – IoT – Difference between cloud and IoT – Cloud IoT architecture –challenges.

#### **UNIT IV:**

Smart City using IoT: Introduction – Concept – The emergence – Dimensions and Components – Design strategies – Factors affecting automation – IoT applications in smart cities – Education – E- governance – Industry . IoT Use Cases: Industrial IoT Use Case – IoT and smart energy – Smart transportation – Smart health – Smart home – Smart Education system – Governance use case – Smart cities.

#### **UNIT V:**

Network Security for IoT and M2M communications: Introduction – Network Technologies for IoT and M2M – Security for IoT and M2M Technologies – Securities in IETF M2M network Technologies – Security in ETSI M2M Network Technologies – Other M2M standard Efforts.

#### **Text Books:**

1. Internet of Things – Principles, Paradigms and Applications of IoT by Dr. Kamlesh Lakhwani, Dr.Hemant Kumar Gianey, Joseph Kofi Wireko, Kamal Kant Hiran (BPB publication First Edition 2020)
2. Internet of Things(IoT) Systems and Applications By Jamil Y . Khan & Mehmet R.Yuce Jenny Stanford Publishing.

#### **Reference Book**

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014

## **INFORMATION TECHNOLOGY SERVICE MANAGEMENT**

#### **Objectives:**

- To make the students understand about the various Information Technology Services
- To make them understand the working principles

#### **Unit I**

Information Technology – System model Layers – Networks, Hardware, Operating



System - Software, Software Tools- Database- Business Process. Service Desk - Omni-channel ticket management - email, social media, live chat, phone - Ticket Workflow

## **Unit II**

Infrastructure layer and Software Layer – Key Infrastructure management activities – Asset Management - Network – Servers – Operating System -Unix / Windows- Software Tools / platforms- Desktop / Workstation support – Mobile handheld device support License management – Licensing models – Warranty management – Hardware Life cycle management- Remote Infrastructure management – Cloud Infrastructure maintenance

## **Unit III**

Incident Management – Priority and Severity – L1 – L2- L3- L4 Tickets– Ticket management system – Incident Workflow– Customer Feedback for incident resolution. Root cause analysis (RCA) – Documentation of RCA – Five-Why Analysis – Corrective and Preventive Actions – Tracking the preventive and corrective actions for closure – Managing critical incidents (P1/P2 incidents) – Lessons Learned – Success Stories

## **Unit IV**

Problem Management – Problem Definition – Problem ticket – Problem ticket workflow - RCA and tracking – scheduling the closure. Change Management – Ticket Workflow – Release management – Maintenance release – minor release – major release. Knowledge Management – Success Stories – Lessons Learned – Documentation – Sharing of the knowledge – Ticket Analysis and Reporting – Incident Reduction – Training the user community and Service Desk L1 support – Automation of mundane jobs

## **Unit V**

ITIL (Infrastructure Technology Information Library) ITIL v3/ 4 Framework – Service Strategy – Service Design – Service Transition – Service Operations – (Continual) Service Improvement – Ticket Management Tools in the market – Role of Artificial Intelligence in ITSM

## **Reference Books:**

1. ITSM QuickStart Guide: The Simplified Beginner's Guide to IT Service Management, by ClydeBank Technology, Amazon Books (2016)
2. Measuring ITIL, Randy A. Steinberg, Google Books (2006)
3. Implementing Itsm: From Silos to Services: Transforming the It



Organization to an It Service Management Valued Partner, Randy A. Steinberg, Amazon Books (2014)

4. Foundations of IT Service Management based on ITIL Google Books (2005)

## **NEURAL NETWORKS**

### **OBJECTIVES:**

- Basic neuron models: McCulloch-Pitts model and the generalized one, distance or similarity based neuron model, radial basis function model, etc.
- Basic neural network models: multilayer perceptron, distance or similarity based neural networks, associative memory and self-organizing feature map, radial basis function based multilayer perceptron, neural network decision trees, etc.
- Basic learning algorithms: the delta learning rule, the back propagation algorithm, self-organization learning
- Applications: pattern recognition, function approximation, information visualization, etc.

### **UNIT I**

Introduction to Neural networks: Neural processing- Neural networks- an overview – the raise of neuro computing – introduction to artificial neural networks : introduction-artificial neural networks – historical development of neural networks – biological neural networks – comparison between the brain and the computer – artificial and biological neural networks – basic building blocks of artificial neural networks – artificial neural network terminologies.

### **UNIT II**

Fundamental models of artificial neural networks: McCulloch-Pits neuron Model-Learning rules. Perceptron networks: Introduction –single layer perceptron –brief introduction to multi layer perceptron networks.

### **UNIT III**

Feedback networks: Introduction- discrete Hopfield net-continuous Hopfield net-relation between BAM and Hopfield nets. Feed forward networks: introduction-back propagation networks.

### **UNIT IV**

Kohonen self - organizing feature maps - counter propagation network: introduction-



Full counter propagation network-Forward only propagation network.

## **UNIT V**

Applications of Neural Networks: Applications of neural networks in Arts-Bioinformatics - Knowledge Extraction – Forecasting - Bankruptcy forecasting-Healthcare-Intrusion - Detection.

## **TEXT BOOK**

1. Introduction to Neural Networks using MATLAB 6.0., S N Sivanandam S Sumathi S N Deepa , McGraw Hill, 2006.

## **REFERENCE BOOKS**

1. Artificial neural Networks B.Yegnanarayana, Prentice Hall India, 2005.
2. Neural Networks Alogorithms, Applications and programming Techniques, James A Freeman David M Skapura, Pearson Education.
3. Neural Networks for Pattern Recognition, Christopher M. Bishop, Indian Edition, OXFORD University Press.

