MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI

UG COURSES – AFFILIATED COLLEGES
B.Sc Computer Scienc

(Choice Based Credit System)
(with effect from the academic year 2017-2018 onwards

V	III	31	Core	Software Engineering and Testing	4	4	0	0	4
	III	32	Core	Data communication and Computer Network	4	4	0	0	4
	III	33	Core	Dot NET Technologies	4	4	0	0	4
	III	34	Major Practical - V	Dot NET	4	0	0	4	2
	III	35	Major Practical - VI	Data Structures	4	0	0	4	2
			Mini Project		4	0	0	4	3
	III	36	Major Elective - II	Cloud Computing	4	4	0		4
	III		Skill Based Common	Personality Development	2	2	0	*	2
				Subtotal	**30**	**21**	**0**	**9**	**25**

	III	37	Core	Operating Systems	5	4	1	0	4
VI	III	38	Core	Computer Graphics and Visualization	4	4	0	0	4
	III	39	Core	Data Warehousing and Data Mining	4	4	0	0	4
	III	40	Major Practical -VII	Computer Graphics	4	0	0	4	2
	III	41	Major Practical -VIII	Oracle	4	0	0	4	2
	III	42	Major Practical - IX	Android Programming	4	0	0	4	2
	III	43	Major Elective - III	Internet of Things	4	4	0	0	4
				Subtotal	**30**	**20**	**1**	**13**	**22**
								Total	140**

- * 10 hours of practical
- **L**-Lecture **T**-Tutorial **P-**Practicals

Distribution of marks between External and Internal Assessment is

For Theory 75 : 25

For Practical 50 : 50

Internal Marks for Practical shall be allotted in the following manner

Continuous Assessment – 25 marks "N" number of practicals be conducted based on the practicals prescribed in the syllabus and the marks should be distributed equally for each practical.

Test - 25 marks Two tests should be conducted and average of tests be taken.

Calculation of marks: Sum of marks awarded to number of practicals + the average marks of two tests

Total **- 50 marks**

Software Engineering and Testing

L T P C

4 0 0 4

OBJECTIVES:

- To understand the concepts of analysis, design and implementation of a software product.
- To have general understanding about object-oriented software engineering.
- To make students to get experience and be ready for the large scale projects in IT Industry.

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.

(12L)

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. (12L)

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.

(12L)

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. (12L)

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.

(12L)

Text Book:

Fundamentals of Software Engineering Fourth Edition by Rajib Mall – PHI Learning Private Limited 2015.

Reference Books:

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

Data communication and Computer Network

L T P C

4 0 0 4

OBJECTIVES:

• To understand the concepts of data communication.

• To get through understanding of different topologies.

• To study the function of different layers.

• To get familiarized with different protocols and network components.

Unit I

Introduction - Data communication – Networks-the Internet –Protocols and Standards –**Network Models** –Layered tasks –OSI model- layers in OSI model-TCP/IP protocol Suit-Addressing.

(12L)

Unit II

Physical layer – Analog and digital – Transmission Impairment –Data rate limits-Performance- Transmission mode -**BandWidth Utilization**- Multiplexing - **Transmission media** – Guided and Unguided media.

(12L)

Unit III

Switching – Circuit Switched Network-Datagram Network – Virtual Circuit Network. **Using telephone and cable networks –** Telephone Network- Dial-Up Modem–Digital Subscriber lIne – Cable TV Network and Cable TV for Data transfer.

(12L)

Unit IV

Data Link Layer : Error Detection and Correction- Introduction- Checksum. **Data link control**-Framing-Flow and Error Control-Protocols-Noiseless Channels-Noisy Channels. **Wired LANs**-IEEE standards-Standard Ethernet- Changes in the Standard – Fast Ethernet-Gigabit Ethernet.

(12L)

Unit V

Wireless LANs: IEEE 802.11-Blue tooth. **Connecting LANs :** Connecting devices, Backbone networks. **Wireless WANs**: Cellular Telephony, Satellite Networks. **Network Layer**- IPv4 Address-IPv6 Address-Internetworking. **Transport Layer**- Process to Process delivery –UDP-TCP. **Application Layer-** Name space-DNS. (12L)

Text Book

Data Communication and Networking –"BEHROUZ A FOROUZAN ",The McGraw- Hill- 4 thed.

References

1. Data Communication and Computer Networks – " Prakash C.Gupta
2. Computer Networks Protocols,Standards and Interfaces- " Uyless Black
3. Data Communications and Computer Networks – Brijendra Singh

Dot NET Technologies

L T P C

4 0 0 4

OBJECTIVES:

- To highlight the features of ASP.NET and apply it to develop various applications.
- To understand the concepts of .Net framework as a whole and the technologies that constitutes the frame work.
- To make the students to get experience and be ready for the large scale projects in IT industry.

Unit I

The .NET Platform and the Web: The Web Client/Server Model – Components of ASP.NET and the .NET Framework – Overview of Internet Information Server – Overview of ASP.NET – The .NET Common Language Runtime and Class Library – Managed Components in .NET – Web Services – Language Independence in the .NET Framework – COM+ Component Services and .NET – Direction and plans for .NET. **The VB.NET:** What is VB.NET? – First VB application – Variables, Constants and Operators – Modularizing Code – Functions and Subroutines – Controlling Program Flow – Handling Errors and Exceptions – Object Oriented Programming – Multithread Programming.

(12L)

Unit II

Working with ASP.NET: The features of ASP.NET – The Anatomy of ASP.NET Pages –Introducing Web Forms – VS.NET Web Applications and other IDE Basics – Separating Content and Code – the Code-Behind Feature – Application Configuration – Using HTML Forms – Using Web Controls – Web Controls for displaying and formatting data –Web Controls for creating buttons – Web control for inputting text – Web controls for selecting choices – Web controls for creating lists – Miscellaneous Basic Controls – Creating a simple ASP.NET Application – ASP.NET Page Directives – ASP.NET Rich Controls – Validation Controls – Data List Controls – User Controls - Saving state with the StateBag Object – ASP.NET Intrinsic Objects. (12L)

Unit III

Using the .NET Framework Class Library: Common Features of the .NET Framework Class Library – Using Data Collections – Handling File Input/output and Directories – Watching the File System for Changes – Using the Windows Event Log – Working with Active Directory Services – Using Message Queues – Communicating with Servers on the Internet – Manipulating XML Data – Sending Internet E-mail. (12L)

Unit IV

Building .NET Managed Components for COM+: The concept of Managed Code Execution – The Common Language Runtime – COM+ Component Services – Using VB.NET to develop Managed Components – Serviced Components – Building VB.NET Serviced Components. **Building Web Services:** The need for Web Services – Overview of Web Services – Web Service Description Language - Web Service Wire Formats – Web Services Discovery – Creating a simple Web Service – Calling Web Services with Proxy Classes – Creating a Client for a Web Service – Managing State in Web Services – Using Transactions in Web Services.

(12L)

Unit V

Accessing Data with ADO.NET: Overview of Data Access on the Web – ADO.NET: The next generation of Data-Access Technology – ADO.NET Programming Objects and Architecture – Displaying Database Data – Programming with the DataList and DataGrid Controls – Working with the DataSet and DataTable Objects – Maintaining Data Integrity with the DataRelation Class – Using Manual Database Transactions – Working with Typed DataSet Objects. **Securing .NET Applications:** Windows Security – IIS Authentication and Authorization Security – A crash course in Cryptography – Implementing Data Encryption – ASD.NET Authentication Security.

(12L)

Text Book

ASP.NET and VB.NET Web Programming –by Matt J. Crouch, Pearson.

Reference Books

1. Upgrading Microsoft Visual Basic 6.0 to .NET - by d Robinson, Michael Bond, Robert Ian Oliver, WP Publishers.

2. Visual Basic.NET - by Shirish Chavan, Pearson

Dot NET Practical Listing

L T P C

0 0 4 2

Objective: Learn to program in Dot Net and to develop web pages using ASP.NET

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. Build a homepage for XYZ Corporation using Web Controls.
2. Create a login page using user control in a web form.
3. Create a simple multiple choice questionnaire. Submit the answers and display the score.
4. Develop a project to input data through a web form to a database and retrieve the data. Use the calendar control to input date.
5. Develop a project to input data through a web form to a database and validate the data. Use the Required Field Validator and RangeValidator Controls.
6. Check whether a given word or phrase is a palindrome using Web Service.
7. Create an online photo gallery using DataList and DataGrid Controls.
8. Develop code to send email from ASP.NET

DATA STRUCTURE PRACTICAL LIST

L T P C

0 0 4 2

Objective: To develop skills in implementing data structure algorithms

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. Search an element in a list using Binary Search.
2. Implementation of Stack- Push and Pop.
3. Implementation of Queue – Enqueue and Dequeue
4. Implementation of Binary Tree Traversals using recursion.
   a) Pre-order b) In-order c) Post-Order

5. Implementation of Breadth First Search algorithm.
6. Implementation of Depth First Search algorithm.
7. Implementation of Merge Sort
8. Implementation of Quick Sor

Mini Project

WEB PROGRAMMING WITH PHP AND MYSQL Practical Listing

L T P C

0 0 4 2

Objective:

To develop applications in PHP using various concepts like arrays, udf's, Sessions and make the students to understand and to establish the connectivity between PHP and MySQL and develop programs to add records, retrieve records and delete records from a table.

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. Create a simple webpage using PHP.

2. Design a form to create an email. Store the data in a database. Validate all the input fields. Database connectivity in PHP with MySQL.

3. Create a mysql database table tbllogin with fields user name and Password. Perform all database operations like select, insert, delete, update on the table tbllogin

4. Develop a **CRUD** application, which stands for **C**reate, **R**ead, **U**pdate, **D**elete.
   A quick example of a CRUD application would be a database of employees for a company. From the control panel, an admin would be about to add a new employee (`create`), view a list of employees (`read`), change an employee's salary (`update`) or remove a fired employee from the system (`delete`).
5. Create a table with two columns namely the name of the player and number of wickets. Create a Chart to display the data.

Major Elective - 3

(OPTIONAL PAPER)

Cloud Computing

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4	0	0	4

- Understand core concepts of cloud computing
- Learn the fundamental concepts about data centers to understand the tradeoffs in power, efficiency and cost.
- Understand use of cloud storage in storage systems.

UNIT I:

Introduction Cloud Computing Introduction, From, Collaboration to cloud, Working of Cloud Computing, Pros and Cons, Benefits, Developing Cloud Computing Services, Cloud Service Development, Discovering Cloud Services.

(12L)

UNIT II:

Cloud Computing For Everyone Centralizing Email Communications, Cloud Computing for Community, Collaborating on Schedules, Collaborating on Group Projects and Events, Cloud Computing for Corporation, Mapping Schedules Managing Projects, Presenting on Road.

(12L)

UNIT III:

Using Cloud Services Collaborating on Calendars, Schedules and Task Management, Exploring on Line Scheduling and Planning, Collaborating on Event Management, Collaborating on Contact Management, Collaborating on Project Management, Collaborating on Word Processing, Spreadsheets, and Databases.

(12L)

UNIT IV:

Outside The Cloud Evaluating Web Mail Services, Evaluating Instant Messaging, Evaluating Web Conference Tools, Creating Groups on Social Networks, Evaluating on Line Groupware, Collaborating via Blogs and Wikis.

(12L)

UNIT V:

Storing And Sharing Understanding Cloud Storage, Evaluating on Line File Storage, Exploring on Line Book Marking Services, Exploring on Line Photo Editing Applications, Exploring Photo Sharing Communities, Controlling it with Web Based Desktops. (12L)

TEXT BOOK:

Cloud Computing, Michael Miller, Pearson Education, New Delhi, 2009.

REFERENCE BOOK:

1. Cloud Computing, V. K. Pachghare, PHI Learning Pvt Ltd, 2016
2. Cloud Computing, Anthony T.Velte, Toby J.Velte, Pobert Elsenpeter, TMH, 2010.
3. Cloud Computing Bible, Barrie Sosinsky, Wiley Publishing, Inc.

Operating Systems

L T P C

4 0 0 4

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.

(12L)

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. (12L)

Unit III

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

(12L)

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.

(12L)

Unit V

File System : File Concept-Access Method-Directory and 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.

(12L)

Text Book:

Operating System Concepts – Abraham Silberscartz, Peter Baer Galvin, and Greg Gange.

Addision Wesley Publishing Company – Ninth Edition.

Reference Books:

1. Operating System: Internal and Design Principles – Fifth Edition, William Stalling ,PHI Learning Private Limited.
2. Understanding Operating Systes: Ida M.Flynn ,Ann MclverMcHoes.

Computer Graphics and Visualization

L T P C

4 0 0 4

OBJECTIVES:

To develop skills and knowledge about computer graphics and Visualization and to understand 2D, 3D transformations.

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 – Midpointcircle algorithm – Filled Area primitives.

(12L)

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. (12L)

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).

(12L)

Unit IV

Interactive Input Methods: Input of graphical data – Input functions – Three dimensional display methods. **Three Dimensional Geormetric and Modeling Transformations**: Translation - Rotation - Scaling

(12L)

Unit V

Three Dimensional Viewing: Viewing Pipeline, Projections. **Visible-surface deduction methods**: Back-face deduction – Depth buffer method- A-Buffer Method – Scanline Method.

(12L)

Text Book:

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

Reference Books

1. Express Learning - Computer Graphics and Multimedia-ITL Education Solution Ltd.
2. Computer Graphics-A programming Approach 2/e-Steven Harrington-Mc Graw Hill Education Private Limited.

3. Computer Graphics, Multimedia and Animation - Malay K. Pakhira - PHI

Data Warehousing and Data Mining

L T P C

4 0 0 4

OBJECTIVES:

- to understand and implement classical models and algorithms in data warehousing and data mining
- to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- to assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

Unit I

DATA WAREHOUSING: Data warehousing Components –Building a Data warehouse –- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata. (12L)

Unit II

BUSINESS ANALYSIS: Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet. . (12L)

Unit III

DATA MINING: Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing

(12L)

Unit IV

ASSOCIATION RULE MINING AND CLASSIFICATION: Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction. .

(12L)

Unit V

CLUSTERING AND TRENDS IN DATA MINING: Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – K-means– Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications. (12L)

Text Book:

1. Alex Berson and Stephen.J.Smith, “Data Warehousing, Data Mining and OLAP”, Tata McGraw Hill, Thirteen 2008
2. Jiawei Han, Micheline Kamber,” Data Mining Concepts and Techniques”, Third Edition Elsevir 2012

Reference Books

1. **Introduction to Data Mining**, *by* **Pang-Ning Tan**, **Michael Steinbach, and Vipin Kumar**, **Pearson Education 2007.**
2. Insight into Data Mining Theory and Practice – K.p. Soman, Shyam Diwakar, V.Ajay, Prentice Hall of India – 2008.
3. G.K. Gupta Introduction to Data Mining with Case studies, PHI Third Edition, 2015.

Computer Graphics and Multimedia Lab Listing

L T P C

0 0 4 2

Objective:

1. To acquire skills in programming computer graphics
2. 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.

Oracle Lab Listing

L T P C
0 0 4 2

Objective:

1. To acquire skills in SQL statements with various constructs
2. To acquire skills in PL/SQL Programming

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. Create an employee database with tables department, employee details, address, pay details and project details. Alter the tables and add constraints relevant to the fields in the tables. Insert records into all the tables.
2. Create queries to retrieve relevant information from a table.
3. Create a table from the existing tables.
4. Develop queries to retrieve information from more than one table.
5. Develop summary queries to retrieve relevant information from the tables.
6. Write a PL/SQL program to print multiplication table
7. Write a PL/SQL program to check whether given string is palindrome or not
8. Write a PL/SQL program to find factorial of numbers using function and procedure.

Android Programming Lab Listing

L T P C

0 0 4 2

Objective:

1. To acquire skills in Android Studio
2. To acquire skills in mobile Programming

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. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop a Android Application that creates Alarm Clock

Major Elective - 3
(OPTIONAL PAPER)
INTERNET OF THINGS

L T P C
4 0 0 4

OBJECTIVES:

- Learn how the Internet of Things (IOT) has the potential to alleviate some of the world's most significant problems
- To learn IOT technology and architecture.

UNIT I

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. (12L)

UNIT II

M2M to IoT – A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. **M2M to IoT-An Architectural Overview**– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

(12L)

UNIT III

M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management.

(12L)

UNIT IV

IoT Architecture-State of the Art – Introduction, State of the art, **Architecture Reference Model-** Introduction, Reference Model and architecture, IoT reference Model.

(12L)

UNIT V

IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. **Real-World Design Constraints-** Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

(12L)

TEXT BOOK

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.

REFERENCE BOOKS

1. Vijay Madisetti and Arshdeep Bahga, **"Internet of Things (A Hands-on-Approach)",** 1stEdition, VPT, 2014.

2. Francis da Costa, **"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",** 1st Edition, Apress Publications, 2013.