RAJALAKSHMI ENGINEERING COLLEGE

(Autonomous)

Curriculum and Syllabus for Minor Degree Programme

Name of the Course	Internet of Things (IoT)
Offering Departments	ECE
Eligible Departments	All branches except ECE/IT/CSE/AIML/CSD/AIDS/CSBS

Pre-requisite:OEC1905-Electronics Engineering

Course Code	Subject Name	L	T	P	C
MEC1901	Introduction to Internet of Things	3	0	0	3
MEC1902	Introduction to Sensor Technology	3	0	0	3
MEC1903	IoT: Communication Technologies	3	0	0	3
MEC1904	Industry 4.0 and IIoT	3	0	0	3
MEC1905	IoT Protocols	3	0	0	3
MEC1906	IoT System Design	3	0	0	3
	TOTAL	18	0	0	18

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MEC1901	**INTRODUCTION TO INTERNET OF THINGS**	T	3	0	0	3

Objectives:
• To acquire knowledge in fundamentals of Internet of Things (IoT)
• To understand the various Internet of Things (IoT) Protocols like SCADA and RFID protocols
• To gain conceptual understanding in various IoT architectures
• To understand fundamentals and architecture of WoT
• To apply the concept of Internet of Things in the real-world scenario

UNIT-I	**IOT – An Overview**	9
Introduction to IoT - Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues. SCADA for Industrial IoT		
UNIT-II	**IOT PROTOCOLS**	9
Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– SCADA and RFID Protocols - Modbus – KNX – Zigbee– Network layer – APS layer – Security		
UNIT-III	**IOT ARCHITECTURE**	9
M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model.		
UNIT-IV	**WEB OF THINGS**	9
Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multi tier WoT Architecture – WoT Portals and Business Intelligence.		
UNIT-V	**IOT APPLICATIONS**	9
Applications of IoT in Agriculture, Logistics, Smart home, Health and Energy - IoT applications for industry: Future Factory Concepts, Brownfield IoT.		
		Total Contact Hours:45

Course Outcomes: On completion of the course, students will be able to
• Understand fundamentals of IoT.
• Apply suitable protocol for IoT applications.
• Analyze various architectures of IoT.
• Implement the architecture of WoT for various applications.
• Deploy an IoT application and connect to the cloud.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions
- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various storage technologies
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

[1] Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012.

[2]Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet ofThings", Springer, 2011.

[3]David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a HighlyConnected World", Cambridge University Press, 2010.

[4] Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.

Reference Books(s) / Web links:

[1] Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014

[2] Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to ConnectingEverything", 1st Edition, Apress Publications, 2013

[3] CunoPfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493-9357-1

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MEC1901.1	3	3	3	3	2	3	2	2	3	2	3	3	3	3	3
MEC1901.2	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
MEC1901.3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
MEC1901.4	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
MEC1901.5	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
Average	3	3	3	3	2.8	2.2	2.8	2.8	3	2.8	3	3	3	3	3

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Dr.J.Saranya,AP(SG)/ECE	Dr.M.Palanivelan, Prof& Head/ECE

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MEC1902	**INTRODUCTION TO SENSOR TECHNOLOGY**	T	3	0	0	3

Objectives:
• To understand basic knowledge in transduction principles, sensors and measurement systems.
• To learn the fundamental principles behind the operation of sensors.
• To provide the knowledge of velocity and acceleration measurement methods
• To deploy various measurement methods of physical and electrical Parameters
• To Apply calibration methods for sensors attached with real time systems.

UNIT-I	**INTRODUCTION TO MEASUREMENT SYSTEMS**	9
General concepts and terminology, measurement systems, sensor classifications: Analog Input and Output, Digital Input and Output, general input-output configuration, methods of correction. Passive SensorsResistive Sensors: Potentiometers, Strain Gages, Resistive Temperature Detectors (RTDs),Thermistors, Light-dependent Resistors (LDRs), Resistive Hygrometers.Capacitive Sensors: Variable capacitor and Differential capacitor.Inductive Sensors: Reluctance variation sensors, Eddy current sensors, Linear variable differential transformers (LVDTs), Magneto elastic sensors, Electromagnetic sensors - Sensors based onFaraday's law of Electromagnetic induction, Touch Sensors: Capacitive, Resistive, Proximity Sensors.		
UNIT-II	**SELF-GENERATING SENSORS**	9
Thermoelectric Sensors: Thermocouples, Thermo electric effects, Common thermocouples, Practicalthermocouple laws, cold junction compensation in thermocouples circuits.Piezoelectric Sensors: Piezoelectric effect, piezoelectric materials, applications.		
UNIT-III	**VELOCITY AND ACCELERATION MEASUREMENT**	9
Relative velocity – Translational and Rotational velocity measurements – Revolution counters and Timers - Magnetic and Photoelectric pulse counting stroboscopic methods. Accelerometers-differenttypes, Gyroscopes-applications.		
UNIT-IV	**DENSITY, VISCOSITY AND OTHER MEASUREMENTS**	9
Units of Viscosity, specific gravity scales used in Petroleum Industries, Different Methods of measuring consistency and Viscosity –Two float viscorator –Industrial consistency meter. Sound-Level Meters,Microphones, Humidity Measurement		
UNIT-V	**CALIBRATION AND INTERFACING**	9
Calibration using Master Sensors, Interfacing of Force, Pressure, Velocity, Acceleration, Flow, Densityand Viscosity Sensors, Variable Frequency Drive3		
Total Contact Hours:45		

Course Outcomes: On completion of the course, students will be able to
• Record the working of sensors using various measurement methods.
• Analyse the actuation of sensors using their fundamental principles.
• Measure the velocity and acceleration of accelerometers and gyroscopes.
• Deploy various measurement methods of physical and electrical parameters.
• Identify the calibration methods for sensors attached with real time systems.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions
- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various measuring technologies
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):
[1] Measurement Systems – Applications and Design – by Doeblin E.O., 4/e, McGraw Hill International, 1990.
[2] Principles of Industrial Instrumentation – Patranabis D. TMH. End edition 1997

Reference Books(s) / Web links:
[1] Sensors and Transducers: D. Patranabis, TMH 2003
[2] Wiley & Sons Ltd. (2006).
[3] Sensor Technology Hand Book – Jon Wilson, Newne 2004.
[4] Instrument Transducers – An Introduction to their Performance and design – by Herman K.P.Neubrat, Oxford University Press.

[5] Measurement system: Applications and Design – by E. O. Doeblin, McGraw Hill Publications.

[6] Electronic Instrumentation by H. S. Kalsi.

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MEC1902.1	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**
MEC1902.2	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**
MEC1902.3	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1902.4	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1902.5	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**
Average	3	3	3	3	3	2	3	2.6	3	2.4	3	3	3	3	3

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Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MEC1903	**IoT: Communication Technologies**	T	3	0	0	3

Objectives:
• To understand the fundamentals of communication networks.
• To explore on various IoT models build efficient IoT platform
• To analyze different design methodologies and build IoT platform using python
• To learn programming Raspberry PI with Python and its interfaces
• To deploy IoT platforms in real time environment.

UNIT-I	**FUNDAMENTALS OF COMMUNICATION NETWORKS**	9
Data Communication, Networks, Protocols and standards, Line configuration, Topology, Transmission mode, Signaling, RS232 Serial Communication and Manchester encoding, OSI reference model - layers and duties. TCP/IP reference model – layers and duties, Addressing		
UNIT-II	**IoT AND M2M**	9
IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model.		
UNIT-III	**IoT PLATFORMS DESIGN METHODOLOGY**	9
IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model, Logical design using Python: Installing Python, Python data types and data structures, control flow, functions, modules, packages, file handling.		
UNIT-IV	**IoT PHYSICAL DEVICES AND ENDPOINTS**	9
Introduction to Raspberry Pi interfaces (Serial, SPI, I2C), programming Raspberry PI with Python, other IoT devices.		
UNIT-V	**IoT PHYSICAL SERVERS AND CLOUD OFFERINGS**	9
Introduction to cloud storage models and communication APIs, WAMP – AutoBahn for IoT, Xively cloud for IoT, case studies illustrating IoT design – home automation, smart cities, smart environment.		
Total Contact Hours:45		

Course Outcomes: On completion of the course, students will be able to
• Understand the fundamentals of communication networks.
• Deploy various IoT platform based on architecture analysis
• Identify accurate design methodologies and build IoT platform
• Program Raspberry PI using Python
• Develop IoT platforms in a real time environment.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions
- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures

- Survey on various storage technologies
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Miniproject
- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

[1] ArshdeepBahga, Vijay Madisetti, ―Internet of Things: A Hands-on-Approach‖, VPT, 1st Edition, 2014.

[2] Matt Richardson, Shawn Wallace, ―Getting Started with Raspberry Pi‖, O'Reilly (SPD), 3rd Edition,2014.

Reference Books(s) / Web links:

[1] Adrian McEwen, Hakim Cassimally, ―Designing the Internet of Things‖, John Wiley and Sons 2014.

[2] Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything‖, A press Publications, 1st Edition2013.

[3] https://www.upf.edu/pra/en/3376/22580.

[4]https://www.coursera.org/learn/iot.

[5] https://bcourses.berkeley.edu.

[6]www.innovianstechnologies.com.

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MEC1903.1	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**
MEC1903.2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1903.3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1903.4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Average	3	3	3	3	2.75	2.75	2.75	2.75	3	2.75	3	3	3	3	3

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Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MEC1904	**Industry 4.0 and IIoT**	T	3	0	0	3

Objectives:
• To understand the basics of Industry 4.0.
• To learn the basics of IIoT.
• To analyze IIOT platform and SDN using big data analytics
• To familiarize and implement safety protocols in Industrial IoT .
• To deploy IIOT in various applications

UNIT-I	**INTRODUCTION**	9
Globalization, The Fourth Revolution, LEAN Production Systems; Industry 4.0: Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis		
UNIT-II	**BASICS OF INDUSTRIAL IOT**	9
IIoT Analytics- Introduction, Machine Learning and Data Science; Industrial IoT: Big Data Analytics and Software Defined Networks: SDN in IIoT, Data Center Networks, Industrial IoT		
UNIT-III	**INDUSTRIAL IOT-BIG DATA ANALYTICS AND SOFTWARE DEFINED NETWORKS**	9
IoT Architecture: State of the art introduction, state of the art; Architecture reference model: Introduction, reference model and architecture, IoT reference model, Logical design using Python: Installing Python, Python data types and data structures, control flow, functions, modules, packages, file handling.		
UNIT-IV	**INDUSTRIAL IOT SECURITY**	9
Fog Computing in IIoT, Security in IIoT, Industrial IoT- Application Domains; Industrial IoT- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management		
UNIT-V	**INDUSTRIAL IOT- APPLICATION DOMAINS**	9
Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies.		
Total Contact Hours:45		

Course Outcomes: On completion of the course, students will be able to
• Understand the basics of Industry 4.0.
• Learn the basics of IIoT.
• Analyze IIOT platform and SDN using big data analytics
• Familiarize and implement safety protocols in Industrial IoT .
• Deploy IIOT in various applications

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic
• Problem solving sessions

- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various storage technologies
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

[1] ArshdeepBahga, Vijay MadisettiInternet of Things A hands on approach, ISBN 978-0996025515

[2]HonboZhou,Internet Of Things In The Cloud A Middleware Perspective,2013

Reference Books(s) / Web links:

[1] Dieter Uckelmann, Mark Harrison, Florian Michahelles ,Architecting the Internet of Things· 2011

[2] Alasdair Gilchrist ,Industry 4.0: The Industrial Internet of Things' · 2016

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MEC1904.1	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1904.2	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1904.3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1904.4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1904.5	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Average	3	3	3	3	2.4	2.4	2.4	2.4	3	3	3	3	3	3	3

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Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MEC1905	**IoT PROTOCOLS**	T	3	0	0	3

Objectives:
• To learn the basic concept and architecture of embedded systems.
• To identify and deploy connectivity technologies for IoT applications.
• To understand the IoT enabled technologies
• To familiarize on Interoperability of IoT.
• To deploy Cloud computing on IoT platforms.

UNIT-I	**INTRODUCTION**	9
Edge Devices NodeMCU/ESP 32, A short tour of Linux operating system, Programming edge node, Introduction to Gateways, Gateways types and configurations, Gateway as an extension of the cloud, HTTP access method using API.		
UNIT-II	**Connectivity Technologies**	9
RFID , NFC, Wi-Fi, Bluetooth low energy, IEEE 802.15.4, Zigbee, Thread, Wireless HART, Z-Wave, LoRa, NB-IoT		
UNIT-III	**IoT Communication Technologies**	9
Introduction, Constrained networks, Types of constrained devices, Internet protocol version 6 (IPv6), RPL,6LoWPAN, Content-centric networking (CCN), Physical web, Multicast DNS (mDNS), Universal plug and play (UPnP), Data Protocols, MQTT, XMPP, REST.		
UNIT-IV	**IoT Interoperability**	9
Introduction, Taxonomy of interoperability, Standards, DLNA, Konnex, UPnP, Frameworks, universal, IoTivity, HomeKit.		
UNIT-V	**Cloud Computing**	9
IOT Associated Technologies: Introduction, Virtualization, Advantages of virtualization, Types of virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Importance of SLA, Metrics for SLA, Cloud Implementation, Cloud simulation.		
Total Contact Hours:45		

Course Outcomes: On completion of the course, students will be able to
• Learn the basic concept and architecture of embedded systems.
• Identify and deploy connectivity technologies for IoT applications.
• Understand the IoT enabled technologies
• Familiarize on Interoperability of IoT.
• Deploy Cloud computing on IoT platforms.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions
- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various storage technologies

- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

[1] Sudip Mishra, Anandarup Mukherjee, Arijit Roy: Introduction to IOT, Cambridge University Press

[2] David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", Cisco Press, 2017.

Reference Books(s) / Web links:

[1] Rahul Dubey, "An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications", Cengage India Publication.

[2] Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Keyapplicationsand Protocols", Wiley, 2012.

[3] RMD SundaramShriram K Vasudevan, Abhishek S Nagarajan, 'Internet of Things', John Wiley and Sons.

[4] Klaus Elk, "Embedded Software for the IoT".

[5] Perry Xiao, "Designing Embedded Systems and the Internet of Things (IoT) with the ARM Mbed". 8. Elizabeth Gootman et. al, "Designing Connected Products", Shroff Publisher/O"Reilly Publisher.

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MEC1905.1	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**3**	**3**	**3**	**3**	**3**
MEC1905.2	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**
MEC1905.3	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1905.4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1905.5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Average	3	3	3	3	2.4	2.6	2.8	2.8	3	2.6	3	3	3	3	3

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Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MEC1906	IOT SYSTEM DESIGN	T	3	0	0	3

Objectives:
• To understand various design techniques for configuration of distributed embedded systems
• To learn programming of Edge devices with Raspberry Pi
• To explore machine learning using Python
• To demonstrate workability of IoT platform using data analytics tools.
• To deploy IoT platform using various cloud storage models.

UNIT-I	INTRODUCTION TO DESIGN TECHNIQUES	9
Design methodologies- Design flows - Requirement analysis – Specifications-System analysis and architecture design – Quality assurance techniques- Distributed embedded systems.		
UNIT-II	**EDGE DEVICES**	9
Raspberry Pi, Programming edge node, Introduction to Gateways, Gateways types and configurations, HTTP access method using API, Introduction and installing the Raspbian Stretch OS, Computer and Rpi configuration to connect Rpi remotely without Ethernet cable via SSH, IP address, Raspberry pi3 interfacing with Sensor DHT11, Raspberry pi python library install and reading sensor feed, MySQL server on Raspberry pi.		
UNIT-III	**MACHINE LEARNING USING PYTHON**	9
Python basics and its libraries for machine learning, NumPy, Pandas, SciPy, MatPlot Lib and SciKit Learn.		
UNIT-IV	**IOT AND DATA ANALYTICS:**	9
IoT and Data Management, Data cleaning and processing, Deep Web, Semantic sensor web, Semantic Web Data Management, Searching in IoT, Real-time and Big Data Analytics for Internet of Things, Heterogeneous Data Processing, Data Processing, Parallel and Distributed Data Processing.		
UNIT-V	**CLOUD OF THINGS:**	9
IoT Physical Servers, Cloud Offerings, and IoT Case Studies, Introduction to Cloud Storage Models, Communication API, Eclipse IoT, AWS IoT, Google Cloud IoT, ThingWorx.		
Total Contact Hours:45		

Course Outcomes: On completion of the course, students will be able to
• Understand various design techniques for configuration of distributed embedded systems
• Learn programming of Edge devices with Raspberry Pi
• Explore machine learning using Python
• Demonstrate workability of IoT platform using data analytics tools.
• Deploy IoT platform using various cloud storage models.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic

- Problem solving sessions
- Flipped classroom - Comparing SOA with Client-Server and Distributed architectures
- Survey on various storage technologies

- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Tutorial problems
- Assignment problems
- Quizzes
- Class Presentation/Discussion

Text Book(s):

[1] ShrirangAmbajiKulkarni: Introduction to IOT with Machine learning and Image Processing using Raspberry Pi, CRC Press.

[2]Rahul Dubey, "An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications", Cengage India Publication

Reference Books(s) / Web links:

[1] Richardson, M., & Wallace, S. (2012). Getting started with raspberry PI. " O"Reilly Publisher Media, Inc."

[2] SudipMisra, Chandana Roy and Anandarup Mukherjee, "Introduction to Industrial Internet of Things and Industry 4.0", CRC Press.

[3] .Rao, M. (2018). Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects. Packt Publishing Ltd

[4] Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", Third Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MEC1906.1	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1906.2	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1906.3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1906.4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
MEC1906.5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Average	3	3	3	3	2.6	2.8	2.8	2.8	3	3	3	3	3	3	3

Prepared by Name and signature	Approved by Name and Signature
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