G. PULLA REDDY ENGINEERING COLLEGE (Autonomous):KURNOOL

Accredited by NBA of AICTE and NAAC of UGC with A+ Grade,

Affiliated to JNTUA, Anantapuramu

Scheme – 2020

Scheme and Syllabus for Minor Program in

Internet of Things (IoT)

Offered by
Department of Electronics and Communication Engineering

G.PULLA REDDY ENGINEERING COLLEGE (AUTONOMOUS): KURNOOL

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MINOR DEGREE IN INTERNET OF THINGS (IOT)
Scheme of Instruction and Examination
(Effective from 2020-2021)

S. No	Semester	Course Code	Course Title	Credits	Scheme of Instruction periods/week		Scheme of Examination Maximum Marks		
					L	T/P	End Exam Assessment	Internal Assessment	Total (100M)
1	IV	MIT01	Introduction to Internet of Things(IIOT)	4	3	2	60	40	100
2	V	MIT02	IoT Architecture and Protocols(IAP)	4	4	0	60	40	100
3	VI	MIT03	Programming with Arduino and Raspberry-Pi	4	3	2	60	40	100
4	VII	MIT04	Industrial Internet of Things	4	4	0	60	40	100
5			MOOCS-1	2	0	0			100
6			MOOCS-2 / Mini Project	2	0	0			100
		Total		20					

MOOCs-1	1. Introduction to IoT and Embedded Systems Course web link: https://www.coursera.org/learn/iot 2. Sensors and Actuators Course web link: https://nptel.ac.in/courses/108/108/108108147
MOOCs-2	1. Design of Internet of Things Course web link: https://onlinecourses.nptel.ac.in/noc21_ee85/ 2.Components and Applications of Internet of Things Course web link: https://onlinecourses.swayam2.ac.in/arp20_ap03/preview

INTRODUCTION TO INTERNET OF THINGS (IIOT)

							Scheme: 2020
Course Code	**Category**	**Hours/Week**		**Credits**	**Maximum Marks**		
MIT 01	**PCC**	**L**	**T/P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**2**	**4**	**40**	**60**	**100**
Sessional Exam Duration: 1½Hrs				**End Exam Duration:3 Hrs**			

Course Outcomes: At the end of the course The students will be able to
CO1: Understand Internet of things and its hardware and software components
CO2:Interface I/O devices, Sensors & communication modules
CO3:Remotely monitor data and control devices
CO4: Develop real life IoT based projects

UNIT-I

Introduction to IoT: Architectural overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals-Devices and gateways, Data management, Business processes in IoT, Role of cloud in IoT

UNIT– II

Elements of IoT: Hardware components – computing (Arduino, Raspberry Pi), communication, Sensing, Actuation, I/O interfaces Software Components- Programming APIs (Using python/Arduino) for communication protocols-MQTT, Zigbee, Bluetooth, CoAP, UDP, TCP.

UNIT– III

Sensing and Actuation: Definition of Sensor, Sensor features, Resolution, Classes, Different types of sensors, Actuator, Different types of Actuators, purpose of Sensors and Actuators in IoT

UNIT– IV

IoT Application Development: Solution frame work for IoT Applications-Implementation of Device integration, Data acquisition and Integration, Device data storage on cloud/local server, Authentication, authorization of Devices

UNIT– V

IoT Case Studies: IoT Case studies and mini projects based on industrial Automation, Transportation, Agriculture, Healthcare, Home Automation

Text Books :
1. Vijay Madisetti, Arshdeep Bahga, Internet of Things, " A hands on Approach", University Press

Reference Books :
1. Dr SRN Reddy, Rachit Thukral and Manasi Mishra ," Introduction to Internet of Things": A practical Approach" ETI Labs
2. Raj Kamal , " Internet of Things: Architecture and Design", McGraw Hill

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

Internal Assessment: **40M**

End Exam: **60M**

IOT ARCHITECTURES AND PROTOCOLS (IAP)

Course Code	Category	Hours/Week		Credits	Maximum Marks		
					Scheme: 2020		
		L	T/P	C	Continuous Internal Assessment	End Exam	TOTAL
MIT 02	PCC	4	0	4	40	60	100

Sessional Exam Duration: 1½Hrs	End Exam Duration:3 Hrs

Course Outcomes: At the end of the course Students will be able to

CO1: Understand Basics of IoT Architectures.

CO2: Understand IoT Protocols

CO3: Understand Programming the IoT applications using Microcontrollers.

CO4: Interpret IoT Technologies in real world design.

CO5: Analyse IoT security layer protocols and security

UNIT– I

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology

UNIT– II

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

UNIT– III

Real-World Design: Constraints- Introduction, Technical Design constraints Data management, Business processes in IoT,Bluetooth Low Energy, Zigbee Smart Energy, Wireless HART

UNIT– IV

Transport & Session Layer Protocols: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP.

UNIT– V

Service Layer Protocols & Security: Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4

Text Books :

1. Jan Holler, *From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence*", 1 st Edition, Academic Press, 2014.

Reference Books :

1. Peter Waher *"Learning of Internet of Things",*Packt Publications,2006.

Question Paper Pattern:

Sessional Exam: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for first sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.

End Examination: The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.

Internal Assessment: **40M**

End Exam: **60M**

PROGRAMMING WITH ARDUINO AND RASPBERRY -PI (PAR)

					Scheme: 2020		
Course Code	**Category**	**Hours/Week**		**Credits**	**Maximum Marks**		
MIT 03	**PCC**	**L**	**T/P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**2**	**4**	**40**	**60**	**100**
Sessional Exam Duration: 1½Hrs				**End Exam Duration:3 Hrs**			

Course Outcomes: At the end of the course Students will be able to
CO1: Understand Programming Loop Statements and Functions.
CO2: Understand different Algorithms and Data Structures using Python
CO3: Interpret the shell programming concept in Raspberry Pi
CO4: Apply programming knowledge to various applications using Raspberry pi
CO5: Understand Shell programming and programming for various case studies

UNIT– I

Python Programming -I: Installation of python , Numbers and Math in python, Variables and Inputs, built –in modules ,functions, strings, python lists, python slicing, Save and run python files

UNIT– II

Python Programming –II : If-else, python elif and nested if , comparison operators and logical operators, while loops and for loop, functions, default parameters and multiple parameters, classes, class constructors and destructors, subclasses, super classes and inheritance.

UNIT– III

Raspberry Pi –I : Linux basics, Linux File system, Navigating the File system, Text Editors, Accessing Files, Permissions , Processes, Linux Graphic user Interface , Raspberry Pi Processor, Raspberry Pi Vs Arduino, Operating system benefits, Raspberry Pi Set up, Configuration.

UNIT– IV

Raspberry-Pi -II: General Purpose IO Pins, Protocol pins, GPIO Access, Pulse width Modulation, Demo of a Blink, Graphic User Interface, Tkinter Library and Interaction.

UNIT– V

Shell Programming Connecting Raspberry-Pi to Internet: Accessing resources of Raspberry –Pi using shell, GPIO programming over shell, webcam accessing using shell, installing server on Raspberry –Pi, sending email through programming, Simple Camera Accessing over Internet

TextBooks :

1. Martin C Brown *"The Complete Reference Python Programming*", 1st Edition, McGraw Hill, 2001.

Reference Books :

1.Alex Martelli, *" Python in a Nutshell",* 2nd Edition, Shroff Publishers & Distributors,2006

Question Paper Pattern:
Sessional Exam: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.   **End Examination:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.
Internal Assessment: 40M   **End Exam:**   60M

INDUSTRIAL INTERNET OF THINGS (IIT)

						Scheme: 2020	
Course Code	**Category**	**Hours/Week**		**Credits**	**Maximum Marks**		
MIT 04	PCC	L	T/P	C	**Continuous Internal Assessment**	**End Exam**	TOTAL
		3	2	4	40	60	100

Sessional Exam Duration: 1½Hrs	**End Exam Duration:3 Hrs**

Course Outcomes: At the end of the course The students will be able to

    CO1: Understand Industrial Internet of things Business Model and Architecture

    CO2: Analyse the IIOT Sensing and IIOT Processing

    CO3: Understand IIOT Security and Fog Computing

    CO4: Develop real life IIoT based Applications

    CO5: Design and IIOT applications

UNIT– I

IIoT-Introduction: Industrial IoT: Business Model and Reference Architerture: IIoT-Business Models-Part I, Part II, IIoT Reference Architecture-Part I, Part II.

UNIT– II

Industrial IoT- Layers: IIoT Sensing-Part I, Part II, IIoT Processing-Part I, Part II, IIoT Communication-Part I.

UNIT– III

Industrial IoT- Layers: IIoT Communication, IIoT Networking-Part I, Part II, Part III.

UNIT– IV

Industrial IoT: Security and Fog Computing - Fog Computing in IIoT, Security in IIoT-Part I, Part II, Industrial IoT- Application Domains.

UNIT– V

Industrial IoT- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.

TextBooks:

1. Giacomo Veneri Antonio Capasso, "Hands-On Industrial Internet of Things", Packtr Publications, January 2018.

Reference Books :

1. Alasdair Gilchrist "Industry 4.0: The Industrial Internet of Things", Apress Publications, January 2017

Question Paper Pattern:
Sessional Exam: The question paper for sessional examination shall be for 25 marks, covering half of the syllabus for sessional and remaining half for second sessional exam. The question paper shall consist of three sections with Two Questions (EITHER/ OR Type) in each section. The student shall answer one question from each section.   **End Examination:** The question paper for End examination shall be for 60 marks. The Question paper shall contain Five Units with Two Questions (Either or Type) from each unit. Each of these questions may contain sub questions and the student should answer any one question from each unit. Each Question carries 12 marks.
Internal Assessment: **40M**   **End Exam:**   **60M**