CMR ENGINEERING COLLEGE
UGC AUTONOMOUS
(Approved by AICTE - New Delhi. Affiliated to JNTUH and Accredited by NAAC & NBA)

COURSE INSTRUCTOR NAME:Mrs.A.PUNITHA   ACADEMIC YEAR:2023-24

SUBJECT NAME:INTERNET OF THINGS   SECTION:B&D

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SEM START DATE AND END DATE: 8-7-24 TO 9-11-24

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HOD

1. DEPARTMENT VISION & MISSION

Vision:

> To produce globally competent and industry-ready graduates in Computer Science & Engineering by imparting quality education with the know-how of cutting-edge technology and holistic personality.

Mission:

1. To offer high-quality education in Computer Science & Engineering in order to build core competence for the graduates by laying a solid foundation in Applied Mathematics and program frameworkwith a focus on concept building.

2. The department promotes excellence in teaching, research, and collaborative activities to prepare graduates for a professional career or higher studies.

3. Creating an intellectual environment for developing logical skills and problem-solving strategies, thus developing, an able and proficient computer engineer to compete in the current global scenario.

2. LIST OF PEOs, POs AND PSOs

2.1 Program Educational Objectives (PEO):

PEO 1: Excel in professional career and higher education by acquiring knowledge of mathematical computing and engineering principles.

PEO 2: To provide an intellectual environment for analyzing and designing computing systems for technical needs.

PEO 3: Exhibit professionalism to adapt current trends using lifelong learning with legal and ethical responsibilities.

PEO 4: To produce responsible graduates with effective communication skills and multidisciplinary practices to serve society and preserve the environment.

2.2. Program Outcomes (POs):

Engineering Graduates will be able to satisfy these NBA graduate attributes:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

8. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

9. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

10. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

11. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

2.3 Program Specific Outcomes (PSOs):

PSO1: Professional Skills and Foundations of Software development: Ability to analyze, design and develop applications by adopting the dynamic nature of Software developments.
PSO2: Applications of Computing and Research Ability: Ability to use knowledge in cutting edge technologies in identifying research gaps and to render solutions with innovative ideas.

3. COURSE OUTCOMES

S. No	Course Out Come
CO1	**Define** basic concepts and terminology, technology different IOT levels and its application.[Understanding]
CO2	**Discuss** about M2M (machine to machine) **Select** best protocols (YANG, SNMP NETOPEER)for IOT application .[Analyzing]
CO3	**Analyze** python language concepts and Apply python packages develop best IOT application. [Applying]
CO4	**Apply** Python programming with Raspberry PI with focus of interfacing external gadgets.[Evaluating]
CO5	**Develop** and Experiment IOT device to work with Cloud Computing Backend.[Creating]

REVISED Bloom's Taxonomy Action Verbs

Definitions	I. Remembering	II. Understanding	III. Applying	IV. Analyzing	V. Evaluating	VI. Creating
Bloom's Definition	Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.	Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.
Verbs	• Choose • Define • Find • How • Label • List • Match • Name • Omit • Recall • Relate • Select • Show • Spell • Tell • What • When • Where • Which • Who • Why	• Classify • Compare • Contrast • Demonstrate • Explain • Extend • Illustrate • Infer • Interpret • Outline • Relate • Rephrase • Show • Summarize • Translate	• Apply • Build • Choose • Construct • Develop • Experiment with • Identify • Interview • Make use of • Model • Organize • Plan • Select • Solve • Utilize	• Analyze • Assume • Categorize • Classify • Compare • Conclusion • Contrast • Discover • Dissect • Distinguish • Divide • Examine • Function • Inference • Inspect • List • Motive • Relationships • Simplify • Survey • Take part in • Test for • Theme	• Agree • Appraise • Assess • Award • Choose • Compare • Conclude • Criteria • Criticize • Decide • Deduct • Defend • Determine • Disprove • Estimate • Evaluate • Explain • Importance • Influence • Interpret • Judge • Justify • Mark • Measure • Opinion • Perceive • Prioritize • Prove • Rate • Recommend • Rule on • Select • Support • Value	• Adapt • Build • Change • Choose • Combine • Compile • Compose • Construct • Create • Delete • Design • Develop • Discuss • Elaborate • Estimate • Formulate • Happen • Imagine • Improve • Invent • Make up • Maximize • Minimize • Modify • Original • Originate • Plan • Predict • Propose • Solution • Solve • Suppose • Test • Theory

Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching, and assessing, Abridged Edition. Boston, MA: Allyn and Bacon.

Action Words for Bloom's Taxonomy					
Knowledge	Understand	Apply	Analyze	Evaluate	Create
define	explain	solve	analyze	reframe	design
identify	describe	apply	compare	criticize	compose
describe	interpret	illustrate	classify	evaluate	create
label	paraphrase	modify	contrast	order	plan
list	summarize	use	distinguish	appraise	combine
name	classify	calculate	infer	judge	formulate
state	compare	change	separate	support	invent
match	differentiate	choose	explain	compare	hypothesize
recognize	discuss	demonstrate	select	decide	substitute
select	distinguish	discover	categorize	discriminate	write
examine	extend	experiment	connect	recommend	compile
locate	predict	relate	differentiate	summarize	construct
memorize	associate	show	discriminate	assess	develop
quote	contrast	sketch	divide	choose	generalize
recall	convert	complete	order	convince	integrate
reproduce	demonstrate	construct	point out	defend	modify
tabulate	estimate	dramatize	prioritize	estimate	organize
tell	express	interpret	subdivide	find errors	prepare
copy	identify	manipulate	survey	grade	produce
discover	indicate	paint	advertise	measure	rearrange
duplicate	infer	prepare	appraise	predict	rewrite
enumerate	relate	produce	break down	rank	role-play
listen	restate	report	calculate	score	adapt
observe	select	teach	conclude	select	anticipate
omit	translate	act	correlate	test	arrange
read	ask	administer	criticize	argue	assemble
recite	cite	articulate	deduce	conclude	choose
record	discover	chart	devise	consider	collaborate
repeat	generalize	collect	diagram	critique	collect
retell	give examples	compute	dissect	debate	devise
visualize	group	determine	estimate	distinguish	express
	illustrate	develop	evaluate	editorialize	facilitate
	judge	employ	experiment	justify	imagine
	observe	establish	focus	persuade	infer
	order	examine	illustrate	rate	intervene
	report	explain	organize	weigh	justify
	represent	interview	outline		make
	research	judge	plan		manage
	review	list	question		negotiate
	rewrite	operate	test		originate
	show	practice			propose
	trace	predict			reorganize
	transform	record			report
		schedule			revise
		simulate			schematize
		transfer			simulate
		write			solve
					speculate
					structure
					support
					test
					validate

4. SYLLABUS COPY

UNIT - I
Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics,Communication protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

UNIT - II
IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF,YANG- NETCONF, YANG, SNMP NETOPEER

UNIT - III
Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling. Python packages - JSON, XML, HTTP Lib, URL Lib, SMTP Lib.

UNIT - IV
IoT Physical Devices and Endpoints - Introduction to Raspberry PI - Interfaces (serial, SPI,I2C). Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT - V
IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs. Webserver – Web server for IoT, Cloud for IoT, Python web application framework. Designing a RESTful web API

TEXT BOOK:
1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti,Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

5.INDIVIDUAL TIME TABLE(A.PUNITHA)

	I	II	III	IV		V	VI	VII
MON	IOT-B		IOT-B					
TUE	IOT-D		IOT-B			IOT-D	IOT-B	
WED		IOT-D				IOT-B		
THU						IOT-D	IOT-D	
FRI	MINI/MAJOR PROJECT STAGE 1					MINI/MAJOR PROJECT STAGE 1		
SAT	MINI/MAJOR PROJECT STAGE 1					MINI/MAJOR PROJECT STAGE 1		

6. SESSION PLAN/LESSON PLAN

S.NO	Topic (Autonamous syllabus)	Sub-Topic	NO. OF LECTURES REQUIRED	PLANNED DATE	CONDUCTED DATE	METHODS OF TEACHING	REMARKS
1		Definition and Characteristics of iot	L1	09-7-24	09-7-24	M1	**No of class required: 15**
2		Physical Design of IoT	L2	10-7-24	10-7-24	M1	
3		Logical Design of IoT	L3	10-7-24	15-7-24	M1	
4		IoT Protocols	L4	15-7-24	16-7-24	Guest Lecture	
5		IoT communication models	L5,L6	16-7-24	22-7-24	M1	
6		IoT Communication APIs	L7	23-7-24	23-7-24	M1	
7	Introduction to Internet of Things	IoT enabled Technologies(Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems)	L8,L9	24-7-24	30-8-24	Guest Lecture	
8		IoT Levels(1,2,3)	L10	30-7-24	30-7-24	Presentation /PPT	
9		IoT Levels(4,5,6)	L11	31-7-24	31-7-24	Presentation /PPT	
10		Domain Specific IoTs – Home, City, Environment.	L12	4-8-24	4-8-24	Guest Lecture	
11		Domain Specific IoTs – Energy, Retail, Logistics, Agriculture	L13,14	4-8-24	6-8-24	Presentation /PPT	

12		Domain Specific IoTs – Industry, health and Lifestyle.	L15	6-8-24	6-8-24	Presentation /PPT	
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				UNIT - II			
14		IoT and M2M	L16,L17	7-8-24	7-8-24	Presentation /PPT	**No of class required: 8**
15		Software defined networks	L18	11-8-24	11-8-24	M1	
16		Network function virtualization	L19,L20	12-8-24	12-8-24	M1	
17		Difference between SDN and NFV for IoT	L21	12-8-24	12-8-24	Presentation /PPT	
18		Basics of IoT System Management with - NETCOZF	L22	13-8-24	13-8-24	M1	
19		Basics of IoT System Management with- YANG- NETCONF	L23	14-8-24	14-8-24	Presentation /PPT	
20		Basics of IoT System Management with - SNMP NETOPEER	L24	19-8-24	20-8-24	M1	

			UNIT-III			
21		Language features of Python	**L25**	**24-8-24**	**24-8-24**	**M1**	**No of class required: 17**
22		Data types	**L26,27**	**27-8-24**	**27-8-24**	**M1**	
23		Data structures	**L28,L29**	**28-8-24**	**28-8-24**	**Presentation /PPT**	
24		Control of flow	**L30,31**	**29-8-24**	**29-8-24**	**M1**	
25		Functions	**L32**	**29-8-24**	**29-8-24**	**M1**	
26		Modules	**L33**	**3-9-24**	**3-9-24**	**Presentation /PPT**	
27		file handling,	**L34**	**3-9-24**	**3-9-24**	**M1**	
28		data/time operations, classes	**L35,L36**	**4-9-24**	**4-9-24**	**Presentation /PPT**	
29		Exception handling. Python	**L37**	**4-9-24**	**4-9-24**	**M1**	
30		Packages - JSON	**L38**	**5-9-24**	**5-9-24**	**Lab/Practical**	
31		Python packages - XML, HTTP Lib	**L39,L40**	**18-9-24**	**18-9-24**	**Presentation /PPT M1**	
32		Python packages - URL Lib	**L41**	**20-9-24**	**20-9-24**	**M1**	
33		Python packages- SMTP Lib.	**L42**	**20-9-24**	**20-9-24**	**Lab/Practical**	

						UNIT 4	

34		Introduction to Raspberry PI	**L42**	**25-9-24**	**25-9-24**	**Presentation /PPT**	**No of class required: 7**
35		Interfaces (serial)	**L43**	**25-9-24**	**25-9-24**	**Presentation /PPT**	
36		Interfaces(SPI)	**L44**	**28-9-24**	**28-9-24**	**Presentation /PPT**	
37		Interfaces(I2C)	**L45**	**28-9-24**	**28-9-24**	**Presentation /PPT**	
38		Programming – Python program with Raspberry PI	**L46**	**30-9-24**	**30-9-24**	**Lab/Practical**	
39		Raspberry PI with focus of interfacing external gadgets	**L47,L48**	**4-10-24**	**5-10-24**	**Lab/Practical**	
40		Controlling output	**L49**	**5-10-24**	**14-10-24**	**Presentation /PPT**	
41		Reading input from pins	**L50**	**16-10-24**	**19-10-24**	**M1**	

				UNIT 5			

42		Introduction to Cloud Storage models	**L51**	**21-10-24**	**21-10-24**	**M1**	**No of class required: 12**
43		Communication APIs	**L52,L53**	**23-10-24**	**26-10-24**	**M1**	

44		Webserver – Web server for IoT	L54,L55	26-10-24	28-10-24	**Presentation /PPT**	
45		Python web application framework	**L56**	**28-10-24**	**28-10-24**	**M1**	
46		Cloud for IoT	**L57,L58**	**28-11-24**	**30-11-24**	**M1**	
47		Designing a RESTful web API	**L59,560**	**30-12-24**	**30-12-24**	**Presentation /PPT**	

TOTAL CLASSES 60

METHODS OF TEACHING:

M1 : Lecture Method	**M4 : Presentation /PPT**	**M7 : Assignment**
M2 : DemoMethod	**M5 : Lab/Practical**	**M8 : Industry Visit**
M3 : Guest Lecture	**M6 : Tutorial**	**M9 : Project Based**

NOTE:
1. AnySubjectinaSemesterissupposetobecompletedin55to65periods.
2. Each Period is of 50minutes.
3. Each unit duration &completion should be mentioned
   in the Remarks Coloumn.
4. ListofSuggestedbookscanbemarkedwithCodeslikeT1,T2,R1,R2etc.

7. Session Execution Log:

S no	Units	Scheduled started date	Completed date	Remarks
1	I	09-07-2024	06-07-2024	COMPLETED
2	II	07-08-2024	20-08-2024	COMPLETED
3	III	24-08-2024	20-09-2024	COMPLETED
4	IV	25-09-2024	19-10-2024	COMPLETED
5	V	21-10-2024	09-11-2024	COMPLETED

8. Lecture Notes – (hand written)

9.ASSIGNMENT QUESTIONS ALONG SAMPLE ASSIGNMENT SCRIPTS

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MID 1 ASSIGNMENT

ACADEMIC YEAR 2024-25

SUBJECT NAME: INTERNET OF THINGS

1 .a.**Brief** about IOT Communication models with diagrams?**(CO1)**

b.**Define** IOT and list the characteristics of IOT ?**(CO1)**

2. a.List out about IOT Enabling Technology in detail.**(CO1)**

b.**How** IOT used in Agriculture and Logistics domain?**(CO1)**

3**. a.Difference** between IOT and M2M with ten difference?**(CO2)**

b.Explain about Network function virtualization (NFV)with diagram ?(CO2)

4. a.**Elaborate** SDN with neat Diagram?**(CO2)**

b.Summarize about SNMP Management with diagram **(CO2)**

5.**Explain** about Data Types in python with examples?**(CO3)**

MID II ASSIGNMENT

ACADEMIC YEAR 2024-25

SUBJECT NAME: INTERNET OF THINGS

1.a. Explain about JSON and XML packages used for IOT?(CO3)

b. Describe the file handling capabilities in Python. What are the different modes available for opening a file, and how can you perform read and write operations?(CO3)

2.a. Test a python program for switching LED/Light based on reading LDR reading with schematic diagram ?(CO4)

b.Outline raspberry pi board and explain each parts ?(CO4)

3. Explain about web services a) Amazon s3 b) Amazon RDS(CO5)

4.a.Provide an overview of the Raspberry Pi and its role in IoT applications. Describe the different interfaces (serial, SPI, I2C) supported by Raspberry Pi, and explain how these interfaces can be used to communicate with external devices? (CO4)

b. Explain the importance of modules and packaging in Python. How do they contribute to code organization and reusability? Provide an example of creating a module and packaging it for distribution?(CO3)

5.a.Explain python web application framework-Django?(CO5)

b. Elaborate WAMP session between client and router with neat diagrams?(CO5)

10. MID EXAM QUESTION PAPER ALONG SAMPLE ANSWER SCRIPTS

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IV.B.TECH-I-SEM-I MID EXAMINATIONS, Date:30/09/2024 Time: 10:00 AM TO 11:30 AM

Subject: IOT	Branch: CSE	Marks: 25 M

Note: Question paper contains two parts, Part - A and Part - B.

Part-A is compulsory which carries 10 marks. Answer all questions in part-A.

Part-B consists of (21/2) units. Answer any one full question from each unit. Each question carries 5 marks and may have a, b, c sub questions.

PART-A   5*2=10

		BTL	CO
1.	.**List** the characteristics of IOT?	1	3
2.	.**List any** 5 application of IOT?	2	4
3.	**Define** internet of things.	1	4
4.	.**Define** YANG?	2	5
5.	**Steps** to install python in windows .	1	4

PART B 3*5=15

		BTL	CO
6.	**List** out about IOT Enabling Technologies in detail	2	3
	(OR)		
7.	**Describe** how IOT can be implemented in Home and City Domain?	4	3
8.	**How** IOT used in Agriculture and Logistics domain?	4	4
	(OR)		
9.	**Discuss** the need for IOT system Management?	4	4
10	Describe data types in python with examples?	2	4
	(OR)		
11	**Elaborate** SDN with neat Diagram?	1	5

IV.B.TECH-I-SEM-I IIMID EXAMINATIONS, Date:08/11/2024   Time: 10:00 AM TO 11:30 AM

Subject: IOT	Branch: CSE	Marks: 25 M

Note: Question paper contains two parts, Part - A and Part - B.

Part-A is compulsory which carries 10 marks. Answer all questions in part-A.

Part-B consists of (21/2) units. Answer any one full question from each unit. Each question carries 5 marks and may have a, b, c sub questions.

<div align="center">

PART-A   **5 x 2M = 10 M**

</div>

			BTL	CO
1.	What is the significance of classes in Python?		1	3
2.	How do you handle exceptions in Python using the try and except blocks?		2	4
3.	How can Python be used to control output from the Raspberry Pi's GPIO pins?		1	4
4.	Why is cloud computing beneficial for IoT systems?		2	5
5.	What is the primary function of a RESTful API in IoT?		1	4

<div align="center">

PART-B   **3 x 5M = 15**

</div>

		BTL	CO
6.	Describe the process of setting up a web server for IoT applications. How can a Python web application framework be used to develop a RESTful web API? Include a practical example of a RESTful API designed for IoT devices.	2	3

<div align="center">(OR)</div>

		BTL	CO
7.	Test a python program for switching LED/Light based on reading LDR reading with schematic diagram ?	6	4
8.	Explain about JSON and XML packages used for IOT	4	5

<div align="center">(OR)</div>

		4	4

9.Provide an overview of the Raspberry Pi and its role in IoT applications. Describe the different interfaces (serial, SPI, I2C) supported by Raspberry Pi, and explain how these interfaces can be used to communicate with external devices.

10.	Explain the importance of modules and packaging in Python. How do they contribute to code organization and reusability? Provide an example of creating a module and packaging it for distribution.	2	4

(OR)

11	Explain about web services a) Amazon s3 b) Amazon Db***	5	3

11.SCHEME OF EVALUATION: **MID 1**

S.NO	THEORY	MARKS	TOTALMARKS
PART-A			
1	List -Internet of things	2	2
2	Application of IOT	2	2
3	Definition-Internet of things.	2	2
4	Definition-YANG	2	2
5	Steps to install python	2	2
PART-B			
1	Technologies	3	5
	Explanation	2	
2	Diagram	2	5
	Explanation	3	
3	Diagram	2	5
	Explanation	3	
4	Needs	2	5
	Explanation	3	
5	Data types	2	5
	Examples	3	
6	Diagram	3	5
	Explanation	2	

MID 2

S.NO	THEORY	MARKS	TOTALMARKS
PART-A			
1	Classes of python	2	2
2	Exceptions in Python	2	2
3	Used to control output	2	2
4	Beneficial for iot systems	2	2
5	Function of a restful API	2	2
1	Diagram	3	5
	Explanation	2	
2	Program	3	5
	Diagram	2	
3	Packages	2	5
	Examples	3	
4	Examples	3	5
	Explanation	2	
5	Technologies	2	5
	Explanation	3	
6	Web Services	2	5
	Types	3	

12.Mapping of COs and Pos with PSOs

COURSE CO-PO &PSO MATRIX	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	1	-	-	2	-
CO3	2	2	2	-	-	-	-	-	-	-	2	2	2
CO4	2	2	2	1	-	1	-	2	2	2	-	2	2
CO5	2	2	2	1	-	-	-	2	2	2	-	2	2
Average	2	2	2	1	0	1	0	2	2	2	2	2	2

13.Cos,POs,PSOs JUSTIFICATION

CO1.:Explainbasics concepts and terminology, technology and its applications of IOT.[Understanding]

Correlated with PO1 moderately: Because it contributes the knowledge on fundamentals of IOT which makes students get engineering knowledge and student can categorize different utilities. So, overall the correlation of CO1 to PO1 is good.

CO2: Discuss about M2M (machine to machine) **Select** best protocols (YANG, SNMP NETOPEER)for IOT application .[Applying]

Correlated with PO1 moderately: Because it provides fundamentals of computer science. So, correlation is good.

Correlated with PO10 low: Because it provides communication in complex activities with machine to machine interaction sometimes. So Correlation of Co2 with PO10 is low.

Correlated with PSO1 moderately: Because it provides. So CO3 Correlation is moderate with PSO1.

CO3: Analyze python language concepts and Apply python packages develop best IOT application. [Analyzing]

Correlated with PO1 moderately: Because it provides python language concepts. So CO3 Correlation is moderate with PO1.

Correlated with PO2 moderately: Because it provides use of python packages. So CO3 Correlation is moderate with PO2.

Correlated with PO3 moderately: Because it provides using of object oriented concepts. So CO3 Correlation is moderate with PO3.

Correlated with PO11 moderately: Because it provides to develop a project python language will ujse. So CO3 Correlation is moderate with PO11.

Correlated with PSO1 moderately: Because it provides dynamic nature by applying different python concepts. So CO3 Correlation is moderate with PSO1.

Correlated with PSO2 moderately: as this course outcome provides student to identify research problems with python languages and packages. So Correlation CO3 is moderate with PSO2.

CO4: Apply Python programming with Raspberry PI with focus of interfacing external gadgets.[Evaluating]

Correlated with PO1 moderately: Because need engineering knowledge about raspberry pi So, correlation is good.

Correlated with PO2 moderately: Because it provides python programming with raspberry pi to analyze problems. So, correlation is good.

Correlated with PO3 moderately: Because it provides python programming with raspberry pi for design solution of engineering problems. So, correlation is good.
Correlated with PO4 low: Because it conducts investigation of engineering problems with research methods. So, correlation is low.
Correlated with PO6 low: Because we can use sensor and fix in society methods. So, correlation is low.
Correlated with PO8 moderately: Because follow rules and regulation while fixing devices. So, correlation is Moderate.
Correlated with PO9 moderately: Because it conducts investigation of engineering problems with design of raspberry pi. So, correlation is moderate.
Correlated with PO10 moderately: Because it conducts investigation of engineering problems with research methods. So, correlation is low.
Correlated with PSO1 moderately: Because it provides dynamic nature by applying different python concepts with Raspberry pi. So CO3 Correlation is moderate with PSO1.
Correlated with PSO2 moderately: as this course outcome provides student to identify research problems with python languages and packages. So Correlation CO3 is moderate with PSO2.

CO5: Develop and Experiment IOT device to work with Cloud Computing Infrastructure.[Creating]
Correlated with PO2 moderately: Because engineering knowledge need to work cloud services correlation of CO5 is good.
Correlated with PO2 moderately: Because problem can be analyzed to choose with cloud service .So, overall correlation of CO5 is good.
Correlated with PO3 moderately: BecauseDevelopand Experiment IOT device to work with Cloud Computing Infrastructure So, overall the correlation of CO5 is good.
Correlated with PO4 low: Because **to** give solution for complex problemsdevice to work with Cloud Computing Infrastructure So, overall the correlation of CO5 is good.
Correlated with PO8 low: outcome contributes better for identification follow rules and ethics principle with environmental aspects. So, that the students can apply to build some applications. So the correlation is low.
Correlated with PO9 low: outcome contributes better for identification of different aspects as a team work.So that the students can apply to build some applications. So the correlation is low.
Correlated with PO10 moderately: as this course outcome provides students identify different Problems that occur when dealing with processes but cannot provide better solution for solving the issues So, overall the correlation of CO5 is good.
Correlated with PSO1 moderately: Because students can design and develop application with the help of clous services . So CO5 Correlation is moderate with PSO1.

Mapping POs with PEOs

		Program Outcome(PO):										
		1	2	3	4	5	6	7	8	9	10	11
	I	X	X	X								
	II	X	X	X								
	III		X	X		X						
PEOS	IV						X		X			

14.Attainment of COs,POs AND PSOs (Excel sheet)

AFTER RESULT

15. Previous Question Papers

[Time: 3 Hours]   [Max. Marks: 70]

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question
carries 10 marks and may have a, b, c as sub questions.

PART-A   (20 Marks)

1. a)	Define Big Data Analytics.	[2M]
b)	Explain various Applications of IoT.	[2M]
c)	Explain SNMP NETOPEER.	[2M]
d)	Explain M2M in IoT.	[2M]
e)	Explain any two data types in Python.	[2M]
f)	Discuss The control flow statements.	[2M]
g)	List peripherals of Raspberry Pi.	[2M]
h)	List the IoT Physical Devices and Endpoints.	[2M]
i)	Illustrate the cloud for IoT?	[2M]
j)	List the web server for IoT.	[2M]

PART-B   (50 Marks)

2. Define IoT. Describe IoT levels and deployment templates in detail. [10M]

OR

3. List the different types of IoT enabling Technologies. Describe them in detail. [10M]

4. Explain SDN architecture in detail with an example. [10M]

OR

5. Explain how NFV can be used for virtualizing IoT devices. [10M]

6. Discuss in detail about functions, modules and packages in Python. [10M]

OR

7. Explain about JSON, XML, HTTP Lib and URL Lib in Python with respect to IoT. [10M]

8. Determine the relative strengths and limitations of Building IOT with RASPBERRY PI. [10M]

OR

9. Demonstrate how Raspberry Pi used for IoT devices? How to program Raspberry Pi using Python? [10M]

10. Explain in detail about the service models of a cloud computing. [10M]

Code No.: CS702PC/AI735PE

R20

H.T.No. | 8 | 1 | 8 | R | ۲ | ۴ | 0 | ۲ | 1 | ۲ |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
IV-B.TECH-I-Semester End Examinations (Regular) - November- 2023
INTERNET OF THINGS
(Common for CSE, CSM)

[Time: 3 Hours]   [Max. Marks: 70]

Note: This question paper contains two parts A and B.
    Part A is compulsory which carries 20 marks. Answer all questions in Part A.
    Part B consists of 5 Units. Answer any one full question from each unit. Each question
    carries 10 marks and may have a, b, c as sub questions.

PART-A   (20 Marks)

1. a)	Define an Internet of Things?	[2M]
b)	Write the any three functions of IoT?	[2M]
c)	What is an Software Defined Networking?	[2M]
d)	List out the advantages of SDN?	[2M]
e)	Define modules in python?	[2M]
f)	Show working with lists in Python?	[2M]
g)	What is a negative index in python?	[2M]
h)	What are iterators in python?	[2M]
i)	Explain briefly about Rasberry PI ?	[2M]
j)	How to run a python program? Explain its steps.	[2M]

PART-B   (50 Marks)

2.	What are the applications of IoT and explain with an example?	[10M]
	OR	
3.	Illustrate the physical design of IoT with Things of IoT and protocols of IoT?	[10M]
4.	Differentiate between IoT and M2M.?	[10M]
	OR	
5.	Describe how SDN can be used for various levels of IoT?	[10M]
6.	Explain the classes and date/time operation in python.	[10M]
	OR	
7.	Write a short note on i) control flow ii) packages iii) file handling of IoT. ?	[10M]
8.	Explain SOA and API in detail?	[10M]
	OR	
9.	Elucidate Rasberry PI interfaces.	[10M]
10.	Discuss cloud storage models and communication.	[10M]
	OR	
11.	Describe python web application frame work designing?	[10M]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, December - 2019
INTERNET OF THINGS
(Common to ECE, CSE, IT)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B
consists of 5 Units. Answer any one full question from each unit. Each question carries 10
marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	What is meant by cloud computing?	[2]
b)	List the various models used in the design of an embedded system.	[3]
c)	What is meant by IoT and M2M?	[2]
d)	Write the factors influencing IoT / M2M.	[3]
e)	What are the advantages of Python?	[2]
f)	List the Language features of Python .	[3]
g)	List the features of Rasberry Pi.	[2]
h)	Give a brief note on SPI and I2C.	[3]
i)	How is IoT related to cloud computing?	[2]
j)	Describe the Cloud for IoT.	[3]

PART – B

(50 Marks)

2.	List and explain the IoT communication models.	[10]
	OR	
3.	Explain the Physical Design of IoT.	[10]
4.	Discuss the Machine to Machine Applications (M2M) for rural areas in India.	[10]
	OR	
5.	Write a short note on the following: a) YANG b) SNMP NETOPEER	[10]
6.	Elaborate on Exception handling in Python.	[10]
	OR	
7.	Describe the XML and HTTP Lib in detail.	[10]
8.	Explain the IoT Physical Devices and Endpoints.	[10]
	OR	
9.	What language do you use to program a Raspberry Pi? Explain in detail.	[10]
10.a)	Give the Python web application framework.	
b)	Explain the Cloud Storage models and communication APIs.	[4+6]
	OR	
11.a)	Give a brief note on the Web server for IoT.	
b)	Describe the Amazon Web Services for IoT.	[4+6]

---oo0oo---

16.Power point presentations (PPTs)

PPTs AND PRESENTATION

INTERNET OF THINGS
BY
A.PUNITHA
ASST.PROFESSOR,CSE PEPT.

UNIT-1
INTRODUCTION TO INTERNET OF THINGS
- 1.Definition and Characteristics of IoT
- 2. Physical Design of IoT
- 3. IoT Protocols
- 4. IoT communication models
- 5. IoT Communication APIs
- 6. IoT enabled Technologies
- 7. Wireless Sensor Networks
- Cloud Computing

UNIT-1
INTRODUCTION TO INTERNET OF THINGS
- Big data analytics
- Communication protocols
- Embedded Systems
- 8. IoT Levels and Deployment Templates
- 9. Domain Specific IoTs -Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

INTRODUCTION
- "Internet of Things" was coined by Kevin Ashton in 1999, and it has recently become more relevant to the practical world largely because of the growth of mobile devices, embedded and appearing communication, cloud computing and data analytics.

- Internet of Things would be a $8.9 trillion market in 2020.

INTRODUCTION-CONT
- Imagine a world where billions of objects can sense, communicate and share information, all interconnected over public or private Internet Protocol (IP) networks. These interconnected objects have data regularly collected, analyzed and used to initiate action, providing a wealth of intelligence for planning, management and decision making. This is the world of the Internet of Things.

APPLICATION OF IOT
- 1 Building and Home
- 2.Medical and Healthcare system
- 3.Manufacturing
- 4.Media
- 5.Environmental Monitoring
- 6.Infrastructure management
- 7.Energy Management
- 8.Transportation
- 9.Better quality of life for elderly.

PHYSICAL DESIGN OF IOT
- The "Things" in IoT usually refers to IoT devices which have unique identities and can perform remote sensing, actuating and monitoring capabilities.
- IoT devices can:
  - Exchange data with other connected devices and applications (directly or indirectly).
  - Collect data from other devices and process the data locally .
  - Send the data to centralized servers or cloud-based application back-ends for processing the data, or
  - Perform some tasks locally and other tasks within the IoT infrastructure, based on temporal and space constraints.

GENERIC BLOCK DIAGRAM OF AN IOT DEVICE
- An IoT device may consist of several interfaces for connections to other devices, both wired and wireless.
  - I/O interfaces for sensors
  - Interfaces for Internet connectivity
  - Memory and storage interfaces
  - Audio/video interfaces

IOT PROTOCOLS
- Data Link Layer
  - 802.3 – Ethernet
  - 802.11 – WiFi
  - 802.16 – WiMax
  - 802.15.4 – LR-WPAN
  - 2G/3G/4G
- Network/Internet Layer
  - IPv4
  - IPv6
  - 6LoWPAN
- Transport Layer
  - TCP
  - UDP
- Application Layer
  - HTTP
  - CoAP
  - WebSocket
 - MQTT
  - XMPP
  - DDS
  - AMQP

IOT PROTOCOLS-CONT

LOGICAL DESIGN OF IOT

◉ Logical design of an IoT system refers to an **abstract representation** of the entities and processes without going into the low-level specifics of the implementation.

◉ An IoT system comprises of a number of functional blocks that provide the system the capabilities for identification, sensing, actuation, communication, and management

LOGICAL DESIGN OF IOT
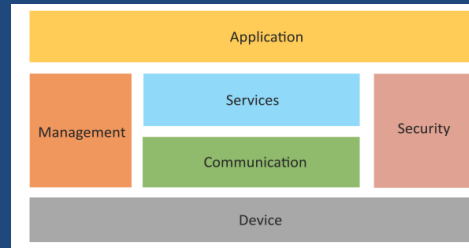
IOT ENABLING TECHNOLOGIES

◉ 1.Wireless Sensor Networks

◉ 2.Cloud Computing

◉ 3.Big Data Analytics

◉ 4.Embedded Systems

◉ 5.Communication Protocols

1.WIRELESS SENSOR NETWORKS

◉ **Distributed Devices with Sensors** used to monitor the environmental and physical condition.
◉ Consists of several **end-nodes acting as routers or coordinates too.**
◉ **Coordinators collect data f**rom all nodes/acts as a gateway that connects WSN to internet.
◉ **Routers route the data packets from end nodes to coordinators.**

CLOUD COMPUTING

◉ **Deliver applications and services over internet**
◉ Provides computing ,networking and storage resources on demand.
◉ Cloud computing performs services such as Pass,Saas and Iaas.
◉ Iaas: Rent Infrastructure
◉ Paas: Supply an on-demand environment for developing, testing, delivering and managing software applications.
◉ Saas: Methods for delivering software application over the internet on demand and typically on a subscription basis.

EMBEDDED SYSTEMS

◉ An Embedded System is a computer system that has computer hardware and software embedded to perform specfic task.
◉ General or personal computers perform a specfic set of tasks.
◉ Key components of the embedded systems includes
◉ 1.Microprocessor
◉ 2.Memory
◉ 3.Networking Units
◉ 4.Input/Output devices
◉ 5.Storage
◉ 6.Graphical Processor

IOT LEVEL-1

◉ A level-1 IoT system has a single node/device that performs sensing and/or actuation, stores data, performs analysis and hosts the application

◉ Level-1 IoT systems are suitable for modeling low-cost and low-complexity solutions where the data involved is not big and the analysis requirements are not computationally intensive.
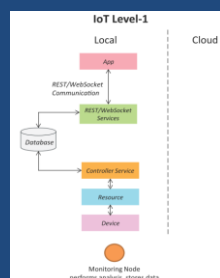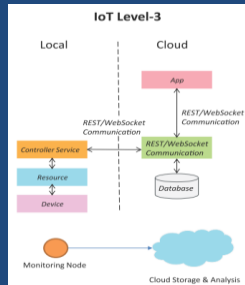

IOT LEVEL-2

◉ A level-2 IoT system has a single node that performs sensing and/or actuation and local analysis.
◉ Data is stored in the cloud and application is usually cloud-based.
◉ Level-2 IoT systems are suitable for solutions where the data involved is big, however, the primary analysis requirement is not computationally intensive and can be done locally itself.
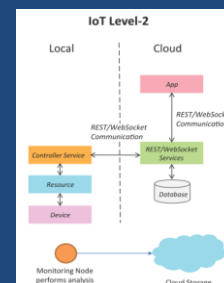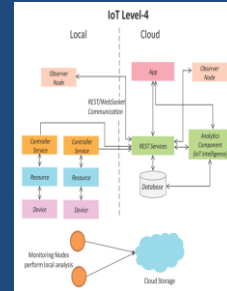
IOT LEVEL-3

- A level-3 IoT system has a single node. Data is stored and analyzed in the cloud and application is cloud-based.
- Level-3 IoT systems are suitable for solutions where the data involved is big and the analysis requirements are computationally intensive.


IoT Level-3

IOT LEVEL-4

- A level-4 IoT system has multiple nodes that perform local analysis. Data is stored in the cloud and application is cloud-based.
- Level-4 contains local and cloud-based observer nodes which can subscribe to and receive information collected in the cloud from IoT devices.
- Level-4 IoT systems are suitable for solutions where multiple nodes are required, the data involved is big and the analysis requirements are computationally intensive.

IoT Level-4

IOT LEVEL-5

- A level-5 IoT system has multiple end nodes and one coordinator node.
- The end nodes that perform sensing and/or actuation.
- Coordinator node collects data from the end nodes and sends to the cloud.
- Data is stored and analyzed in the cloud and application is cloud-based.
- Level-5 IoT systems are suitable for solutions based on wireless sensor networks, in which the data involved is big and the analysis requirements are computationally intensive.

IoT Level-5
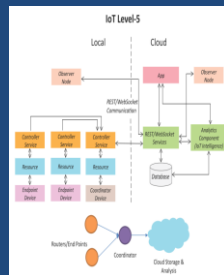
DOMAIN SPECIFIC IOT'S

Outline

IoT Applications for :
- Home
- Cities
- Environment
- Energy Systems
- Retail
- Logistics
- Industry
- Agriculture
- Health & Lifestyle

Home Automation

IoT applications for smart homes:
- Smart Lighting
- Smart Appliances
- Intrusion Detection
- Smoke / Gas Detectors

Cities

IoT applications for smart cities:
1. Smart Parking
2. Smart Lighting for Road
3. Smart Road
4. Structural Health Monitoring
5. Surveillance
6. Emergency Response

Environment

IoT applications for smart environments:
1. Weather Monitoring
2. Air Pollution Monitoring
3. Noise Pollution Monitoring
4. Forest Fire Detection
5. River Flood Detection

Energy

IoT applications for smart energy systems:
1. Smart Grid
2. Renewable Energy Systems
3. Prognostics

17. Innovative Teaching method if any(Attached Innovative Assignment)

QUESTIONS

1. How Cybersecurity might affect the Development and Implementation ofthe Internet of Things (IoT), especially in USA?

2.What is the Current Federal Regulatory Role of USA Governmentpertinent to Internet Of Things (IoT)?

18. References (Textbook/Websites/Journals)

Textbook

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti,Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

Websites or URLs e- Resources

1. https://nptel.ac.in/courses/106105166/

2.https://archive.nptel.ac.in/courses/106/105/106105166/

3.https://onlinecourses.nptel.ac.in/noc19_cs65/preview

4.https://onlinecourses.nptel.ac.in/noc23_cs82/preview

5. https://rajivbhandari.files.wordpress.com/2018/11/nptel-1.pdf

Journals

1.Internet of things applications using Raspberry-Pi: a survey

Khalid M. Hosny, Amal Magdi, Ahmad Salah, Osama El-Komy, Nabil A. Lashin

2. IoT Based Home Automation System using Raspberry Pi 4

T Maragatham, P Balasubramanie and M Vivekanandhan

3.An Enhanced AI-Based Network Intrusion Detection System Using Generative Adversarial Networks
Cheolhee Park; Jonghoon Lee; Youngsoo Kim; Jong-Geun Park; Hyunjin Kim; Dowon Hong

4.Internet of Things for Smart Cities
Andrea Zanella; Nicola Bui; Angelo Castellani; Lorenzo Vangelista; Michele Zorzi