RGPV (DIPLOMA WING BHOPAL			'ING)		ICULUM FOR	FORMAT	-3	Sheet No. 1/3
Branch		Electron	ics and	Telecommunicatio	n Engineering	Semester		VI
Course	Code			Course Name		IoT Lab		
Course	Outco	ome 1	Setup	etup a basic IoT hardware.			Teac Hrs	<sup>™</sup>   Marks
Learning Outcome 1			Connect Arduino board with internet. 10 10					
Contents/Tasks to be performed		AT co	mmands like UAR	module, interfacing A Γ, CWMODE, CWLA	P, CWJAP, O	CIPM		
			LAN/ LAN/	internet with static linternet.	nnecting Arduino to a IP. Checking TCP con	1		
Method	of Asse		LAN/2 LAN/2 Exterr	internet with static l internet. nal	IP. Checking TCP con	nection with	Ardui	no over
Method Learnin		essment	LAN/2 LAN/2 Exterr	internet with static l internet. nal nstrate the working	6	nection with		
Learnin	g Outo	essment come 2	LAN/2 LAN/2 Extern Demo contro Write Demo contro Write -Write -Write -Run t	internet with static l internet. nal nstrate the working ol. <b>ng first IoT based</b> <i>ntrol an LED conne</i> e a basic program (in as on a browser wind e and upload the Ard	IP. Checking TCP con of simple IoT task of <b>Program on Arduino</b> <i>cted to an Arduino</i> : .e. html code) in a PC	nection with LED : for creating of F control of	Ardui 10 comm LED.	and over

RGPV (DIPLO BHO		'ING)		COURSE	FORMA	2	Sheet No. 2/3
Branch	Electron	ics and	Telecommunicatio	on Engineering	Semester	VI	
Course Code			Course Name		IoT Lab	-	
Course Outco	Implement IoT based temperature logger 10 10						n Marks
Learning Outo	g Outcome 3       Implement IoT based temperature logger.       10       10         Cloud based data logging:       10       10       10		10				
Contents/Tasks to be performed			e) Arduino, LM35 a Connection of LI connected to inte Setting up cloud cloud service/ser Write and upload LM35, given IoT	M35 with Arduino boa rnet/intranet with the b based account (Things	rd (which is help of ESP8 speak etc.) or data logger p P8266.	already 266) any ot progran	, her IoT n using
Method of Asse		Exte Imple		ne automation system.		10	10
Learning Outcome 4 Contents/Tasks to be performed			connected to inte Writing cloud ba to communicate Execute the abov internet/intranet to Arduino board w electrical/electron	lays with Arduino boar rnet/intranet with the h sed or local executable with the above Arduine e code to send the ON to the relays connected hich ultimately will sv	help of ESP8 e code (i.e. pl o board. /OFF control l to different	266) ain htn l comm pins of	nl code) aands via

RGPV (DIPLOMA W BHOPAL			/ING)		RICULUM FOF	FORMA	<b>.</b> .3	Sheet No. 3/3			
Branch		Electron	ics and	Telecommunicatio	on Engineering	Semester	VI				
Course C	Code			Course Name	IoT Lab						
Course	Outco	ome 3	Apply	IoT concepts in ad	lvance applications.		Tea Hr	Mark			
Learning	g Outc	come 5	Imple	Implement IoT based street light control system.1010							
Contents per	s/Task forme		-	the help of ESP8 Writing cloud ba	used or local executabl						
Mathada			-	Execute the above light and if it is lessend the ON/OF relays connected ultimately will se	with the above Arduin we code to sense the ar ess/greater than the pr F control commands v to different pins of th witch ON/OFF the structure	nbient light edefined thr ia internet/in e Arduino b	eshold ntranet	level then to the			
Method c	of Asse		- Exterr	Execute the above light and if it is lease send the ON/OFF relays connected ultimately will seenal	ve code to sense the ar ess/greater than the pr F control commands v to different pins of th witch ON/OFF the stre	nbient light edefined thr ia internet/in e Arduino be eet lights.	eshold atranet bard wi	level then to the hich			
Method c		essment		Execute the above light and if it is lease send the ON/OFF relays connected ultimately will seenal	ve code to sense the ar ess/greater than the pr F control commands v to different pins of th	nbient light edefined thr ia internet/in e Arduino be eet lights.	eshold ntranet	level then to the			
Learning	g Outc	essment come 6 cs to be	Apply Speed	Execute the above light and if it is has send the ON/OFF relays connected ultimately will send the OT concepts in spend I Control of DC Mased Speed Control Connection of L2 with Arduino boo with the help of has to communicate Executing the ab Arduino board we motor driver and	ve code to sense the ar ess/greater than the pr F control commands v to different pins of th witch ON/OFF the stra- beed control of DC mo lotor of DC Motor with PV 293D motor driver (co ard (which is already of	nbient light i edefined thr ia internet/in e Arduino be eet lights. tor. <i>WM signals</i> onnected to a connected to e code (i.e. p to board. nstructions to PWM signal	10 nd DC internet blain ht o the a l to be	level then to the hich 10 motor) et/intranet ml code) bove			

## Suggested List of Experiments:

S.N.	Experiment	LO
1.	Connection of an Arduino board with ESP8266 wifi module.	L01
2.	IoT based control of an LED using Arduino.	LO2
3.	IoT and cloud based data logger using LM35 and Arduino.	LO3
4.	IoT based home automation using Arduino.	LO4
5.	IoT based street light control using Arduino.	LO5
6.	IoT based DC motor speed control using Arduino.	LO6

## **ReferenceBooks/WebPortals:**

S.N.	Title	Author
1	Internet of Things with Arduino Cookbook	Marco Schwartz Packt Publishing Ltd.
2	Internet of Things with Arduino Blueprints	Pradeeka Seneviratne Packt Publishing Ltd.
3	Internet of Things: A Hands On Approach	Arshdeep Bahga and Vijay Madisetti Universities Press (India) Private Limited
5	spoken-tutorial.org	
6.	nptel.ac.in	
7.	swayam.gov.in	

				SC	HEME FOR LEA	ARNING	Bran	nch Code		Course Co	de	CO Code	LO Code	л
KGPV		ma Wing ) Bho	opai		OUTCOM	E	Ε	0 3	6	0		1	1	ormat No. <b>4</b>
COURS	E NAME	Internet of Things	Lab				- <u> </u>	I		I		_		
CO Des	cription	Setup a basic IoT hard	ware.											
LO Deso	cription	Connect Arduino board	d with inte	ernet.										
					SCHEME	OF STUDY								
S. No.		Learning Conten	t		Teaching – Learning Method	Descriptio Proce			each Irs.	Pra /Tut		LRs F	Require	Remarks
LO-01	Connectic module, in AT comma CWJAP, C Arduino to static IP. C	T setup with Arduino and ESP8266: ttion of Arduino board with ESP8266 wifi e, interfacing Arduino with ESP8266 using mands like UART, CWMODE, CWLAP, , CIPMUX, CIPSERVER, CIFSR. Connecting D to access-point with LAN/internet with P. Checking TCP connection with Arduino N/internet.Interactive lab demonstration, assignments, hands-on practice on Arduino board/IDE and other peripherals, lab assignments.• Teacher will explain contents and provi handouts to studer • Teacher with suppor from lab staff will demonstrate the procedure of lab experiments.• Student will practic Arduino board, IDE peripherals and con lab assignment bas experiments.		l provide students support f will the lab practice o rd, IDE ar ind cond	on nd uct		10		Lab manual, Arduino board and peripheral computer with relevant simulation software and high speed internet.		,			
					SCHEME OF		Г							
S. No.	Metho	d of Assessment		C	escription of Assess	sment		Maxin Mar	-	Reso	ource	s Requ	ired	External / Internal
LO-01	01 Practical test in laboratory 3. Establish a			and init ct ESP8 AT com sh and	e asked to (and/or): ialize Arduino IDE for th 266 with Arduino and w mands. check TCP/IP connection net connection.	rite and execute		10	)	Rub	rics/F	Rating s	cale	External
	1		ADD		AL INSTRUCTIONS F		/ FΔCUI	TY (IF	VNV)	1			I	

RGP\/	/ (Dinlo	oma Wing ) Bhopal	SCHEME FOR LI	EARNING	Branch Coc	le	Course Code	CO LO Code Code	Format No. <b>4</b>
			OUTCON	ΛE	E 0	3 (	5 0	1 2	
COURS	E NAME	Internet of Things Lab							
CO Des	cription	Setup a basic IoT hardware.							
LO Dese	cription	Demonstrate the working of sir	nple IoT task of LED control.						
		'	SCHEN	ME OF STUDY					
S. No.		Learning Content	Teaching – Learning Method	Descriptio Proce		Teach Hrs.	Pract. /Tut Hrs.	LRs Require	d Remarks
LO-02	To contro -Write a k for creatin window. -Write an control of -Run the p	rst IoT based Program on Arduin I an LED connected to an Arduino pasic program (i.e. html code) in a ng command buttons on a brows d upload the Arduino code for Of LED. program of Arduino and give the pased command to control the LE	: demonstration, PC assignments, hands on practice on Arduino N/OFF board/IDE and other peripherals, lab assignments.	<ul> <li>Teacher will excontents and phandouts to st</li> <li>Teacher with slab staff will de the procedure experiments.</li> <li>Student will pr Arduino board peripherals an assignment ba experiments.</li> </ul>	orovide udents. upport from emonstrate of lab actice on , IDE and d conduct lab		10	Lab manual Arduino boa and peripherals computer w relevant simulation software ar high speed internet.	vith
	1		SCHEME	OF ASSESSMEN	Γ				
S. No.	Metho	d of Assessment	Description of Assessr	nent	Maximu Marks		Resource	s Required	External Internal

LO-02	Practical test in laboratory	<ol> <li>Student will be asked to(and/or):</li> <li>Write a basic program (e.g. html code) in a computer to send the command to Arduino over internet/intranet.</li> <li>Write and upload Arduino program for LED control.</li> <li>Demonstrate the working of remote control of LED over internet/intranet.</li> </ol>	10	Rubrics/Rating scale	Internal
		ADDITIONAL INSTRUCTIONS FOR THE HOD/	FACULTY (IF AN	IY)	

RGP	/ (Diplo	oma Wing ) Bho	pal S	CHEME FOR LEA	_	Branch Cod	e	Course Co	ode	CO Code	LO Code	Format No. <b>4</b>
	(=.6.6			OUTCOME	<b>E</b>	E 0	3 6	0		1	3	
COURS	SE NAME	Internet of Things La	ab									
CO Des	cription	Apply IoT concept in sim	ple real life a	applications.								
LO Des	cription	Implement IoT based te	mperature lo	gger.								
				SCHEME	OF STUDY							
S. No.		Learning Content	:	Teaching – Learning Method	Description Proce		Teach Hrs.		act. : Hrs.	LRs	Requ	ired Remark
LO-03	IoT based (Or any or ESP8266 - Cr (v in ES - Se (T Se - M da da	Cloud based data logging: oT based Temperature logger using ThingSpeak OT any other cloud service) Arduino, LM35 andInteractive lab demonstration, assignments, hands on practice on Arduino board (which is already connected to internet/intranet with the help of ESP8266)Interactive lab demonstration, assignments, hands on practice on Arduino board/IDE, IOT cloud service and other peripherals, lab assignments.Teacher will ex contents and p handouts to student service service/serverWrite and upload Arduino temperature data logger program using LM35, given IOT cloud service and ESP8266. -Interactive lab demonstration, assignments.Teacher will ex contents and p handouts to student with set procedure of la experimentsWrite and upload Arduino temperature data logger program using LM35, given IOT cloud service and ESP8266. -Setting up cloud based account (Thingspeak etc.) or any other loT cloud service/server.Student will prac Arduino board (basing LM35, given IoT cloud service and ESP8266. -Student will prac veripherals and lab assignment experiments.		ab ractice on l, IDE and d conduct		1	.0	Ardui and p comp relev simul softw to lo <sup>1</sup> servic Thing	ation vare, ac Γ cloud ce like gSpeaks nigh spe	rd rals, ith cess etc.		
				SCHEME OF	ASSESSMENT							
S. No.	Metho	od of Assessment		Description of Assessn	nent	Maximu m Marks	R	esour	ces Re	quire	d	External / Internal
LO-03	Practic	al test in laboratory	. Connect LN	ill be asked to M35 IC with Arduino cloud server account (like o it.	ThingSpeak etc.)	10		Rubrics	/Ratin	g scale	2	External

<ol> <li>Write and upload Arduino temperature data logger program using LM35, given IoT cloud service and ESP8266.</li> </ol>			
<ol> <li>View and verify the temperature logs on the IoT cloud service.</li> </ol>			
ADDITIONAL INSTRUCTIONS FOR THE HOD/ F	ACULTY (IF	ANY)	

RGPV	/ (Diplo	oma Wing ) Bhopal	SCHEME FOR	_	В	ranch Co	de	Co	urse Coo	de Co		LO Code	Forma	at No. <b>4</b>
CO Des	E NAME cription cription	Internet of Things Lab Apply IoT concept in simple rea Implement IoT based home aut	omation system.		E	0	3	6	0		2	4		
S. No.		Learning Content	SCH Teaching –Learning Method	EME OF STUDY Description Process			Teach Hrs.	/	act. Tut Irs.	LRs	s Red	quire	ł	Remarks
LO-04	IoT based - C A co w - W ez co al - E	tomation: home automation onnection of relays with rduino board (which is already onnected to internet/intranet ith the help of ESP8266) /riting cloud based or local kecutable code (i.e. plain html ode) to communicate with the pove Arduino board. kecute the above code to send he ON/OFF control commands	Interactive lab demonstration, assignments, hands on practice on Arduino board/IDE, IoT cloud service and other peripherals, lab assignments.	<ul> <li>Teacher will explace contents and prohandouts to stud</li> <li>Teacher with suplab staff will dem the procedure of experiments.</li> <li>Student will prace Arduino board, IE peripherals and cassignment based experiments.</li> </ul>	vide lents. port fro onstrat lab tice on DE and conduct	e		_	10	Lab man board a comput simulati access t service etc. and internet	nd pe er wi on se o loT like T l high	eriphe ith rele oftwar cloud hingSp	rals, evant e, beaks	

			SCHEME OF ASSESSMENT			
S. No.	Method of Assessment		Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-04	Practical test in laboratory	1. Co ap 2. W co 3. Ex	ent will be asked to(and/or): onnect the required number of relays and opliances to the Arduino board. The Arduino program and remote program to ontrol these relays. Secute above programs and control the appliances are intranet/internet	10	Rubrics/Rating scale	Internal
		ADD	DITIONAL INSTRUCTIONS FOR THE HOD/ FA	CULTY (IF ANY)	· · · · · · ·	

RGPV (Diploma Wing ) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code		Course Co	de	CO Code	LO Code F	ormat No. <b>4</b>				
				E 0	3	6 0		3	5					
COURS	E NAME	Internet of Things Lab			· ·			i		i				
CO Des	cription	Apply IoT concepts in advance	applications.											
LO Deso	cription	Implement IoT based street lig	nent IoT based street light control system.											
			SCH	EME OF STUDY										
S. No.	Learning Content		Teaching –Learning Method	Description of T-L Process		Teach Hrs.	Pract. /Tut Hrs.	LRs Required		Remarks				
LO-05	<ul> <li>Street Light Control         <ul> <li>IoT Based Street Light Control</li> <li>Connection of LDR and relays (connected to street lights) with Arduino board (which is already connected to internet/intranet with the help of ESP8266)</li> <li>Writing cloud based or local executable code (i.e. plain html code) to communicate with the above Arduino board.</li> <li>Execute the above code to sense the ambient light near the street light and if it is less/greater than the predefined threshold level then send the ON/OFF control commands via internet/intranet to the relays connected to different pins of the Arduino board which ultimately will switch ON/OFF the street lights.</li> </ul> </li> </ul>		Interactive lab demonstration, assignments, hands on practice on Arduino board/IDE, IoT cloud service and other peripherals, lab assignments.	<ul> <li>Teacher will explain the contents and provide handouts to students.</li> <li>Teacher with support from lab staff will demonstrate</li> </ul>		Hrs.         Hrs.            10		Lab manual, Arduino board and peripherals, computer with relevant simulation software, access to IoT cloud service like ThingSpeaks etc. and high speed internet.		ls, ant				
		1	SCHEM	E OF ASSESSMEN	Т									
S. No.	Meth	nod of Assessment	Description of As	ssessment	Maximum Marks		Resour		sources Required		External / Internal			

LO-05	Practical test in laboratory	<ol> <li>Student will be asked to(and/or):</li> <li>Connect the required number of LDRs and relays and street lights to the Arduino board.</li> <li>Write the Arduino program and remote program to read from the LDRs and control these relays.</li> <li>Execute above programs to control (manually and automatically) the street lights over intranet/internet</li> </ol>	10	Rubrics/Rating scale	External					
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)										

RGPV (Diploma Wing ) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch	Branch Code		Code	CO Code	LO Code	Form	nat No. <b>4</b>	
				ΕΟ	3			3	6			
COURS	E NAME	Internet of Things Lab										
CO Des	cription	Apply IoT concepts in advance a	applications.									
LO Des	cription	Apply IoT concepts in speed con	ntrol of DC motor.									
		·	SCH	EME OF STUDY								
S. No.	Learning Content		Teaching –Learning Method	Description of T-L Process		Teach Hrs.	Pract. /Tut Hrs.	LRs Required		ed	Remarks	
LO-06			Interactive lab demonstration, assignments, hands on practice on Arduino board/IDE, IoT cloud service and other peripherals, lab assignments.	<ul> <li>Teacher will explain the contents and provide handouts to students.</li> <li>Teacher with support from lab staff will demonstrate</li> </ul>			•		erals, evant re, d speaks			
			SCHEM	E OF ASSESSMEN	Г							
S. No.	Meth	nod of Assessment	nent Description of Assessment		Maximum Marks		<b>Resources Required</b>		ired	External / Internal		

LO-06	Practical test in laboratory	<ul> <li>Student will be asked to(and/or):</li> <li>1. Connect L293D motor driver with Arduino</li> <li>2. Write and upload Arduino program and remote program.</li> <li>3. Execute above programs to control (manually and automatically) the speed of DC motor over intranet/internet.</li> </ul>	10	Rubrics/Rating scale	External					
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)										