

RGPV (DIPLOMA WING) BHOPAL		OBE CURRICULUM FOR THE COURSE		FORMAT-3		Sheet No. 1/3	
Branch	Electronics and Telecommunication Engineering			Semester	VI		
Course Code		Course Name	IoT Lab				
Course Outcome 1	Setup a basic IoT hardware.				Teach Hrs	Marks	
Learning Outcome 1	Connect Arduino board with internet.				10	10	
Contents/Tasks to be performed	Basic IoT setup with Arduino and ESP8266: Connection of Arduino board with ESP8266 wifi module, interfacing Arduino with ESP8266 using AT commands like UART, CWMODE, CWLAP, CWJAP, CIPMUX, CIPSERVER, CIFS. Connecting Arduino to access-point with LAN/internet with static IP. Checking TCP connection with Arduino over LAN/internet.						
Method of Assessment	External						
Learning Outcome 2	Demonstrate the working of simple IoT task of LED control.				10	10	
Contents/Tasks to be performed	Writing first IoT based Program on Arduino: <i>To control an LED connected to an Arduino:</i> -Write a basic program (i.e. html code) in a PC for creating command buttons on a browser window. -Write and upload the Arduino code for ON/OFF control of LED. -Run the program of Arduino and give the browser based command to control the LED.						
Method of Assessment	Internal						

RGPV (DIPLOMA WING) BHOPAL		OBE CURRICULUM FOR THE COURSE		FORMAT-3		Sheet No. 2/3	
Branch	Electronics and Telecommunication Engineering			Semester	VI		
Course Code		Course Name	IoT Lab				
Course Outcome 2	Apply IoT concept in simple real life applications.				Teach Hrs	Marks	
Learning Outcome 3	Implement IoT based temperature logger.				10	10	
Contents/Tasks to be performed	<p>Cloud based data logging: <i>IoT based Temperature logger using ThingSpeak (Or any other cloud service) Arduino, LM35 and ESP8266</i></p> <ul style="list-style-type: none"> - Connection of LM35 with Arduino board (which is already connected to internet/intranet with the help of ESP8266) - Setting up cloud based account (Thingspeak etc.) or any other IoT cloud service/server. - Write and upload Arduino temperature data logger program using LM35, given IoT cloud service and ESP8266. - View and verify the temperature logs on the IoT cloud service. 						
Method of Assessment	External						
Learning Outcome 4	Implement IoT based home automation system.				10	10	
Contents/Tasks to be performed	<p>Home Automation: <i>IoT based home automation</i></p> <ul style="list-style-type: none"> - Connection of relays with Arduino board (which is already connected to internet/intranet with the help of ESP8266) - Writing cloud based or local executable code (i.e. plain html code) to communicate with the above Arduino board. - Execute the above code to 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 electrical/electronic appliances. 						
Method of Assessment	Internal						

RGPV (DIPLOMA WING) BHOPAL		OBE CURRICULUM FOR THE COURSE		FORMAT-3		Sheet No. 3/3	
Branch	Electronics and Telecommunication Engineering			Semester	VI		
Course Code		Course Name	IoT Lab				
Course Outcome 3	Apply IoT concepts in advance applications.				Teach Hrs	Marks	
Learning Outcome 5	Implement IoT based street light control system.				10	10	
Contents/Tasks to be performed	<p>Street Light Control <i>IoT Based Street Light Control</i></p> <ul style="list-style-type: none"> - Connection of LDR and relays (connected to street lights) with Arduino board (which is already connected to internet/intranet with the help of ESP8266) - Writing cloud based or local executable code (i.e. plain html code) to communicate with the above Arduino board. - 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. 						
Method of Assessment	External						
Learning Outcome 6	Apply IoT concepts in speed control of DC motor.				10	10	
Contents/Tasks to be performed	<p>Speed Control of DC Motor <i>IoT based Speed Control of DC Motor with PWM signals</i></p> <ul style="list-style-type: none"> - Connection of L293D motor driver (connected to and DC motor) with Arduino board (which is already connected to internet/intranet with the help of ESP8266) - Writing cloud based or local executable code (i.e. plain html code) to communicate with the above Arduino board. - Executing the above code to send the instructions to the above Arduino board which in turn generates PWM signal to be fed to the motor driver and hence control the speed of DC motor. 						
Method of Assessment	Internal						

Suggested List of Experiments:

S.N.	Experiment	LO
1.	Connection of an Arduino board with ESP8266 wifi module.	LO1
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	

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					E	O	3	6	0		1	1	
COURSE NAME	Internet of Things Lab												
CO Description	Setup a basic IoT hardware.												
LO Description	Connect Arduino board with internet.												
SCHEME OF STUDY													
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks						
LO-01	Basic IoT setup with Arduino and ESP8266: Connection of Arduino board with ESP8266 wifi module, interfacing Arduino with ESP8266 using AT commands like UART, CWMODE, CWLAP, CWJAP, CIPMUX, CIPSERVER, CIFSR. Connecting Arduino to access-point with LAN/internet with static IP. Checking TCP connection with Arduino over LAN/internet.	Interactive lab demonstration, assignments, hands-on practice on Arduino board/IDE and other peripherals, lab assignments.	<ul style="list-style-type: none"> Teacher will explain the contents and provide handouts to students. Teacher with support from lab staff will demonstrate the procedure of lab experiments. Student will practice on Arduino board, IDE and peripherals and conduct lab assignment based on experiments. 	--	10	Lab manual, Arduino board and peripherals, computer with relevant simulation software and high speed internet.							
SCHEME OF ASSESSMENT													
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal								
LO-01	Practical test in laboratory	Student will be asked to (and/or): <ol style="list-style-type: none"> Install and initialize Arduino IDE for the given Arduino board. Connect ESP8266 with Arduino and write and execute simple AT commands. Establish and check TCP/IP connection with available intranet/internet connection. 	10	Rubrics/Rating scale	External								
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													

--

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		<i>E</i>	<i>0</i>	<i>3</i>	<i>6</i>	<i>0</i>		<i>1</i>	<i>2</i>	

COURSE NAME	Internet of Things Lab
CO Description	Setup a basic IoT hardware.
LO Description	Demonstrate the working of simple IoT task of LED control.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-02	<p>Writing first IoT based Program on Arduino: <i>To control an LED connected to an Arduino:</i> -Write a basic program (i.e. html code) in a PC for creating command buttons on a browser window. -Write and upload the Arduino code for ON/OFF control of LED. -Run the program of Arduino and give the browser based command to control the LED.</p>	Interactive lab demonstration, assignments, hands on practice on Arduino board/IDE and other peripherals, lab assignments.	<ul style="list-style-type: none"> Teacher will explain the contents and provide handouts to students. Teacher with support from lab staff will demonstrate the procedure of lab experiments. Student will practice on Arduino board, IDE and peripherals and conduct lab assignment based on experiments. 	--	10	Lab manual, Arduino board and peripherals, computer with relevant simulation software and high speed internet.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
--------	----------------------	---------------------------	---------------	--------------------	---------------------

LO-02	Practical test in laboratory	Student will be asked to (and/or): <ol style="list-style-type: none">1. Write a basic program (e.g. html code) in a computer to send the command to Arduino over internet/intranet.2. Write and upload Arduino program for LED control.3. Demonstrate the working of remote control of LED over internet/intranet.	10	Rubrics/Rating scale	Internal
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)					

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					E	O	3	6	0		1	3	
COURSE NAME	Internet of Things Lab												
CO Description	Apply IoT concept in simple real life applications.												
LO Description	Implement IoT based temperature logger.												
SCHEME OF STUDY													
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks						
LO-03	Cloud based data logging: <i>IoT based Temperature logger using ThingSpeak (Or any other cloud service) Arduino, LM35 and ESP8266</i> <ul style="list-style-type: none"> - Connection of LM35 with Arduino board (which is already connected to internet/intranet with the help of ESP8266) - Setting up cloud based account (ThingSpeak etc.) or any other IoT cloud service/server. - Write and upload Arduino temperature data logger program using LM35, given IoT cloud service and ESP8266. - View and verify the temperature logs on the IoT cloud service. 	Interactive lab demonstration, assignments, hands on practice on Arduino board/IDE, IoT cloud service and other peripherals, lab assignments.	<ul style="list-style-type: none"> • Teacher will explain the contents and provide handouts to students. • Teacher with support from lab staff will demonstrate the procedure of lab experiments. • Student will practice on Arduino board, IDE and peripherals and conduct lab assignment based on experiments. 	--	10	Lab manual, Arduino board and peripherals, computer with relevant simulation software, access to IoT cloud service like ThingSpeaks etc. and high speed internet.							
SCHEME OF ASSESSMENT													
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal								
LO-03	Practical test in laboratory	Student will be asked to <ol style="list-style-type: none"> 1. Connect LM35 IC with Arduino 2. Create IoT cloud server account (like ThingSpeak etc.) and login to it. 	10	Rubrics/Rating scale	External								

		<p>3. Write and upload Arduino temperature data logger program using LM35, given IoT cloud service and ESP8266.</p> <p>4. View and verify the temperature logs on the IoT cloud service.</p>			
--	--	--	--	--	--

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code		CO Code	LO Code	Format No. 4
					<i>E</i>	<i>0</i>	<i>3</i>	<i>6</i>	<i>0</i>		<i>2</i>	
COURSE NAME	Internet of Things Lab											
CO Description	Apply IoT concept in simple real life applications.											
LO Description	Implement IoT based home automation system.											

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-04	<p>Home Automation: <i>IoT based home automation</i></p> <ul style="list-style-type: none"> - Connection of relays with Arduino board (which is already connected to internet/intranet with the help of ESP8266) - Writing cloud based or local executable code (i.e. plain html code) to communicate with the above Arduino board. - Execute the above code to send the ON/OFF control commands 	Interactive lab demonstration, assignments, hands on practice on Arduino board/IDE, IoT cloud service and other peripherals, lab assignments.	<ul style="list-style-type: none"> • Teacher will explain the contents and provide handouts to students. • Teacher with support from lab staff will demonstrate the procedure of lab experiments. • Student will practice on Arduino board, IDE and peripherals and conduct lab assignment based on experiments. 	--	10	Lab manual, Arduino board and peripherals, computer with relevant simulation software, access to IoT cloud service like ThingSpeaks etc. and high speed internet.	

	via internet/intranet to the relays connected to different pins of the Arduino board which ultimately will switch ON/OFF the electrical/electronic appliances.						
--	--	--	--	--	--	--	--

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-04	Practical test in laboratory	Student will be asked to(and/or): 1. Connect the required number of relays and appliances to the Arduino board. 2. Write the Arduino program and remote program to control these relays. 3. Execute above programs and control the appliances over intranet/internet	10	Rubrics/Rating scale	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

--

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME				Branch Code			Course Code			CO Code	LO Code	Format No. 4
						E	O	3	6	0		3	5	
COURSE NAME	Internet of Things Lab													
CO Description	Apply IoT concepts in advance applications.													
LO Description	Implement IoT based street light control system.													
SCHEME OF STUDY														
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks							
LO-05	Street Light Control <i>IoT Based Street Light Control</i> <ul style="list-style-type: none"> - Connection of LDR and relays (connected to street lights) with Arduino board (which is already connected to internet/intranet with the help of ESP8266) - Writing cloud based or local executable code (i.e. plain html code) to communicate with the above Arduino board. - 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. 	Interactive lab demonstration, assignments, hands on practice on Arduino board/IDE, IoT cloud service and other peripherals, lab assignments.	<ul style="list-style-type: none"> • Teacher will explain the contents and provide handouts to students. • Teacher with support from lab staff will demonstrate the procedure of lab experiments. • Student will practice on Arduino board, IDE and peripherals and conduct lab assignment based on experiments. 	--	10	Lab manual, Arduino board and peripherals, computer with relevant simulation software, access to IoT cloud service like ThingSpeaks etc. and high speed internet.								
SCHEME OF ASSESSMENT														
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal									

LO-05	Practical test in laboratory	<p>Student will be asked to(and/or):</p> <ol style="list-style-type: none"> 1. Connect the required number of LDRs and relays and street lights to the Arduino board. 2. Write the Arduino program and remote program to read from the LDRs and control these relays. 3. Execute above programs to control (manually and automatically) the street lights over intranet/internet 	10	Rubrics/Rating scale	External
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)					

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					E	O	3				3	6	
COURSE NAME	Internet of Things Lab												
CO Description	Apply IoT concepts in advance applications.												
LO Description	Apply IoT concepts in speed control of DC motor.												
SCHEME OF STUDY													
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks						
LO-06	Speed Control of DC Motor <i>IoT based Speed Control of DC Motor with PWM signals</i> <ul style="list-style-type: none"> - Connection of L293D motor driver (connected to and DC motor) with Arduino board (which is already connected to internet/intranet with the help of ESP8266) - Writing cloud based or local executable code (i.e. plain html code) to communicate with the above Arduino board. - Execute the above code to send the instructions to the above Arduino board which in turn generates PWM signal to be fed to the motor driver and hence control the speed of DC motor. 	Interactive lab demonstration, assignments, hands on practice on Arduino board/IDE, IoT cloud service and other peripherals, lab assignments.	<ul style="list-style-type: none"> • Teacher will explain the contents and provide handouts to students. • Teacher with support from lab staff will demonstrate the procedure of lab experiments. • Student will practice on Arduino board, IDE and peripherals and conduct lab assignment based on experiments. 	--	10	Lab manual, Arduino board and peripherals, computer with relevant simulation software, access to IoT cloud service like ThingSpeaks etc. and high speed internet.							
SCHEME OF ASSESSMENT													
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal								

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

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

--