RGPV(Diploma Wing)Bhopal				SEMESTERTEACHINGLEARNING&ASSESSMENT PLAN				FORMAT-6
NAMEOFPROGRAMME	THREEYEARS DIPLOMA		SCHEME	OBE	IMPLEMENTINGYEAR			2021-22
BRANCHCODE	*E05*	NAMEOFBRANCH	*ELECTRICAL&ELECTRONICSENGINEERING*			SEMESTER		*FIFTH*

S. No	COURSE DETAILS					T-LPLAN		ASSESSMENTPLAN								
	COURSE CODE	COURSE NAME	PAPER CODE/ CREDITS	No. of COs	No. of LOs	Total T-L Hrs.	T-L Hrs. /Week	Internal Assessment		ExternalAssessment(UniversityExam)						Grand Total of Marks
										TheoryPaper			PracticalExam*			
								No.of Los (T+P)	Total Marks	No.of LOs	Total Marks	Duration	No.of LOs	Total Marks	Duration	
1	501	POWERSYSTEM OPERATION AND PROTECTION	6848/ 06	05	15	105	07	03+02	30+20	07	70	3Hrs.	03	30	3Hrs.	150
2	502	POWER ELECTRONICS AND APPLLICATIONS	6849/ 06	05	15	105	07	03+02	30+20	07	70	3Hrs.	03	30	3Hrs.	150
3	503	EMBEDEDE SYSTEM WITH AURDINO	6830/ 06	05	14	105	07	03+02	30+20	07	70	3Hrs.	02	30	3Hrs.	150
4	Elective (AnyOne):	511 ELECTRIC VEHICLE	6851/ 06	05	15	90	06	03+02	30+20	08	70	3Hrs.	02	30	3Hrs.	150
		512CONTROL SYSTEM AND INDUSTRIAL AUTOMATION	6852/ 06	05	15	90	06	03+02	30+20	07	70	3Hrs.	03	30	3Hrs.	150
		513 DATA COMMUNICATION& NETWORKING	6828/ 06	05	14	90	06	03+02	30+20	07	70	3Hrs.	02	30	3Hrs.	150
5	504	INDUCTION TRAINING AND MINOR PROJECT	02	02	05	30	02	02	20	-	-	-	02	30	3Hrs.	50
6	505	PROFESSIONAL DEVELOPMENT-V	02	03	06	60	04	06	75	-	-	-	-	-	-	75
TOTAL				-	-	495	33									

ExamforLOs(Psycho+Affect.),
#3hoursperweekforselflearning/libraryetc.

RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 1/5

Branch	Electrical and Electronics Engineering	Semester	V

Course Code	501	Course Name	Power System Operation and Protection

Course Outcome - 1	Express restructuring and representation of power system.	Teach Hrs	Marks
Learning Outcome E0150111	Describe various elements, interconnection and restructuring of power system. [Cognitive Domain]	07	10
Contents	• Various elements of power system: electrical equivalent circuit diagram, phasor diagram of alternator, transformer and transmission lines. • Interconnection of power system: necessity, advantages and types. • Restructuring of power system: concept, necessity, advantages and disadvantages.		
Method of Assessment	Internal: Mid semester-I theory examination (Pen paper test)		
Learning Outcome E0150112	Identify different methods of representing a power system. [Cognitive Domain]	07	10
Contents	• Single line diagram: construction and advantages. • Per unit system: definition and advantages. • Per unit impedances (Z_{pu}): computation in 1ϕ and 3ϕ system, computation for changed base value. • Per unit impedance diagram: construction for a given power system. • Representation of a power system as two-port power network: generalized ABCD parameters, proof of AD-BC=1 • Numerical Problems		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0150113	Evaluate parameters of a two port power network. [Psychomotor Domain]	07	10
Contents	• Determine ABCD parameters of given 'π' and 'T' network. • Verify reciprocity of a power network by proving AD-BC=1		
Method of Assessment	External: End semester practical exam (performance of task & viva voce)		

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Branch	Electrical and Electronics Engineering	Semester	V

Course Code	501	Course Name	Power System Operation and Protection

Course Outcome - 2	Expound power system operation and fault analysis.	Teach Hrs	Marks
Learning Outcome E0150121	Explain in brief the concept of PLCC, load flow study and symmetrical fault analysis. **[Cognitive Domain]**	**07**	**10**
Contents	• PLCC: functioning with the help of block diagram • Load flow study: types of buses in a power system, formation of admittance matrix (Y-bus matrix) for a given 3-bus test system. • Fault study: definition of fault, types of fault: series and shunt faults, abnormalities in power system, causes and effects of fault. • Symmetrical fault analysis: transients in transmission lines, 3ϕ short circuit on an unloaded synchronous generator.		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0150122	Illustrate symmetrical components to identify sequence networks and unsymmetrical faults. **[Cognitive Domain]**	**9**	**12**
Contents	• Fortescue's theorem, 'a' operator, symmetrical components. Numerical problems • Sequence networks: sequence impedances, sequence networks for alternator, transformer, and transmission line. Construction of sequence networks for a given PS (i.e. single line diagram). • Analysis of L-G, L-L and L-L-G unsymmetrical faults by using symmetrical components. Numerical problems.		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0150123	Model unsymmetrical faults for transmission lines. **[Psychomotor Domain]**	**07**	**10**
Contents	• To determine fault current and draw sequence networks for L-G fault. • To determine fault current and draw sequence networks for L-L fault. • To determine fault current and draw sequence networks for L-L-G fault.		
Method of Assessment	External: End semester practical exam (performance of task & viva voce)		

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Branch	Electrical and Electronics Engineering	Semester	V

Course Code	501	Course Name	Power System Operation and Protection

Course Outcome – 3	Discuss protection system and protective relays.	Teach Hrs	Marks
Learning Outcome E0150131	Explain necessity, types and various components of protection system **[Cognitive Domain]**	**07**	**10**
Contents	• Circuit diagram and components of a basic protection system. • Need of a protection system. • Role of CTs and PTs in protection. • Primary and Back-up protection. • Desirable qualities of protective relaying.		
Method of Assessment	Internal: Mid semester-II theory examination (Pen paper test)		
Learning Outcome E0150132	Classify and describe protective relays **[Cognitive Domain]**	**07**	**10**
Contents	• Technical terms regarding relays: pick-up value, re-set value, operating time. • Classification of relays. • Principle and working of relays: Electromagnetic (induction and attracted armature type) relays, static (thermal) relays and Directional relay • Time-current characteristics of various relays: IDMT characteristic, plug setting multiplier (PSM), time multiplier setting (TMS). Numerical problems. • Distance relays: impedance relay, reactance relay and mho realy. • Differential relays: current differential relay, biased differential protection		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0150133	Analyse time-current characteristic of IDMT relays. **[Psychomotor and Affective Domain]**	**07**	**10**
Contents	• To plot time-current characteristic of an IDMT relay. • To demonstrate the effect of PSM and TMS on current setting and operating time.		
Method of Assessment	Internal: Performance of task, and viva voce		

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Branch	Electrical and Electronics Engineering	Semester	V

Course Code	501	Course Name	Power System Operation and Protection

Course Outcome 4	Comprehend circuit interrupting devices.	Teach Hrs	Marks
Learning Outcome E0150141	Explain fuses and their characteristics. [Cognitive Domain]	05	8
Contents	• Basic technical terms regarding fuses: fuse element, minimum fusing current, fuse rating, fusing factor, operating time (arcing and pre-arcing time), prospective current, cut off current. • Types of fuses: Kit-kat and high rupturing capacity (HRC) fuses. • Construction, working, cut-off characteristic and applications of HRC fuses.		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0150142	Elucidate circuit breakers. [Cognitive Domain]	07	10
Contents	• Arc formation and principle of arc extinction. • Arc extinction methods. • Technical terms regarding circuit breakers: arc voltage, re-striking voltage, recovery voltage, making and breaking current, RRRV and circuit breaker rating. • Types of circuit breakers: minimum oil CB (MOCB), bulk oil CB (BOCB), air blast CB (ABCB), SF_6 CB and vacuum CB. • Construction, working principle, merits, demerits and applications of above said circuit breakers. • Isolators: working and application. • Comparison among fuse, circuit breaker and isolator.		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0150143	Evaluate performance of fuse and MCB. [Psychomotor Domain]	07	10
Contents	• To determine fusing factor of a given fuse. • To plot time-current characteristic of a given fuse wire. • To plot time-current characteristic of a given MCB.		
Method of Assessment	External: End semester practical exam (performance of task & viva voce)		

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Branch	Electrical and Electronics Engineering	Semester	V

Course Code	501	Course Name	Power System Operation and Protection

Course Outcome - 5	Discuss over voltage protection and select suitable protective schemes.	Teach Hrs	Marks
Learning Outcome E0150151	Explain over voltage protection. [Cognitive Domain]	7	10
Contents	• Causes and effects of over voltage. • Travelling wave phenomenon. • Necessity of insulation co-ordination. • Lightning and switching surges: impulse wave shape. • Lightning arresters (LA): operating principle and location. • Surge absorbers • Ground wire: constructional diagram, advantages and disadvantages.		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0150152	Identify various protection schemes for protecting different components of a power system. [Cognitive Domain]	07	10
Contents	• Abnormalities in alternator, transformer and transmission lines. • Protection schemes: (i) Alternators: merz price protection, overcurrent and earth fault protection. (ii) Transformers: buchholz relay and differential protection.		
Method of Assessment	Internal: Quiz and Assignment		
Learning Outcome E0150153	Identify various protective devices. [Psychomotor and Affective Domain]	07	10
Contents	• To visit a power sub-station for identification of protective devices, over-voltage protection and earthing system. • To demonstrate the working of Bucholz relay.		
Method of Assessment	Internal: Report submission and viva voce		

REFERENCE BOOKS:

S.N.	Book Title& Publication	Author	ISBN number
1	Electrical Power System, New Age International Publishers,	C. L. Wadhwa	978-81-224-2468-3
2	Power System Engineering, Mc Graw Hill publication	D. P. Kothari and I. J. Nagrath	978-93-531-6512-3
3	Power System Analysis, Mc Graw Hill publication, Indian Edition	J. John Grainger and Willium D. Stevenson	978-00-705-8515-7
4	Electrical Power Systems. CBS Publishers & Distributors	Ashfaq Hussain	9788123914480
5	Power System Analysis, CBS Publishers and Distributers	Nagoor Kani	978-9389261714
6	Principles of Power System, S. Chand and Company Ltd.	V. K. Mehta and Rohit Mehta	9788121924962
7	Power system Analysis, McGraw-Hill Inc.,US; Subsequent edition.	Hadi saadat	978-0075616344
8	Power System Analysis. Chand and Company Ltd.	Dr. B.R. Gupta	978-81-219-22388
9	Restructured Electrical Power Systems Operation, Trading and Volatility. New York : Marcel Dekker, c2001	Mohammad Shahidehpour Muwaffaq Alomoush	9780824706203

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Branch	Electrical and Electronics Engineering	Semester	5th

Course Code	502	Course Name	Power Electronics and Application

Course Outcome - 1	Utilize SCR in different power electronic circuit and compare SCR with other power semiconductor devices.	Teach Hrs	Marks
Learning Outcome E0150211	Explain the fundamental of SCR and protection technique for thyristor. (Cognitive domain)	9 Hrs	12 Marks
Contents	Thyristor – SCR: Structure and Operation, Static Characteristics, Type of turn-on methods, Dynamic Switching Characteristics, Two transistor model, Thyristor Protection: Over voltage, over current, dv/dt, di/dt, Gate protection SCR operation: Overview of Series and parallel		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0150212	Utilize auxiliary circuit for SCR and Illustrate various type of power semiconductor devices. (Cognitive domain)	7 Hrs	10 Marks
Contents	Firing Circuits for SCR: Main Features of Firing Circuits, Resistance and Resistance-capacitance Firing Circuits and Unijunction Transistor (UJT) Power semiconductor device (Structure, Static Characteristics, Rating, application): LASCR, DIAC, TRIAC, Power BJT, IGBT and MOSFET.		
Method of Assessment	Internal: Mid semester theory examination (Pen paper test)		
Learning Outcome E0150213	Explain commutation techniques used in power electronics circuit. (Cognitive domain)	5 Hrs	8 Marks
Contents	SCR commutation techniques: Class A commutation Class B commutation Class C commutation Class D commutation		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0150214	Perform experiment for Static characteristics of power semiconductor devices and for SCR auxiliary Circuits. (Psychomotor domain)	8 Hrs	10 Marks
Contents	• Draw static Characteristics of SCR and find Latching and Holding Current • To analyse variation of firing angle of UJT triggering circuit of SCR. • Draw static characteristic of any one of given power semiconductor device- IGBT/MOSFET/TRIAC		
Method of Assessment	External: Laboratory observation and viva voce.		

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Branch	Electrical and Electronics Engineering	Semester	5th
Course Code	502	Course Name	Power Electronics and Application

Course Outcome -2	Analyse phase controlled rectifiers for different loads.	Teach Hrs	Marks
Learning Outcome E0150221	Classify phase controlled rectifiers and compare half-wave converter output for various load. (Cognitive domain)	6 Hrs	10 Marks
Contents	Classification of phase controlled rectifiers Single-phase converter: Half-wave converter with R load, (Vrms and Vav) Half-wave converter with RL and RLE load		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0150222	Use various phase controlled rectifiers. (Cognitive domain)	7 Hrs	10 Marks
Contents	Full wave converter with RL load- Mid-point, Bridge type full and semi converter, Effect of freewheeling diode Single-phase Dual Converters: RL load Three phase Half-wave converter with R load Advantages of polyphaser rectification		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0150223	Analyse variation of output voltage of single phase controlled rectifier. (Psychomotor domain)	8 Hr	10 Marks
Contents	• To analyse variation of output voltage of single phase half wave controlled rectifier with R and R-L load. • To analyse variation of output voltage of single phase bridge type full wave controlled rectifier with R and R-L load.		
Method of Assessment	External: Laboratory observation and viva voce.		

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Branch	Electrical and Electronics Engineering	Semester	5th

Course Code	502	Course Name	Power Electronics and Application

Course Outcome – 3	Examine different type of inverter.	Teach Hrs	Marks
Learning Outcome E0150231	Categorize single phase inverter and describe their construction, working and applications of bridge type inverter. (Cognitive domain)	6 Hrs	10 Marks
Contents	Classification of inverter Single phase voltage source inverter: Half bridge inverter and full bridge inverter.		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0150232	Select inverter on bases of various techniques. (Cognitive domain)	6 Hrs	10 Marks
Contents	Series inverter and parallel inverter. Pulse width modulated inverter: Single pulse modulation and sinusoidal pulse with modulation. Overview of concept of harmonic.		
Method of Assessment	Internal: Mid semester theory examination (Pen paper test)		
Learning Outcome E0150233	Demonstrate function of inverter. (Psychomotor domain)	8 Hrs	10 Marks
Contents	• Demonstrate characteristic of series inverter/parallel inverter. • Simulate Half bridge inverter and full bridge inverter.		
Method of Assessment	External: Laboratory observation and viva voce.		

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Branch	Electrical and Electronics Engineering	Semester	5th

Course Code	502	Course Name	Power Electronics and Application

Course Outcome – 4	Use power semiconductor devices in chopper, cycloconverter and AC voltage controller circuit.	Teach Hrs	Marks
Learning Outcome E0150241	Select converter for various application and Explain AC voltage controller. (Cognitive domain)	7 Hrs	10 Marks
Contents	Chopper: Classification, Step up, stepdown and 4-quadrant operation of choppers operation Cycloconverter: Classification, single phase step up and stepdown cycloconverter operation (Bridge type and Mid-Point Type) AC voltage controller: Single phase AC voltage controller with R and RL load		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0150242	Demonstrate function of various converter. (Psychomotor domain)	8 Hrs	10 Marks
Contents	Demonstrate working of step down chopper / step up chopper. Demonstrate working of single phase step down cycloconverter. Simulate single phase step up cycloconverter. Simulate single phase AC voltage controller with R Load.		
Method of Assessment	Internal: Laboratory observation and viva voce.		

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Branch	Electrical and Electronics Engineering	Semester	5th

Course Code	502	Course Name	Power Electronics and Application

Course Outcome – 5	Examine power electronics devices based circuit for different application.	Teach Hrs	Marks
Learning Outcome E0150251	Illustrate power electronics device and circuit. (Cognitive domain)	6 Hrs	10 Marks
Contents	SMPS, UPS, Static AC circuit breaker, Static DC circuit breaker, AC Static switch and DC Static switch, solid state relays		
Method of Assessment	Internal: Assignment and Quiz		
Learning Outcome E0150252	Utilize power electronic devices based circuit for speed control of electric motors. (Cognitive domain)	6 Hrs	10 Marks
Contents	Speed control of Motors - Advantages of electronic speed control DC drive (block diagram only): single phase and three phase Chopper drive (block diagram only): Speed control, 4-quadrant operation AC drive (block diagram only): Stator voltage control, Stator frequency control and Stator voltage and frequency control.		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0150253	Analyze the speed control of motors and examine working of power electronics device and circuit (Psychomotor domain)	8 Hrs	10 Marks
Contents	Demonstrate speed control of single phase induction motor using TRIAC and DIAC. Demonstrate speed control of three phase induction motor/ DC motor. Demonstrate any one of given circuit-UPS, SMPS, Static AC circuit breaker, Static DC circuit breaker, AC Static switch and DC Static switch, solid state relays		
Method of Assessment	Internal: Laboratory observation and viva voce.		

REFERENCE BOOKS:

S.N.	Title & Publication	Author
1.	Power Electronics, Khanna Publishers, ISBN: 9788174092793, 9788174092793	Bimbhra, P. S.
2.	Power Electronics, Publisher: Pearson Education India, ISBN: 9789332584587, 9789332584587	Rashid Muhammad H.
3.	Power Electronics, Publisher: Tata McGraw-Hill Publishing limited, New Delhi ISBN-13: 9780070583894, ISBN-10: 0-07-058389-7	Singh M. D. and Khanchandani, K. B.
4.	Power Electronics, Publisher: Nirali Prakashan, ISBN: 9789389825909	Sen, P.
5.	Power Electronics - A Conceptual Approach, Publisher: Technical Publication Pune, ISBN: 9788184314182, 8184314183	Chitode, J. S.
6.	Power Electronics, Publisher: Prentice-Hall of India Pvt.Ltd, ISBN: 9788120341968, 9788120341968	Jagannathan V.
7.	पॉवर इलेक्ट्रॉनिक्स एंड ड्राइव, Publisher: Neelkanth Publishers Pvt. Ltd., ISBN: 9788184446401, 8184446403	Mohar Singh

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Branch	*ELECTRICAL & ELECTRONICS ENGINEERING*	Semester	V

Course Code	503	Course Name	Embedded Systems with Arduino

Course Outcome 1	Classify embedded systems.	Teach Hrs.	Marks
Learning Outcome 1	Identify the embedded system devices from the real world. **(Cognitive)**	8	10
Contents	Embedded system: History, Block diagram, Comparison with general purpose computers, classification, applications and simple case studies (in functional diagram level) like Washing Machine, traffic light controller and microwave oven		
Method of Assessment	Internal		
Learning Outcome 2	Compare different microcontrollers. **(Cognitive)**	8	10
Contents	Microcontroller Types: PIC, AVR, ARM, features and applications AVR microcontroller: Types, Architecture Internal Architectural, Block diagram of controller of ATmega328, Functions of each pins of ATmega328		
Method of Assessment	External		

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Branch	*ELECTRICAL & ELECTRONICS ENGINEERING*	Semester	V

Course Code	503	Course Name	Embedded Systems with Arduino

Course Outcome 2	Make use of ATmega328 and peripheral for use in Arduino board.	Teach Hrs.	Marks
Learning Outcome 3	Select essential peripherals for ATmega328 (Psychomotor)	7	15
Contents	Essential Peripheral circuits: Crystal Circuit, Power supply		
Method of Assessment	External		
Learning Outcome 4	Prepare ATmega328 for programming. (Cognitive)	8	10
Contents	Initial programming configurations of Atmega328: port, counter, timer, Bootloader Circuit, ISP of Atmega328, Comparison of ATmega8 and ATmega328		
Method of Assessment	External		
Learning Outcome 5	Configure timers, counters and ADC of ATmega328. (Cognitive)	7	10
Contents	Configuration of Two 8-bit and One 16-bit Timers and Counters 6-channel ADC Working.		
Method of Assessment	Internal		

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Branch	*ELECTRICAL & ELECTRONICS ENGINEERING*	Semester	V

Course Code	503	Course Name	Embedded Systems with Arduino

Course Outcome 3	**Make use of Arduino software/hardware platform.**	Teach Hrs.	Marks
Learning Outcome 6	**Illustrate Arduino development board and functional diagram.** **(Cognitive)**	7	10
Contents	Arduino: Birth, Open Source community, Functional Block Diagram of Arduino. Functions of each Pin of Arduino, Arduino Development Board diagram (including different blocks only)		
Method of Assessment	External		
Learning Outcome 7	**Explain the basics of the Arduino platform. (Cognitive)**	7	10
Contents	Arduino: IDE, I/O Functions, Looping Techniques, Decision Making Techniques Designing of 1st sketch Programming of an Arduino (Arduino ISP), Arduino Boot loader, Serial Protocol (serial port Interfacing), Initialization of Serial Port using Functions, Basic Circuit For Arduino		
Method of Assessment	External		
Learning Outcome 8	**Demonstrate the interfacing of basic peripherals with Arduino.** **(Psychomotor)**	8	10
Contents	Interfacing LED, Switch, keypad, LM35, 16x2 LCD, POT and their Arduino codes		
Method of Assessment	Internal		

RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT- 3	Sheet No. 4/5

Branch	*ELECTRICAL & ELECTRONICS ENGINEERING*	Semester	V

Course Code	503	Course Name	Embedded Systems with Arduino

Course Outcome 4	Develop small projects based on Arduino	Teach Hrs	Marks
Learning Outcome 9	**Interface a motor driver L293D with Arduino.** **(Cognitive)**	7	10
Contents	Motor Driver L293D, IR Sensor, Interfacing L293D and IR sensor with Arduino,		
Method of Assessment	External		
Learning Outcome 10	**Utilize Arduino in a simple home automation system. (Cognitive)**	7	10
Contents	Interfacing of Relay Driver ULN2803 with Arduino, Code for Home automation (fans, lights, AC, fridge etc.) and its Control		
Method of Assessment	Internal		
Learning Outcome 11	**Preparing ATmega328 for an independent bootable microcontroller in a circuit. (Psychomotor)**	8	15
Contents	Basic ATmega328 Circuit, Interfacing of USB-UART, Initialization of serial port and its code.		
Method of Assessment	External		

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Branch	*ELECTRICAL & ELECTRONICS ENGINEERING*	Semester	V

Course Code	503	Course Name	Embedded Systems with Arduino

Course Outcome 5	**Utilize the embedded system concepts in robotics.**	Teach Hrs	Marks
Learning Outcome 12	Define robotics and its terminologies. **(Cognitive)**	8	10
Contents	History of robots, Classification of robots, Present status and future trends. Basic components of robotic systems. Basic terminology- Accuracy, Repeatability, Resolution, Degree of freedom. Specifications of robots. Definition of Forward and Reverse Kinematics		
Method of Assessment	External		
Learning Outcome 13	**Identify the basic sensors used in robotics.** **(Cognitive)**	7	10
Contents	Sensors in robot – Touch sensors, Tactile sensor, Proximity and range sensors, Robotic vision sensor, Force sensor, Light sensors, Pressure sensors.		
Method of Assessment	External		
Learning Outcome 14	**Assemble a simple robot using Arduino with ATmega328.** **(Psychomotor)**	8	10
Contents	Implementation of small project demonstration of robot (e.g. line follower robot, robotic arm etc.) using Arduino with ATmega328.		
Method of Assessment	Internal		

Suggested List of Experiments:

S.N.	Experiment	CO
1.	Install and configure Arduino IDE.	
2.	Identify different Arduino development board hardware and choose the corresponding board in the Arduino IDE.	
2.	Write and execute LED blinking program.	
4.	Interface computer serial port to generate LED blinking pattern.	
5.	Write a program to use a switch to ON/OFF an LED.	
6.	Make a counter using a single digit 7 segment display to count from 0 to 9.	
7.	Write and execute a program to display “HELLO WORLD” on a 16x2 LCD display.	
9.	Write a program to monitor temperature using LM35 and display the temperature on 16x2 LCD display	
10.	Write and execute a program to control the intensity of LED light using a POT.	
11.	Write and execute a program to control the speed of a DC motor using L293D.	

Note: These practical experiments(CO1to CO4) should preferably be performed on Arduino Kits+Components+Breadboard, however for self learning; students should be introduced to software/online simulation platforms like TinkerCAD etc.

Reference Books/Web Portals:

S.N.	Title	Author/Publisher
1	Arduino Made Simple: With Interactive Projects	By Ashwin Pajankar BPB Publications
2	Getting Started with Arduino: The Open Source Electronics Prototyping Platform	By Massimo Banzi, Michael Shiloh Make Community, LLC
3	Programming Arduino: Getting Started with Sketches	By Simon Monk McGraw-Hill Education
4		
5	spoken-tutorial.org	

6.	nptel.ac.in
7.	swayam.gov.in

RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 1/5

Branch	Electrical and Electronics Engineering	Semester	5
Course Code	511	Course Name	Electric Vehicles

Course Outcome 1	Relate the necessity of electric vehicle in present scenario and compare various electric vehicles.	Teach Hrs	Marks
Learning Outcome E0151111	Discuss the need of Electric Vehicles in present scenario. [Cognitive Domain]	03	05
Contents	➢ Historical journey of hybrid and electric vehicle. ➢ Types of different pollutants produced due to IC engine vehicle (ICEV) and their effect on human health. ➢ Economic and environmental impacts of using Electrical vehicles.		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0151112	Classify Electric Vehicles based on various configurations. [Cognitive Domain]	06	10
Contents	➢ Classification, Vehicle configuration and challenges of electric vehicles: • Pure Electric Vehicle (PEV) : Battery Electric vehicle • Hybrid Electric vehicle (HVE) • Conventional HVE: Micro, Mild and Full hybrid, series hybrid. Parallel hybrid, series parallel hybrid, complex hybrid. • Grid able HVE: plug in hybrid (PHEV), Range Extended (REV) • Fuel cell electric vehicle (FCEV)		
Method of Assessment	Internal: Mid semester-I theory examination (Pen paper test)		
Learning Outcome E0151113	Identify components of Electric Vehicles used in various applications. [Cognitive Domain]	04	08
Contents	➢ Components used in Hybrid Electric Vehicle. ➢ Solar electric vehicle: Solar electric power trains. ➢ Electric bicycle: Introduction, Electric bicycle propulsion system, Electric bicycle power distribution list.		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0151114	Compare various vehicles and identify its parts. [Affective & Psychomotor domain]	06	10
Contents	➢ Develop block diagram of Electric vehicle and identify parts. ➢ Case study- Compare minimum three vehicles for economic and environmental analysis		
Method of Assessment	Internal: Viva voce & report submission.		

RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 2/5

Branch	Electrical and Electronics Engineering	Semester	5

Course Code	511	Course Name	Electric Vehicles

Course Outcome 2	Analyze various mechanical factors affecting movement of electric vehicle.	Teach Hrs	Marks
Learning Outcome E0151121	Derive various equations for movement of vehicle. [Cognitive Domain]	06	10
Contents	➢ General description of vehicle movement ➢ Rolling resistance and its equation ➢ Rolling resistance coefficient, factors affecting rolling resistance, typical values of rolling resistance. ➢ Aerodynamic drag and its equation, typical values of drag coefficient, Grading resistance		
Method of Assessment	Internal: Quiz & Assignment.		
Learning Outcome E0151122	Compute different resistances affecting vehicle movement. [Cognitive Domain]	04	07
Contents	➢ Grading resistance ➢ Road resistance, ➢ Acceleration resistance, ➢ total driving resistance ➢ Dynamic equation. ➢ Numerical		
Method of Assessment	External: End semester theory examination (Pen paper test)		

RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 3/5

Branch	Electrical and Electronics Engineering	Semester	5
Course Code	511	Course Name	Electric Vehicles

Course Outcome 3	Choose suitable motor for electric vehicle application.	Teach Hrs	Marks
Learning Outcome E0151131	Explain constructional features & working of motors used in EV. [Cognitive Domain]	06	10
Contents	➢ Difference between the electrical motors for electrical vehicles and for other industrial purpose. ➢ Classification of electrical motors used for EV applications: Induction Motor, Permanent magnet motor, switched reluctance motor. ➢ Construction working and control of permanent magnet motor. ➢ Construction working and control of switched reluctance motor.		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0151132	Select appropriate motor for EV application. [Cognitive Domain]	06	10
Contents	➢ Factors to be considered for selection of motor. ➢ Regenerative breaking in motors. ➢ Configuration of motor layout: single motor configuration, dual motor configuration, in wheel motor configuration.		
Method of Assessment	Internal: Mid semester-II theory examination (Pen paper test)		
Learning Outcome E0151133	Control the speed of motors used in electric vehicles. [Affective & Psychomotor domain]	10	15
Contents	➢ To perform speed control experiment on BLDC. ➢ To perform speed control experiment on SRM. ➢ Visit to an Electric vehicle facility center to identify the type of motor configuration & prepare a report on it.		
Method of Assessment	External: Report submission, Performance of given task and viva voce		

RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 4/5

Branch	Electrical and Electronics Engineering	Semester	5
Course Code	511	Course Name	Electric Vehicles

Course Outcome 4	Improve performance of electric vehicle by managing battery system.	Teach Hrs	Marks
Learning Outcome E0151141	Compare different type of batteries used in EV. [Cognitive Domain]	06	10
Contents	➢ Electrochemical Batteries: lead-acid battery, nickel based batteries, lithium-based batteries. ➢ Battery parameters: Physical Dimensions, Voltage and current rating ,Capacity and power 'C' Rate, Battery Efficiency, Energy Density, Power Density ,Sate of charge (SOC),Depth of discharge (DoD),State of Health (SoH), Operating Temperature ,Lifetime. ➢ Construction and working of lithium-based batteries. ➢ Comparison of batteries with respect to specific energy, specific power, cycle life, cost. ➢ Brief introduction of: Ultra capacitor, Ultra flywheel, Fuel cell.		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0151142	Manage battery system for EV. [Cognitive Domain]	06	10
Contents	➢ Charging of EV and HEV • AC charging • DC Charging • Battery swapping • Smart charging • Wireless charging ➢ Battery Management System • Need of battery management system • Block diagram of BMS		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0151143	Maintain battery performance. [Affective & Psychomotor domain]	09	15
Contents	➢ Measure normal open circuit voltage, charging voltage & current of a battery used in any vehicle. ➢ Verify Ampere-hour capacity of a battery with any load available. ➢ Visit to an Electric Vehicle charging station to identify the type of charging present there & prepare a report on it.		
Method of Assessment	External: Report submission, Performance of given task and viva voce		

RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 5/5

Branch	Electrical and Electronics Engineering	Semester	5
Course Code	511	Course Name	Electric Vehicles

Course Outcome 5	Select suitable power electronic converter for EV.	Teach Hrs	Marks
Learning Outcome E0151151	Explain power electronic circuits used in EV. **[Cognitive Domain]**	06	10
Contents	➢ EV and EHV configuration based on power electronics. ➢ Converter requirement for on board charger. ➢ battery pack, motor drive, auxiliary battery ➢ Commonly used DC to DC converter in EV and HVE		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0151152	Differentiate various converters used in EV. **[Cognitive Domain]**	06	10
Contents	➢ Isolated converter ➢ Non isolated converter ➢ Unidirectional and bidirectional converter ➢ DC to AC converter.		
Method of Assessment	External: End semester theory examination (Pen paper test)		
Learning Outcome E0151153	Identify specifications of converters used in electric vehicles & prepare test report. **[Affective & Psychomotor domain]**	06	10
Contents	➢ Prepare a report on specifications of converters used for Electric vehicles ➢ Prepare test procedure for equipment used in Electric vehicle.		
Method of Assessment	Internal: Viva voce & report submission.		

Reference Books:

1. A.K. Babu, Electric & Hybrid Vehicles, Khanna Publishing House, New Delhi (Ed. 2018)
2. Fuhs, A. E. Hybrid Vehicles and the Future of Personal Transportation, CRC Press.
3. Husain, I. *Electric and Hybrid Electric Vehicles*, CRC Press.
4. Chan C. C. and K. T. Chau, *Modern Electric Vehicle Technology*, Oxford Science Publication.
5. Gianfranco, *Electric and Hybrid Vehicles:* Power Sources, Models, Sustainability, Infrastructure and The Market, Pistoia Consultant, Rome, Italy.
6. Ehsani, M. *Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design*, CRC Press.
7. Lechner G. and H. Naunheimer, *Automotive Transmissions: Fundamentals, Selection,Design and Application*, Springer.
8. Rashid, M. H. *Power Electronics: Circuits, Devices and Applications*, 3rd edition, Pearson.
9. Moorthi, V. R. *Power Electronics: Devices, Circuits and Industrial Applications*, Oxford University Press.
10. Krishnan, R. *Electric motor drives: modelling, analysis, and control*, Prentice Hall.
11. Krause, O. P. ; C. Wasynczuk, S. D. Sudhoff, *Analysis of electric machinery*, IEEE Press.

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	5
Course Code	512	Course Name	Control System & Industrial Automation

Course Outcome 1	Use control system concepts in different applications.	Teach Hrs	Marks
Learning Outcome E0151211	Explain basic concepts of control system.(Cognitive domain)	6Hr	10 Mark
Contents	• Control System: Basic concept of open loop and closed loop control system and their comparison. • Transfer function definition, Simple Mathematical problems on block diagram and signal flow graphs. • Analogy between different systems: Mechanical, Electrical, Thermal • Block diagram of Fan, AC, Automatic tank level control.		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0151212	Define various terms use in time domain analysis. (Cognitive domain)	6 Hr	10 Mark
Contents	• Time Domain Analysis: First and second order control System (Without mathematical treatment). • Definition of different performance indices: delay time, rise time, peak time, percentage peak overshoot, Settling time, steady state error. • Type-0, Type -1, type-2 system definition. • Concept of stability: absolute stability, relative stability. • Necessary conditions for stability.		
Method of Assessment	Internal: Mid semester theory examination (Pen paper test)		
Learning Outcome E0151213	Identify type of control system used in different applications. (Psychomotor domain)	6 Hr	10 Mark
Contents	• To identify components used in various open loop control system and make their block diagram. • To identify components used in various close loop control system and make their block diagram. • To interpret function of automatic tank level control system with the help of block diagram.		
Method of Assessment	External: Laboratory observation and viva voce.		

RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 1/5

Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	5
Course Code	512	Course Name	Control System & Industrial Automation

Course Outcome 2	Make use of number systems and logic gates in digital circuits.	Teach Hrs	Marks
Learning Outcome E0151221	Classify number systems and their conversion. (Cognitive domain)	6 Hr	10 Mark
Contents	➢ Number Systems: decimal, binary, octal, hexadecimal and BCD; definition and inter-conversions. ➢ Compliments: 1's and 2's compliment. ➢ Binary Addition and Subtraction.		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0151222	Outline operation of various logic gates used in digital circuits. (Cognitive domain)	6 Hr	10 Mark
Contents	➢ Logic Gates: truth tables and circuit symbols. AND, OR, NOT, NAND, NOR, X-OR, X-NOR;		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0151223	Verify operation of various logic gates. (Psychomotor domain)	6 Hr	10 Mark
Contents	➢ To verify truth table of various logic gates.		
Method of Assessment	External: Laboratory observation and viva voce.		

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	5

Course Code	512	Course Name	Control System & Industrial Automation

Course Outcome 3	Justify the need of programmable logic controller in industrial automation.	Teach Hrs	Marks
Learning Outcome E0151231	Compare types of industrial automation systems. (Cognitive domain)	3 Hr	6 Mark
Contents	➢ Automation: Need and benefits. ➢ Types of automation system: Fixed, Programmable, Flexible ➢ Different systems used for Industrial automation: PLC, HMI, SCADA, DCS, Drives. ➢ Evolution of programmable logic controller (PLC).		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0151232	Explain fundamental concepts of programmable logic controller. (Cognitive domain)	9 Hr	14 Mark
Contents	➢ Building blocks of PLC**:** CPU, Memory organization, Input-output modules (discrete and analog), Specialty I/O Modules, Power supply, Fixed and Modular PLC and their types, Redundancy in PLC module. ➢ I/O module selection criteria, Interfacing different I/O devices with appropriate I/O modules ➢ PLC I/O addressing ➢ PLC programming Instructions**:** Relay type instructions, Timer instructions: On delay, off delay, retentive. ➢ Counter instructions: Up, Down, High speed, Logical instructions, Comparison instructions, Data handling Instructions, Arithmetic instructions.		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0151233	Identify various parts for given PLC. (Psychomotor domain)	6 Hr	10 Mark
Contents	➢ To identify various parts of the given PLC and front panel status indicators. ➢ Use PLC to test the START STOP logic using two inputs and one output.		
Method of Assessment	External: Laboratory observation and viva voce.		

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	5

Course Code	512	Course Name	Control System & Industrial Automation

Course Outcome 4	Utilize PLC programming for various applications.	Teach Hrs	Marks
Learning Outcome E0151241	Make use of ladder logic for PLC programming. (Cognitive domain)	6 Hr	10 Mark
Contents	➢ PLC programming language: Functional Block Diagram (FBD), Instruction List. Structured text, Sequential Function Chart (SFC), Ladder Programming. ➢ Simple Programming examples using ladder logic: Language based on relay, timer counter, ➢ Logical, comparison, arithmetic and data handling instructions.		
Method of Assessment	Internal: Mid semester theory examination (Pen paper test)		
Learning Outcome E0151242	Use PLC for various applications. (Cognitive domain)	6 Hr	10 Mark
Contents	PLC Based Applications: ➢ Traffic light control, Elevator control, Tank Level control, Conveyor system. ➢ Motor sequence control. ➢ Stepper motor control.		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0151243	Develop ladder program for various applications and test it. (Psychomotor domain)	6 Hr	10 Mark
Contents	➢ Develop / test the Ladder program for sequential control application of lamps/ DC motors. ➢ Develop ladder program for Traffic light control system. ➢ Develop / test ladder program for rotating stepper motor in forward and reverse direction at constant speed. ➢ Develop /test ladder program for tank water level control.		
Method of Assessment	Internal: Laboratory observation and viva voce.		

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	5

Course Code	512	Course Name	Control System & Industrial Automation

Course Outcome 5	Make use of SCADA system for industrial automation.	Teach Hrs	Marks
Learning Outcome E0151251	Explain functioning of SCADA. (Cognitive domain)	6 Hr	10 Mark
Contents	➢ Introduction to SCADA: Typical SCADA architecture/block diagram, Benefits of SCADA ➢ Various editors of SCADA ➢ Interfacing SCADA system with PLC: Typical connection diagram, Object linking & embedding for Process Control(OPC) architecture. ➢ Steps in Creating SCADA Screen for simple object, Steps for Linking SCADA object (defining Tags and Items) with PLC ladder program using OPC.		
Method of Assessment	External: End semester theory examination (Pen paper test).		
Learning Outcome E0151252	Utilize SCADA for different control application. (Cognitive domain)	6 Hr	10 Mark
Contents	Applications of SCADA: ➢ Traffic light control. ➢ Water distribution. ➢ Pipeline control.		
Method of Assessment	Internal: Assignments/Quiz and viva voce		
Learning Outcome E0151253	Prepare a report on functioning of SCADA system. (Psychomotor and Affective domain)	6 Hr	10 Mark
Contents	➢ To prepare a report on functioning of SCADA system by visiting a SCADA deployed place.		
Method of Assessment	Internal: Observation and viva voce.		

Reference Books:

1.	Control System, Publisher: New Age International Pvt Ltd, ISBN: 9789386070111, 9789386070111	Nagrath & Gopal
2.	Linear Control Systems with MATLAB Applications, Publisher: Khanna Publishers, ISBN: 9788174093103, 9788174093103	Manke, B. S.
3	Digital Electronics, Technical Publication, Pune	Godse, A. P.
4.	Digital Design, Publisher: Prentice Hall of India Pvt. Ltd.	M. Morris Mano, Michael D. Ciletti,
5.	Digital Electronics: Principles, Devices and Applications, Publisher: Willy	Maini, A. K.
6.	Introduction to Programmable Logic Controllers, Thomson /Delmar learning, New Delhi, 2005,ISBN 13 : 9781401884260	Dunning, G.
7.	Programmable Logic Controller, Khanna publishers, New Delhi, 2017, ISBN : 9788174092281	Jadhav, V. R.
8.	Programmable Logic Controllers, McGraw Hill India, New Delhi, 2010, ISBN: 9780071067386	Petruzella, F.D.
9.	Programmable Logic Controllers, PHI Learning, New Delhi, 2003, ISBN : 9780130607188	Hackworth, John; Hackworth, Federic
10.	Industrial automation and Process control, PHI Learning, New Delhi, 2003, ISBN : 9780130618900	Stenerson Jon
11.	Programmable Logic Controllers and Industrial Automation - An introduction, Penram International Publication, 2015, ISBN: 9788187972174	Mitra, Madhuchandra; Sengupta, Samarjit,
12.	Supervisory Control and Data Acquisition, ISA Publication, USA, ISBN: 978-1936007097	Boyar, S. A.
13.	Practical SCADA for industry, Newnes (an imprint of Elsevier), UK 2003, ISBN:0750658053	Bailey David ; Wright Edwin

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	5

Course Code	513	Course Name	Data Communication and Networking

Course Outcome 1	Explain the fundamentals of computer network.	Teach Hrs	Marks
Learning Outcome 1	Classify different computer networks and servers. **(Cognitive)**	6	10
Contents	Parallel vs serial transmission; Definition, Benefits and Components of computer network, Classification of Network by their Geography: PAN, LAN, MAN, WAN, Classification of Network by their Component Role: Peer-to-Peer Network, client-Server Network, Topologies of network: Bus, Ring, Star, Mesh, Tree,		
Method of Assessment	Question Paper -External- End Sem Exam		
Learning Outcome 2	Compare different codes and switching methods. **(Cognitive)**	8	10
Contents	Types of switching: Circuit switching, message switching, packet switching, virtual circuit switching, Text codes:-ASCII, introduction to Unicode; Error codes- Parity code, Block code, Hamming code, CRC code		
Method of Assessment	Question Paper -External- End Sem Exam		
Learning Outcome 3	Describe Security services used in computer network. **(Cognitive)**	4	10
Contents	Need of network security, Definition and applications of security services- password, Biometric, captcha, antivirus, firewall Encryption: symmetric key, Asymmetric key, digital signature		
Method of Assessment	Internal –Assignment &/ Progressive		

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	5

Course Code	513	Course Name	Data Communication and Networking

Course Outcome 2	Identify different network devices and transmission media. **(Cognitive)**	Hrs	Marks
Learning Outcome 4	Define different types of networking devices.	6	10
Contents	Need of Networking devices, Introduction and applications of NIC, Repeater, Bridge, Switch, Router, Gateway, Modems-DSL, ADSL, band splitter, media convertor, WiFi adapter card, Wifi access point		
Method of Assessment	Question Paper -External- End Sem Exam		
Learning Outcome 5	Set-up and configure a Local Area Network **(Psychomotor)**	8	10
Contents	Setup and configure a LAN network using network devices (routers, switches etc), Configure user devices. Identify Transmission media. Identify MAC address, IP address		
Method of Assessment	Internal practical assessment		
Learning Outcome 6	Compare different types of transmission media and media access methods. **(Cognitive)**	6	10
Contents	Need of Transmission Media, Selection Criteria. Guided Media: Types of cables, introduction, characteristics and comparison of: Twisted Pair Cable, STP, UTP, Ethernet cable, Co-axial Cable, Fiber Optic Cable. Selection Criteria of Unguided Media: Types of Communication Bands, Radio wave Communication, Microwave Communication, Infrared Communication, Satellite band. Frequency, Bandwidth and application. Definition of Media access; Media access methods: Polling, Token passing, CSMA/CA.		
Method of Assessment	Internal- Assignment &/ Progressive		

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	5

Course Code	513	Course Name	Data Communication and Networking

Course Outcome 3	Compare OSI model and TCP/IP protocol suite.	Hrs	Marks
Learning Outcome 7	Illustrate OSI Reference Model Concept. **(Cognitive)**	6	10
Contents	Introduction of OSI model – Layered Architecture, Peer-to- Peer Processes, Protocols, Encapsulation. Functions of each Layers of OSI model.		
Method of Assessment	Question Paper -External- End Sem Exam		
Learning Outcome 8	Define TCP/IP protocol suite and related protocols. **(Cognitive)**	6	10
Contents	Layers in the TCP/IP Protocol Suite, Comparison between OSI and TCP/IP Protocol Suite. Definition and applications of Protocols: PPPOE, ARP, RARP, IP, UDP, TCP, Http, Ftp, Telnet, SMTP, IMAP & POP, DHCP.		
Method of Assessment	Question Paper–External- End Sem Exam		
Learning Outcome 9	Interpret addressing in TCP/IP network. **(Cognitive)**	6	10
Contents	Addressing- MAC address; IP Address IPv4, Class A, B, C and D IP addresses, Netid, Hostid, Sub-netting, super-netting, Need of classless addressing, Need for IPv6; Port Address; Define URL and Domain name system		
Method of Assessment	Question Paper–External- End Sem Exam		

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	5

Course Code	513	Course Name	Data Communication and Networking

Course Outcome 4	Manage computer network and host websites.	Hrs	Marks
Learning Outcome 10	Install and configure application layer software. **(Psychomotor)**	6	15
Contents	Install and configure Web browser and OS firewall. Client software of email (outlook, thunderbird), telnet (DoS, puTTY etc.) and ftp (FileZilla).		
Method of Assessment	External practical assessment		
Learning Outcome 11	Monitor LAN /Ethernet network. **(Psychomotor)**	8	15
Contents	Perform Network monitoring and functions like- Bandwidth management, Packet management, URL and content filtering, using software like wireshark, spiceworks, etc. Antivirus installation and use.		
Method of Assessment	External practical assessment		
Learning Outcome 12	Develop and host website. **(Psychomotor)**	8	10
Contents	Create web pages using Content Management System (i.e Joomla, Drupal, Wordpress). Domain name registration and web hosting Process.		
Method of Assessment	Internal practical assessment		

RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 5/5

Branch	ELECTRICAL & ELECTRONICS ENGINEERING	Semester	5

Course Code	513	Course Name	Data Communication and Networking

Course Outcome 5	Identify current and future computer network technologies.	Hrs	Marks
Learning Outcome 13	Compare architecture of current computer network technologies. **(Cognitive)**	6	10
Contents	Introduction, architecture and application of different Computer Networks technologies: Ethernet, Bluetooth, Wi-Fi, USB, DSL & FTTH.		
Method of Assessment	Question Paper -External- End Sem Exam		
Learning Outcome 14	Define upcoming data technologies. **(Cognitive)**	6	10
Contents	Cloud: definition, architecture and services; Introduction of Artificial Intelligence, Machine learning, Block chain and Data Mining		
Method of Assessment	Internal- Assignment &/ Progressive		

Suggested List of Experiments*:

S.N.	Experiment
1.	Prepare and test Ethernet Cable connector
2.	Identify Network devices
3.	Connect standard Ethernet network
4.	Configure user device for Ethernet
5.	Configure broadband Router
6.	Connect a WiFi network
7.	Identify transmission cables and write characteristics
8.	Identify MAC address, IP address, port address of user devices
9.	Monitor a computer network using software i.e.wireshark, spicework
10.	Configure web browser
11.	Configure email(Outlook, Thunderbird) , ftp(Filezilla), telnet(DoS, putty)
12.	Perform domain name registration and hosting process
13.	Develop Web pages using open source software i.e Wordpress, Joomla, Drupal

Ten experiments in a semester as per the discretion of the subject teacher.

Major Equipment/Materials:

1.	Network devices Router, Modem, switch
2.	Computers with internet connectivity
3.	Ethernet cables with RJ 45 connectors
4.	Computers for server and workstation
5.	Network Cables
6.	Local Area Network Trainer

Suggestions for Practicals:

Experiments are expected to be performed using:

1. Open source software for network management i.e Wireshark, Spicework
2. Open Source Content Management software i.e. Wordpress, Joomla, Drupal
3. Application software i.e Outlook, Filezilla, putty etc.

Reference Books/Web Portals:

S.N.	Title	Author
1	Data communication and Computer Networking	Behrouz A Fourozan
2	Computer Network	Andrew S Tanenbaum
3	Data communication and Computer Networks	Rajneesh Agrawal and Bharat Bhushan Tiwari
4	nptel.ac.in	
5	swayam.gov.in	

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No.
					5	0	5	1	1	4

COURSE NAME	**Professional Development- V**
CO Description	**Student will be able to lead the group discussion**
LO Description	**Student will be able to participate in the group discussion**

SCHEME OF STUDY

S. No	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Need and importance of group discussion in professional work, ideal group discussion, skills needed to effectively participate in group discussion, practice of group discussion skills	Traditional lecture method + Case Study	Teacher will teach students how group discussion is organized, through examples and cases. Teacher will form small student groups, assign them topics for group discussion, lead the group discussion, guide them to participate in group discussion, teacher will also supervise, correct and improve their participation, teacher will ensure their learning through organizing group discussions on various topics	04	06	Handout, video film*	*Teacher will suggest a suitable online video to be viewed by students

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Student activity/task	The teacher will arrange a group discussion and the student will participate in it. Teacher will observe and assess appropriateness of student's participation	10	Rating Scale	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

1. **Group Discussion**:- It is to discuss and argue about the given topic
2. **Group size**: - Normally 10 to 15 persons.

3. **Group discussion topics**: - Current affairs, social issues, real life multi-aspect engineering/technology related problems, professional cases etc.
4. **Prior communication of topic to students**:- Topic of GD should be communicated to students well in advance so that they could prepare themselves for the discussion through gaining knowledge about topic.
5. **Duration of group discussion**: - Normally 20-30 Minutes.
6. **Skills required for effective participation in GD:-**
    - Communication skills
    - Behavioral Skills & Etiquettes
    - Listening and arguing skills
    - Self-view presenting skill
    - Student's analysis skill
    - Student's appropriate attitude
7. **Discussion etiquette**

    Dos:-

    1. Speak pleasantly and politely to the group
    2. Respect the contribution of every member
    3. Learn to disagree politely
    4. Try to stick to the topic of the discussion
    5. Agree with and acknowledge what you find interesting

    Don't:-

    1. Lose your temper
    2. Shout. Use moderate tone and medium pitch
    3. Use too many gestures when you speak. Gestures like finger pointing and table thumping.

4. Dominate the discussion.

8. Group discussion rules for participants:-

- Come prepared
- Note down the names of all the participants
- Maintain a firm posture
- Actively participate in the discussion
- Retain your standing and balance
- Do not get emotional

9. Assessment criteria:-

- Extent of Imitativeness demonstrated 2marks
- Extent of involvement (action /reaction) 2marks
- Effectiveness of Communication within group settings 2marks
- Extent of persuasion demonstrated 2marks
- Extent of efforts to bring best out of the GD 2marks

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No.
					5	0	5	1	2	4

COURSE NAME	**Professional Development- V**
CO Description	**Student will be able to lead the group discussion**
LO Description	**Student will be able to lead the group discussion**

SCHEME OF STUDY

S. No	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Need and importance of leading in group discussion, role of leader, skills needed to effectively lead group discussion, practice of leading the group discussion	Traditional lecture method + Case Study	Teacher will teach students how group discussion is lead by the leader through examples and cases. Teacher will form small student groups, demonstrate the role of leader, guide students to lead the group discussion ensure practice of role of leader by each student, teacher will also supervise, correct and improve their role as leader	03	07	Handout, video film*	*Teacher will suggest a suitable online video to be viewed by students

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Student activity/task	The teacher will arrange a short group discussion and the student will lead it. Teacher will observe and assess appropriateness of student's performance as leader	15	Rating Scale	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

1. **Role of Leader in group discussion:-**

He /she Leads the group to discuss ALL aspects of the topic, avoid chaos & confusion, focus on the given issue & not be sidetracked and facilitates the

group to reach a consensus (if possible). Without a shred of doubt, this role is highly desirable and one should try assuming this role.

2. **Leader's responsibilities:-**
    1. To introduce topic and purpose of the discussion
    2. Arrange to provide all members sufficient time to speak
    3. To skillfully keep the discussion on the track
    4. To control the inappropriate behaviors and language of group members, if any
    5. To motivate members hesitating to speak
    6. To discourage members unnecessarily dominating the group
    7. Summaries what has been come out of GD
    8. Thanking all group members for their contribution
3. The teacher should organize short practice GD sessions where each student can get opportunity to learn the role of leader
4. The teacher should organize a series of assessment GD sessions where each student can be assessed for his/her learning of role of leader
5. **Assessment criteria:-**
    a. **Ability to keep discussion on track** **(4marks)**
    b. **Ability to control the group members for their behaviors** **(3marks)**
    c. **Ability to judge and give fair chance to members hesitating to speak** **(3marks)**
    d. **Ability to create coherent tale of different arguments and views** **(5marks)**

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No.
					5	0	5	2	1	4

COURSE NAME	**Professional Development- V**
CO Description	**Student will be able to organize a short awareness programme for nearby community / society on any relevant and useful social / environmental / ethical / technical / professional topic**
LO Description	**Student will be able to prepare a proposal of a short awareness programme for nearby community on any relevant and useful social/environmental/ ethical / technical / professional topic**

SCHEME OF STUDY

S. No	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Need and importance of planning and organizing skills, importance of awareness programme , planning a short awareness programme, preparation of proposal for programme	Traditional lecture method + Case Study	Teacher will teach students the planning and organizing skills through examples and cases. Teacher will form small student groups, assign them topics for planning short awareness programmmes, guide them to prepare proposals for the programme, teacher will assess, correct/improve their proposals	02	06	Handout, video film*	*Teacher will suggest a suitable online video to be viewed by students

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Student group assignment	The teacher will assess the short awareness programme proposals of different student groups on basis of criteria	10	Rating Scale	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

1. **Planning and organizing skills**: - These are important soft skills for professionals. Planning is the process of thinking about the activities required to achieve a desired goal. It is the first and foremost activity to achieve desired results. After planning, next comes Organizing. Organizing is the process of arranging human, material and financial resources to put them in action in an integrated way according to the plan so that the desired goal could be achieved.

2. **Community:** - The members of any group small or large, liver together in such a way that they share the basic conditions of a common life. Example: - city or sub-urban area or township or colony or village. Small communities exist within larger communities as cities/villages within the district.

3. **Awareness programme**: - these are the programmes intended to create awareness or to educate the common people. Normally the duration of awareness programme ranges from few hours (2 to 3 Hrs.) to few days (2-3days).

4. **Importance of community awareness programmes:-** Organizing community awareness programme develops ability in students to interact with the society or community as a professional. It also develops skills to plan and implement professional micro projects as per requirements. It also develops attitudes in students to social work for the nearby community.

5. The teacher should form small groups of students (4-5 students) and assign them general topics for community awareness programmes. The student group should be asked to first plan the programme and then develop the proposal under guidance of the teacher. The programme should be of duration 1 to 2 Hrs. with expected no. of participants 50 to 70. Venue can be local community centre or community hall or nearby government primary/middle/higher secondary school or any other convenient place. Timings should be

convenient to participants, venue managers and organizing student group. Programmes may be also planned for targeted community like household women, teenagers, senior citizens, laborers, farmers, footpath businessmen etc.

6. **Topics for awareness programmes**:- Any appropriate topic which caters the need of community may be finalized. Few suggestions are as below:-

	Domain of awareness	**Suggested Topics**
1	Technical	Awareness about conservation of petroleum fuel (Petrol/Diesel/LPG/Kerosene) Awareness about conservation of domestic electricity Awareness of non-conventional sources of energy for homes Solar energy based water pumps as energy conservation devices for farmers
2	Professional	Laws and legal procedures related to purchase/sale/ registry of house property Introduction to medi-claim insurance for citizens Importance of saving and government saving schemes Various government schemes to support small enterprises and home industries
3	Social	Importance of cleanliness and hygiene in community Benefits of cleanliness in houses and nearby area Awareness about seasonal deceases and measures for precautions and prevention Harmful effects of smoking, drugs and alcohol
4	Environmental	Harmful effects of plastics and polyethylene on environment Prevention of pollution in public water sources Effect of air/ water pollution on human health Importance of plantation and protection of greenery
5	Ethical	Respect for life, law and public good

		Honesty and integrity in public life Respect for senior citizens, handicapped, poors and deprived people Benefits of ethical living

7. Format for proposal:-

1. Name of proposed programme;-
2. Student group details
3. Date, time and duration of programme
4. Venue of programme
5. Type and number of participants
6. Major activities to be completed
7. Details of charts/ posters/ Banners / pamphlets to be required
8. Major activities to be performed for preparation of programme:-

	Activity details	Duration	Start date	Finish date	Responsible member	Resources required
1						
2						
3						

9. Estimated cost of the programme
10. Programme Schadule

	Time (from….to)	Event
1		Inaguration

		……..
		……..
6		Vote of thanks

11. Signature of students

8. Assessment criteria:-

- Extent of appropriateness of programme topic and title **2 marks**
- Extent of appropriateness of details of major activities to be undertaken **3marks**
- Extent of appropriateness of programme schedule **3marks**
- Extent of appropriateness of charts/ posters/ Banners needed **2marks**

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No.
					5	0	5	2	2	4

COURSE NAME	**Professional Development- V**
CO Description	**Student will be able to organize a short awareness programme for nearby community / society in small group on any relevant and useful social / environmental / ethical / technical / professional topic**
LO Description	**Student will be able to organize a short awareness programme for nearby community / society in small group on any relevant and useful social / environmental / ethical / technical / professional topic**

SCHEME OF STUDY

S. No	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	organizing skills, working on the plan, conduction of the programme	Guided student activity	Each student group will work on the programme proposal for organizing the awareness programme under guidance of the teacher. Teacher will be present in every such programme to assess the quality of conduction of programme	-	12	Handout, video film*	*Teacher will suggest a suitable online video to be viewed by students

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Student group activity	The teacher will be present in every short awareness programme organized by student group and he/she will assess the quality of the conducted programme	15	Rating Scale	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)
1. Assessment criteria:- • Extent to which activities conducted as per programme schedule **4 marks** • Extent of quality in presentation of charts, posters, banners etc. 4 **marks** • Extent of quality in awareness sessions conducted by students 4 **marks** • Extent of satisfaction of participants from programme (through feedback) 3 **marks**

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No.
					5	0	5	3	1	4

COURSE NAME	**Professional Development- V**
CO Description	**Student will be able to demonstrate his/her learning from industry exposure**
LO Description	**student will be able to demonstrate his/her learning from lectures of industry experts / professionals**

SCHEME OF STUDY

S. No	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Necessity of exposure to industrial environment and practices, lectures by industry experts	Traditional Lecture method + Student assignment	The department/teacher will organize at least two lectures of industry experts for the students, students will prepare assignment after attending the lecture, teacher will guide them to prepare the assignment	06	-	Handout, video film*	*Teacher will suggest a suitable online video to be viewed by students

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Student assignment	The teacher will assess the two assignments on expert lectures, submitted by each student, on the basis of set criteria	05+05	Rating Scale	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

1. The university is emphasizing closer ties with the industry and its professionals to keep up with the challenging role of preparing the diploma graduates for the work place. Guest lectures, in which practicing industry professionals, frequently teach and share their experiences with the students, provides valuable learning to the students.

2. Industry experts include relevant industry experts related to design & product development, manufacturing/ construction, sales & servicing, testing, repair and maintenance etc.

3. The expert lecture should be of duration 1 to 2 Hrs. The date, time, expert details and topic of the lecture should be communicated in advance to the students.
4. After attending the expert lecture, each student will prepare and submit an assignment.
5. **Format for student assignment:-**

Name		Date	
Roll No.			
Semester			
Expert lecture date		Name of expert	
Expert lecture topic			
Sub topics covered in the lecture :-			
1. 2. 3.			
My learning about the topic from attending this lecture:- 1. 2.			

3. 4. 5.
Signature of student

6. Assessment criteria for assignment:-

- **Extent of amount of learning (2marks)**
- **Extent of quality in learning (3marks)**

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No.
					5	0	5	3	2	4

COURSE NAME	**Professional Development- V**
CO Description	**Student will be able to demonstrate his / her learning from industry exposure**
LO Description	**student will be able to demonstrate his / her learning from his/her visit to relevant industry**

SCHEME OF STUDY

S. No	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Importance of Students' industrial visits, learning through observing real life industrial systems, planning and organizing the industrial visit	Traditional lecture method +student visit+ student assignment	The teacher will teach students how to learn by observing real life industry systems, the college/ department/ teacher will organize at least one industrial visit of students to any relevant industry, after visit, students will prepare assignment, teacher will guide them to prepare the assignment	02	12	Handout, video film*	*Teacher will also suggest a suitable online video to be viewed by students

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Student assignment	The teacher will assess the assignment on industry exposure submitted by each student on the basis of set criteria	15	Rating Scale	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

1. Being a part of interactive learning, educational visits give students a major exposure to real working environments along with a practical perspective of a theoretical concept relevant to their domain. In addition to that, industrial visits bridge the widening gap between theoretical learning and practical exposure by giving students the first-hand exposure to identify the inputs and outputs for different business operations

and processes performed at the workplace.

2. The college/department/ teacher should arrange at least one industrial visit of the students. The visit may be to a nearby relevant industry or to a distant relevant industry. The visit should be of at least one working day (8 Hrs.) or its equivalent (two visits of 4hrs. + 4Hrs., or two visits of 5Hrs + 3Hrs. etc.).
3. The term industry is a broad term and encompasses many stake holding units such as production plants, bottling and packaging plants, construction units for roads/bridges/tunnels, sales and service outlets, repair and maintenance workshops, small scale industries, cooperative industries, private proprietary enterprises, authorized dealerships, authorized service stations, public sector enterprises etc.
4. If, due to unavoidable reasons, it is not possible to arrange the industrial visit, the college/ department should plan for demonstration of relevant industry related video movies and films to the students, to show the inside working of industry including technology, systems, machines, equipments, plants, processes, testing, roles of officers and workers etc. The total duration of movies or videos demonstrations should be at least 8 hours.
5. After industrial visit, each student will prepare and submit an assignment.
6. **Suggested format for student assignment:-**

Name of student		**Date**	
Roll No.		**Semester**	
Industry exposure date(s)		**Name of industry(s)**	
Description of my important observations about the industry:- **1.** **2.** **3.**			

My learning from the these observations:-

1.

2.

3.

4.

5.

Signature of student

7. **Assessment criteria for assignment:-**
    - Extent of amount of learning **(5 marks)**
    - Extent of quality in learning **(10 marks)**