Veermata Jijabai Technological Institute (V.J.T.I)
(Central Technological Institute, Maharashtra State, INDIA)
H. R. Mahajani Marg, Matunga, Mumbai 400019
Tel.No. +912224198101-02 Fax: +91 2224102874
Website: www.vjti.ac.in

Programme: Diploma in Electronics Engineering(DElnE)　　　Semester: V　　　　　　　Implemented from:2017

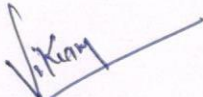| COURSE CODE | COURSE | GR | TEACHING SCHEME (HRS/WK) | | | | EXAMINATION SCHEME | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | CR | PAPER HRS | TH | | IST | TOTAL | | PR | | OR | | TW | | TOTAL MARKS |
| | | | | | | | | Max | Min | | Max | Min | Max | Min | Max | Min | Max | Min | |
| 173EX51 | Industrial Training(6 weeks in summer break after 4 sem) | A | - | - | 6# | 6# | - | - | - | - | - | - | - | - | 75** | 30 | 75@ | 30 | 150 |
| 173EX52 | Power Electronics | C | 3 | - | 3 | 6 | 3 | 80 | 32 | 20 | 100 | 40 | 25** | 10 | | | 25@ | 10 | 150 |
| 173EX53 | Digital Communication | C | 3 | - | 3 | 6 | 3 | 80 | 32 | 20 | 100 | 40 | 25** | 10 | | | 25@ | 10 | 150 |
| 173EX54 | Microprocessor and Microcontroller | C | 3 | - | 3 | 6 | 3 | 80 | 32 | 20 | 100 | 40 | 25** | 10 | | | 25@ | 10 | 150 |
| 173EX55 | Data Communication and Protocols. | C | 3 | - | 3 | 6 | 3 | 80 | 32 | 20 | 100 | 40 | 25** | 10 | | | 25@ | 10 | 150 |
| ## | **Elective I (any one)** | A | 3 | - | 2 | 5 | 3 | 80 | 32 | 20 | 100 | 40 | - | - | 25** | 10 | 25@ | 10 | 150 |
| 173EX57 | Project I | A | - | - | 3 | 3 | | | | | | | | | 50** | 20 | 50$ | 20 | 100 |
| | TOTAL | | 15 | - | 17 | 32 | | 400 | | 100 | 500 | | 100 | | 150 | | 250 | | 1000 |

Abbreviations: B – Basic; C – Core; A – Applied; M – Management; L – Theory Lecture; T – Tutorial; P – Practical; TH – Theory Paper; IST – In-Semester Tests (02);

PR – Practical Exam; OR – Oral Exam; TW- Term Work.

* Assessment by Internal Examiner　** assessment by External Examiner @ : TW assessment by Internal Examiner $: Project Report ##list of electives for Semester V and VI

(#): Evaluation of industrial training and its reports will be done in 5th semester and credits for same will be included in 5th semester and the credits for same will be included in 5th semester mark sheet. The teaching load assigned to a faculty member for guiding students in preparation of training report and its evaluation for a batch of students(equivalent to practical batch size) would be 1hour/week in 5th semester.

Curriculum Coordinator　　　　　　　　　　Head
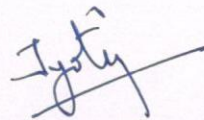　　　　　　　　　　　　　　　　　　Diploma in Electronics Engg.　　　　　　　　Dean -Diploma

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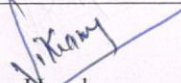
Programme: Diploma in Electronics Engineering (DElnE)   Implemented from:2017

List of Elective Subjects for Semester V and VI

Sr. No.	Course code	Course Name
1	173EX56E1	PLC /SCADA
2	173EX56E2	Smart Grid Communication
3	173EX56E3	Biomedical Instrumentation
4	173EX56E4	Very Large Scale Integration(VLSI)
5	173EX56E5	Internet of Things(IoT)
6	173EX64E1	Mobile Communication
7	173EX64E2	Electronics Circuit Design
8	173EX64E3	Signals and Systems
9	173EX64E4	Image processing and Neural networks
10	173EX64E5	Software Skill

Curriculum Coordinator

Head
Diploma in Electronics Engg.

Dean -Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRONICS ENGINEERING
PROGRAMME CODE	: DElnE
SEMESTER	: FIFTH
COURSE TITLE	: Industrial Training
COURSE CODE	: 173EX51

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
				PAPER HRS	TH		IST		TOTAL		PR		OR		TW		TOTAL MARKS
L	T	P	CR		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
		6	6	-	-	-	-	-	-	-	-	-	75	30	75	30	150

Course Objectives:

After studying this subject, students will be able to

1. Understand the understand the organizational setup from executive to workmen level.
2. Understand the various stages involved in processing, sequential arrangement of different equipment as well as equipment testing etc.
3. Know the various analytical methods used in the quality control department.
4. Know the trouble shooting in process operation.
5. Know the importance of safety in industries.

Course Contents:

Following activities related to project are required to be dealt with, during this semester

1. Students have to attend industrial training 6 weeks in summer break after 4th semester.
2. Student can choose industry for training according to their area of interest.
3. After successful completion training students have to submit report of training.

Curriculum Coordinator	Head	Dean - Diploma
	Diploma	

DIPLOMA PROGRAMME:	DIPLOMA IN ELECTRONICS ENGINEERING
PROGRAMME CODE:	DElnE
SEMESTER:	FIFTH
COURSE TITLE :	POWER ELECTRONICS
COURSE CODE:	173EX52

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	3	6	3	80	32	20	100	40	25	10	-	-	25	10	150

Course Objectives:

1. To understand the construction, working, characteristics of various power electronic devices.
2. To understand the behaviour of power electronic devices in static and dynamic switching conditions.
3. To understand the various protection schemes of power electronic devices.

Course Outcomes:

Student should be able to

CO1	Understand the I/V characteristics of various power electronic semiconductor devices
CO2	Provide proper protection for static and dynamic switching of these devices
CO3	Use these power electronics devices in appropriate application as a switch
CO4	Use SCRs in series /parallel connection for getting desired increase in current/voltage
CO5	Compare the switching characteristics, advantages & disadvantages of above devices

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Course Content:

SECTION-I								
Unit & Sub-Unit		Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1		**Introduction to Power Electronics:**						
	1.1	Power Diode, Power BJT, Power MOSFET, IGBT, MOS Controlled Thyristor (MCT) Their construction, characteristic & application. Safe Operating Area (SOA), Secondary Breakdown in transistors Comparing their advantages, disadvantages & application as a switch	06	10	CO1 CO3	40%	40%	20%
2		**Silicon Controlled Rectifier:**						
	2.1	Construction, Static I/V characteristics, Turn on methods of thyristor						
	2.2	Switching characteristics of thyristor during turn- on and turn off process.						
	2.3	Two transistor model of thyristor (SCR)			CO1			
	2.4	Thyristor ratings: Anode voltage, anode current, gate voltage, gate current, turn on/turn/off times	12	20	CO2 CO5	30%	30%	40%
	2.5	Thyristor Protection: Overvoltage, Over current, Gate Protection, Use of Snubber circuit						
3		**Commutation techniques of thyristor:**						
	3.1	Introduction to Natural & Forced Commutation			CO1			
	3.2	Class A : Load Commutation	06	10	CO2	30%	30%	40%
	3.3	Class B : Resonant Pulse Commutation			CO5			
	3.4	Class C : Complementary Commutation						

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						R	U	A
	3.5	Class D : Impulse Commutation						
	3.6	Class E : External Pulse Commutation						
	3.7	Class F : Line Commutation						
Section II								
4		**Series and parallel operation of SCRs :**						
	4.1	String efficiency, Derating factor (DRF).						
	4.2	Static and dynamic equalizing circuits for series connected SCRs. Numerical problems.	06	10	CO4	40%	40%	20%
	4.3	Simultaneous turn on, same temperature rise, uniform current sharing, symmetrical arrangement problems of parallel connected SCRs. Symmetrical heat sink arrangement and current equalization by the use of reactor						
5		**Other members of the thyristor family:**						
	5.1	Construction of PUT (Programmable Unijunction Transistor), DIAC, SCS, SUS, Light Activated thyristor (LASCR), TRIAC, Gate Turn Off thyristor (GTO).			CO1 CO2 CO3 CO5			
	5.2	Static I/V characteristics of above devices	18	30		30%	30%	40%
	5.3	Turn on and Turn off processes						
	5.4	Switching characteristics						
	5.5	Comparison between GTO & thyristor.(based on advantages and disadvantages)						
	5.6	Applications of above devices						

Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxanomy).

Practical Course Outcomes:

Student should be able to

CO1	Understand the Voltage/Current characteristics of various power electronics devices
CO2	Explain the application of Power BJT, Power MOSFET and PUT devices

List of Practical:

Sr. No.	Unit	Practical	Approx. Hours	CO
1	1	To study and plot the I/P & O/P characteristics of Power BJT	02	1
2	1	To study and plot the drain & transfer characteristics of Power MOSFET	02	1
3	2	To study and plot the static I/V characteristics of SCR	02	1
4	2	To measure holding and latching current of SCR	02	1
5	5	To study and plot the I/V characteristics of DIAC	02	1
6	5	To study and plot the V/I characteristics of PUT	02	1
7	1	To study and plot the I/V & transfer characteristics of IGBT	02	2
8	5	PUT Relaxation Oscillator application	02	2
9	1	Common Emitter Power BJT used as a switch	02	2
10	1	Common Source Power MOSFET used as a switch	02	2

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	Dr. P. S. Bimbhra	Power Electronics, 6th Edition	Khanna Publisher
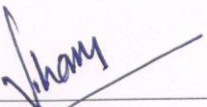
Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	Khanchandani, Singh, Tata McGraw-Hill.	Power Electronics, 2nd Edition	Tata McGraw Hill.
2	M. H. Rashid	Power Electronics, Circuits, Devices and Applications, 3rd Edition	Pearson Education
3		GEC SCR Manual 5th or 6th Edition	GEC

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Websites:

1) http://www.ssit.edu.in/dept/assignment/pelabmanual.pdf
2) http://www.ee.iitgp.ernet.in/faci_pe.php
3) http://www.ece.umn.edu/groups/power/labs/pe/pe_manual.pdf

Curriculum Coordinator	Head Diploma	Dean - Diploma

DIPLOMA PROGRAMME	: Diploma in Electronics Engineering
PROGRAMME CODE	: DElnE
SEMESTER	: FIFTH
COURSE TITLE	: Digital Communication
COURSE CODE	: 173EX53

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
				PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
L	T	P	CR		Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	3	6	3	80	32	20	100	40	25	10	-	-	25	10	150

Course Objectives:

This is technology group subject, which will enable student to comprehend facts, concepts & working principle of digital communication system. This subject familiarizes the student with information theory, measurement of information rate &capacity. This subject helps the student to understand the concept of various pulse modulations, Digital modulation techniques, coding methods and error control, multiplexing & multiple access techniques and S.S. modulation. The knowledge acquired by student will help them to apply it in various modern communication systems.

Course Outcomes:

Student should be able to:

CO1	Distinguish analog and digital communication system & Understand channel capacity and entropy
CO2	Understand various pulse coding techniques with principle of sampling & quantization
CO3	Understand various error detection and error correction methods
CO4	Understand various digital modulation techniques
CO5	Understand various multiplexing and multiple access schemes
CO6	Explain the characteristics of fading channels.

Course Content:

SECTION-I							
Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1	**Introduction of Digital Communication:**	8	12	CO1	17%	50%	33%

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	1.1	Basic digital communication system, block diagram						
	1.2	Channel capacity-definition, Hartley's law, Shannon-Hartley theorem, Channel capacity equation, channel noise and its effect						
	1.3	Average and Mutual information, Entropy, Advantages and disadvantages of digital Communication						
2		**Pulse Communication:**						
	2.1	Introduction, comparison with Continuous Wave Modulation, advantages.						
	2.2	Pulse code modulation- block diagram of PCM transmitter & receiver, quantization, quantization error, Companding, Inter symbol Interference	10	16	CO2	25%	50%	25%
	2.3	Delta modulation- block diagram of DM, slope overload distortion, granular noise, Adaptive Delta Modulation (ADM), Adaptive Differential PCM (ADPCM), Comparison of PCM techniques, problems						
3		**Coding methods and Error control :**						
	3.1	Baud rate, Bit rate, Line coding - unipolar, bipolar – NRZ, RZ, Manchester						
	3.2	Source coding, ASCII, EBCDIC and baudout code	6	12	CO3	33%	33%	34%
	3.3	Channel coding, Error, Causes of error and its effects, error detection & correction using parity, Hamming code & simple numerical.						
SECTION-II								
4		**Digital Modulation Technique :**						
	4.1	ASK, FSK, PSK definition & waveforms, their transmitter and receiver block diagram and working						
	4.2	M-ary encoding, QPSK, QAM, DPSK block diagram of transmitter and receiver and working	10	18	CO4	34%	44%	22%
	4.3	Bandwidth for each modulation technique and their comparison						
5		**Multiplexing and Multiple Access**						
	5.1	Need of multiplexing, TDM, FDM definition block diagram and their comparison	6	10	CO5	30%	50%	20%
	5.2	Introduction to WDM						

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5.3	Multiple access technique TDMA, FDMA, CDMA and advantages of TDMA over FDMA						
6	**Fading Channels :**						
6.1	Small Scale Multipath Propagation	8	12	CO6	42%	42%	16%
6.2	Parameters of Multipath channels, Types of small scale fading						
6.3	Rayleigh and Rician distribution						
	TOTAL	48	80				

Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxanomy).

Practical Course Outcomes:

Intellectual Skills to be developed:

CO1	To analyze the various pulse coding modulation and demodulation techniques .
CO2	To identify the errors in the received data and to correct them using various correction methods.
CO3	To modulate the given data by applying various digital modulation and demodulation techniques.

List of Practical/Assignments/Tutorials:

Sr. No.	Unit	Practical/Assignment	Approx. Hours	CO
1	2	Observe waveforms of Pulse code modulation and demodulation.	3	1
2	2	Observe waveforms of Delta modulation	3	1
3	3	Error detection & correction using parity bits	3	2
4	3	Error detection & correction using hamming codes	3	2
5	3	To generate following different line codes and decode them. 1. NRZ (Unipolar) 2. Bipolar NRZ 3. RZ (Unipolar) 4. Bipolar RZ	3	2
6	4	Observe waveforms of ASK modulation & demodulation	3	3
7	4	Observe waveforms of FSK modulation & demodulation	3	3
8	4	Observe waveforms of PSK modulation & demodulation	3	3
9	4	Observe waveforms of QPSK modulation & demodulation	3	3
10	4	Observe waveforms of QAM modulation & demodulation	3	3
*Note : Atleast some practical should be conducted using multisim or MATLAB				

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	Wayne Tomasi	Electronic Communication Systems	5th Edition, Pearson Publication
2	Roddy & Collen	Electronic Communications	4th Edition, Prentice Hall India Pvt. Ltd.
3	Kennedy and Devis	Electronics Communication System	Tata McGraw Hill.

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	K Sam Shanmugam	Digital & Analog Communication Systems	1st Edition, Wiley India Pvt. Ltd.
2.	B. Sklar & P. Ray	Digital Communications: Fundamentals & Applications	2nd Edition, Pearson Education
3	Simon Haykin	Digital Communications	1st Edition, Wiley India Pvt. Ltd.
4	B.P. Lathi	Modern Digital and analog communication system	6th Edition, Pearson Education

Website:

1. https://nptel.ac.in/courses/117101051/

2. https://www.tutorialspoint.com/digital_communication/digital_communication_techniques.html

Curriculum Coordinator	Head Diploma	Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRONICS ENGINEERING
PROGRAMME CODE	: DElnE
SEMESTER	: FIFTH
COURSE TITLE	:Microprocessor and Microcontroller
COURSE CODE	: 173EX54

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	3	6	3	80	32	20	100	40	25	10	-	-	25	10	150

Course Objectives:

After studying this subject, students will be able to

1. Understand architecture and operation of typical microprocessor and microcontroller.
2. Programming and interfacing of microprocessor and microcontroller.
3. Design real world applications using microprocessor.

Course Outcomes:

Student should be able to

CO1	Explain the microprocessor and Microcontroller internal architecture
CO2	Apply knowledge and demonstrate programming proficiency using the various addressing modes, data transfer instructions and other instruction set of the microprocessor.
CO3	Interface of microprocessor with memory chips, Interfacing Device and its applications and interface memory chips microcontroller.

Course Content:

Unit & Sub-Unit		Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
		SECTION-I						
1		**Introduction to 8085 Microprocessor:**	09	15	CO1	40%	50%	10%
	1.1	Schematic diagram of microcomputer. General function of microprocessor and interfacing devices like latches, buffers, decoders, encoders.						
	1.2	Evolution of microprocessors.						
	1.3	Silent features of 8085 Microprocessor						
	1.4	Architecture of 8085 microprocessor.						
	1.5	Pin definition of 8085 microprocessor.						
2		**8085 Instructions Set, Assembly language Programming.**	09	15	CO1, CO2	10%	40%	50%
	2.1	Instruction Format (one byte, two byte and three byte instruction), Addressing modes of 8085, 8085 Instruction set (Arithmetic, logical, data transfer, program control transfer, Machine control, I/O control), Instructions related with interrupts						
	2.2	8085 programming with examples.						
3		**8085 Interfacing with Memory and Programmable peripheral interface 8255 with applications.**	06	10	CO1, CO3	10%	40%	50%
	3.1	Address decoding techniques						
	3.2	Simple example of RAM/ROM memory interfacing with microprocessor						
	3.3	Block diagram and interfacing of 8255 chip with the 8085 Microprocessor.						

	3.4	Interfacing example:
		   - Traffic Light Controller.
		   - Temperature Controller.
		   - Speed control of Stepper Motor.
		   - Level Controller.						

		SECTION II						
4		**Introduction to Microcontroller**						
	4.1	Comparison of Microprocessor, Microcontroller and Microcomputer						
	4.2	Commercial Microcontroller devices and						

		families.						
	4.3	MCS-51 Architecture and details (8051 Microcontroller)	12	20	CO1 CO3	30%	50%	20%
	4.4	Pin configuration						
	4.5	8051 Hardware details :- Clock, Oscillator, Registers, SFRs, DPTR, Flags, Stack, PC, Port structure and operations.						
	4.6	Power saving options						
	4.7	Memory Organization :- Program memory, Data memory, External memory.						
	4.8	External memory interfacing with 8051 microcontroller						
5		**MCS-51 Timers/Counters, Interrupts and Serial Interface**						
	5.1	Study of Timers/Counters :- Timer modes of operations, SFRs of timer TMOD and TCON in detail.	12	20	CO1	40%	50%	10%
	5.2	Study of Interrupts :- Priority level structure, IE and IP SFRs, external interrupt, Response time.						
	5.3	Study of Serial Interface :- SCON, SBUF, PCON SFRs, Multiprocessor communications, Baud Rates and generating baud rates, Serial port in different modes.						

Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxanomy).

Practical Course Outcomes:

CO1	Develop algorithm, Flowchart and Assembly language program for 8085 microprocessor.
CO2	Load and execute the program in microprocessor kit.
CO3	Observe the result in the internal architecture of 8085 microprocessor and memory location.

List of Practical:

Sr. No.	Unit	Practical/Assignment	Approx. Hours	CO
1	1,2	Add / Sub two 8 bit/16 bit numbers.	3	1,2,3

2	1,2	Add/ Sub of two Multibyte numbers. e.g. Two 3/4 Byte Numbers.	3	1,2,3
3	1,2	Find sum of series of 8 bit numbers.	3	1,2,3
4	1,2	Multiply two 8 bit numbers and square of given number.	3	1,2,3
5	1,2	Square of given number using look up table.	3	1,2,3
6	1,2	Division two 8 bit numbers.	3	1,2,3
7	1,2	Addition of two BCD numbers and Find one's and two's complement of a given number.	3	1,2,3
8	1,2	Find No. of 0's and 1's from 8 bit Binary number and from 10 bytes.	3	1,2,3
9	1,2	Transfer block of data from Source memory location to Destination memory location and exchange given memory locations data.	3	1,2,3
10	1,2	Exchange the lower & upper nibble of a byte and Sort odd and even byte from given 10 bytes.	3	1,2,3
11	1,2	Calculate the sum of series of even and odd numbers from given 10 bytes	3	1,2,3
12	1,2	Find smallest/ largest number from array of n numbers	3	1,2,3
13	1,2	Arrange numbers in array in ascending/ descending order.	3	1,2,3
14	1,2	Find a given byte in the list of 10 numbers stored in the consecutive memory locations.	3	1,2,3
15	1,2	BCD to Binary and Binary to BCD conversion.	3	1,2,3
16	1,2	BCD to HEX and HEX to BCD conversion.	3	1,2,3

Text Books:
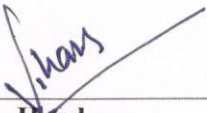
Sr. No.	Author	Title	Publisher and Edition
1	Ramesh S. Gaonkar,	Microprocessor Architecture, Programming, and Applications with the 8085, 5th Edition	Penram Internation Publisher.
2	Kenneth J Ayala,	The 8051 Microcontroller, Architecture Programming and Application, 2nd Edition	Penram International Publishers (India).

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Reference Books:

Sr. No.	Author	Title	Publisher and Edition
1	N K Srinath,	8085 Microprocessor Programming & Interfacing, 1st Edition	Prentice Hall of India Pvt. Ltd.
2	B Ram	Fundamentals of Microprocessor and Microcomputers, 1st Edition	Dhanpat Rai and Sons.
3	Ajay Deshmukh	Microcontrollers: Theory & Applications, 1st Edition	Tata McGraw-Hill
4	Muhammad Ali Mazidi Janice Gillispie Mazidi Rolin D. McKinlay	The 8051 Microcontroller and Embedded Systems	Pearson publication

Website:

6. https://nptel.ac.in/courses/106108100/
7. https://www.slideshare.net/saquib208/8085-microprocessor-ramesh-gaonkar

Curriculum Coordinator	Head Diploma	Dean - Diploma

15

DIPLOMA PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
PROGRAMME CODE	: DELnE
SEMESTER	: FIFTH
COURSE TITLE	: DATA COMMUNICATION AND PROTOCOLS.
COURSE CODE	: 173EX55

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME													
					TH			TOTAL		PR		OR		TW		TOTAL MARKS
L	T	P	CR	PAPER HRS	Max	Min	IST	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	3	6	3	80	32	20	100	40	25	10	-	-	25	10	150

Course Objectives:

- Understand network application and current trends of computer communication and inter networking technology.
- Understand concept of digital data communication & Network models.
- Identify the error & suggest corrective techniques.
- Understand Switching, Routing protocols and transport layer protocols.
- Realize and inbuilt data network to provide safe and fast data environment.
- Compare different distributed application system.

Course Outcomes:

Student should be able to

CO1	Describe Data Communications System and its devices.
CO2	Analyses the different types of networks, topologies and protocols.
CO3	Develop the skills of sub netting and routing mechanisms.
CO4	Locate error and take corrective action.
CO5	Identify security and privacy issues that relate to computer networks.

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Course Content:

		SECTION-I						
Unit & Sub-Unit		Topics/Sub-topics	Hou rs	Mark s	CO	R Le vel	U Lev el	A Lev el
1		**Concept of Data Communication.**						
	1.1	Components of communication. Brief introduction of bit length, bit rate, Propagation delay, Bandwidth Delay product.	04	08	CO1, CO2	40 %	60%	-
	1.2	Network Hardware: Topologies, Categories of networks like LAN, MAN, WAN.						
	1.3	The OSI Model, Layered Architecture, TCP/IP protocol suite, difference between TCP/IP and OSI model.						
	1.4	Protocols and Standards.						
2		**Connecting Devices and switching.**						
	2.1	Passive Hubs (Repeaters), Active Hub (Bridges).	10	12	CO2, CO3	30 %	50%	20 %
	2.2	Two layer Switches and three layer switches						
	2.3	Circuit-Switched Networks.						
	2.4	Datagram Network.						
	2.5	Virtual-Circuit Networks.						
3		**Flow, Errors and Multiple access Control.**						
	3.1	Flow control: Stop-and-wait, Sliding Window	10	20	CO4	20 %	60%	20 %
	3.2	Error Control ARQ: Error types single bit error burst error. Stop-and-wait ARQ, Go-back-n ARQ, Selective reject ARQ.						
	3.3	Error Detection: VRC, LRC, CRC, Checksum.						
	3.4	Multiple Access control: Random Access, Pure Aloha, Slotted Aloha.						
	3.5	Carrier sense multiple access: CSMA/CD, CSMA/CA.						
	3.6	Reservation Access: Polling, Token Passing.						
		SECTION-II						
Unit & Sub-Unit		Topics/Sub-topics						
4		**Data link layer protocols**						
	4.1	Wireless LAN: IEEE 802.11 - Architecture-BSS, ESS.	06	10	CO2,	30	50%	20

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					CO5	%		%
	4.2	Physical layer: FHSS, DSSS, OFDM.						
	4.3	MAC layer: DCF, PCF.						
	4.4	Bluetooth: Architecture; Bluetooth layers – Media layer.						
	4.5	Base band layer, physical links, L2 CAP.						
5		**Network and Transport layer protocols**						
	5.1	Link State Routing and Distance Vector Routing algorithms. Routing in the Internet, RIP and OSPF.	12	20	CO3, CO5	20%	40%	40%
	5.2	Class full and Classless addressing (Numerical problems),						
	5.3	Introduction to IPv4 and IPv6, Compatibility with IPV4,						
	5.4	TCP and UDP.						
	5.5	Port numbers, Multiplexing and de-multiplexing.						
6		**Introduction to Distributed Application Layer Protocols.**						
	6.1	Simple Network Management Protocol (SNMP), Simple Mail Transfer Protocol (SMTP).	06	10	CO5	30%	60%	10%
	6.2	Domain Name system (DNS).						
	6.3	Multipurpose Internet Mail Extension (MIME).						
	6.4	Hyper Text Transfer Protocol (HTTP), File Transfer Protocol (FTP), Uniform Resource Locator (URL)						
			48	**80**				

Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxanomy).

Notes: This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.

Practical Course Outcomes:

Student should be able to

CO1	Analyses the different types of networks, topologies and nodes.
CO2	Develop the skills of sub netting and routing mechanisms.

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CO3	Locate the error & suggest corrective techniques.

List of Practical/Assignments/Tutorials:

Sr. No.	Unit	Practical/Assignment	Approx. Hours	CO
1	2	Show different types of switches and bridges.	02	1
2	3	Implementation of VRC.	02	3
3	3	Implementation of CRC	02	3
4	3	Checksum implementation.	02	3
5	4	Study of wireless LAN, example: Bluetooth in mobiles.	02	2
6	5	Framing and segmentation (any example).	02	2
7	6	Study of protocols with the help of college laboratory (e.g. ftp, http in college internet).	02	1,3
8	6	Serial Communication with serial port between 2 PCs and calculate throughput.	02	2

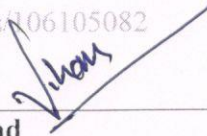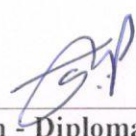* Minimum 8 and maximum 12 practicals/experiment sessions to be included in a course in a term

Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	B. A. Forouzan.	"Data Communications & Networking"	Tata McGraw –Hill, (2nd edition).
2	William Stalling.	"Data Computer Communications"	Pearson Education, (10th edition).

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	A. S. Tanenbaum.	"Computer Networks"	Pearson Education, (5th Edition).
2	Achyut S Godbole.	"Data Communications and Networks"	Tata McGraw-Hill Education, (2nd Edition).
3	Michael A Miller.	"Introduction to Data & Network Communications"	Thomson Delmar Learning, (1st Edition).

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Website:

1. https://freevideolectures.com/course/2278/**data-communication**
2. https://www.nptel.ac.in/courses/106105082

Curriculum Coordinator	Head	Dean - Diploma
	Diploma in	

DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRONICS ENGINEERING
PROGRAMME CODE	: DElnE
SEMESTER	: FIFTH
COURSE TITLE	:PLC and SCADA
COURSE CODE	: 173EX56E1

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME													
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Course Objectives:

After studying this subject, students will be able to

1. Understand Automation and its need in today's developing world.
2. Understand the operation of various components used in ladder diagrams and PLC program.
3. Design and analyze the ladder logic for specified control jobs.
4. Understand the hardware of a PLC, its wiring and identifying the functions of the main components.
5. Understand the concept of SCADA and its applications

Course Outcomes:

Student should be able to

CO1	Understand the Ladder diagram and PLC programming execution.
CO2	Explore the use of various input and output devices in industrial machine control

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CO3	Understand virtual logic circuits in PLC program.						
CO4	Understand the wiring of PLC hardware with input and output devices						
CO5	Understand the application of SCADA in various industrial fields.						

Course Content:

SECTION-I							
Unit & Sub-Unit		Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1		**Introduction to Automation and Ladder diagram Fundamentals**						
	1.1	Definition and Need of Automation,						
	1.2	Advantages of Automation.						
	1.3	Basic Components and Their Symbols: Control transformers, Fuses, Switches, Indicator lamps, Relays, Timers.	04	08	CO1, CO2	38%	50%	22%
	1.4	Fundamentals of Ladder Diagrams. Machine Control Terminology						
2		**Programmable logic controller**						
	2.1	Basic history, PLC Configurations.						
	2.2	System Block Diagram and description of different parts: Processor, Input / output Modules, Power supply, Programming unit.	04	08	CO1, CO2	30%	40%	10%
	2.3	Execution of Ladder program: Update-Solve the Ladder-Update.						
3		**Fundamental PLC programming**						
	3.1	Physical Components vs. Program Components PLC wiring diagram			CO1, CO2,			
	3.2	Ladder diagram for basic logic circuits and their hardware connections (NOT, AND,OR,	08	12	CO3	20%	30%	50%

		NAND, NOR, XOR, X-NOR).						
	3.3	Oscillator circuit, Disagreement circuit, Majority circuit, Always energized and de-energized circuit, Holding (also called Sealed, or Latched) Contacts.						
	3.4	Ladder Diagrams Having More Than One Rung, Ladder program Execution sequence.						
4		**Mnemonics coding and Advanced Programming Techniques**						
	4.1	Mnemonic Programming Code Introduction, Mnemonic Coding for All logic gates rung, Simple branches and Complex branches.						
	4.2	Introduction, Flip Flops: RS Flip Flop PLC program, D Flip Flop PLC program, T Flip Flop PLC program	08	12	CO1, CO2, CO3	10%	35%	45%
	4.3	Automatic One shot						
	4.4	Counters: UP counter, DOWN counter, BI-DIRECTIONAL counter.						
	4.5	Sequencers, Timers: TON delay, TOF delay Retentive TON						
	4.6	PLC program using timers and counters.						
SECTION-II								
5		**Wiring Techniques**						
	5.1	PLC Power Connection						
	5.2	Input Wiring						
	5.3	Inputs Having a Single Common						
	5.4	Relay Outputs	12	20	CO2, CO4	20%	50%	30%
	5.5	Solid State Outputs						
	5.6	Introduction to Analog Input and Analog Output, Analog to Digital conversion in Input module and Digital to Analog conversion in Output module.						

5.7	Analog Data Handling, Analog I/O Potential Problems						
6		**Discrete Position Sensors**					
	6.1	Sensor Output Classification	08	12	CO2, CO4	20%	50%	30%
	6.2	Connecting Discrete Sensors to PLC Inputs					
	6.3	Types of Sensors					
	6.4	PLC program using sensor.					
7		**Definition of SCADA**					
	7.1	Functional Block Diagram	04	08	CO5	30%	50%	20%
	7.2	Function of SCADA					
	7.3	Communication between PLC and SCADA					
	7.4	SCADA Applications					

Legends: R- Remember, U – Understand, A – Apply and above levels (Blooms's Revised Taxanomy).

Practical Course Outcomes:

Student should be able to

CO1	Understand the various hardware components of PLC and its software program execution.
CO2	Write programs for logic gates and Flip-flop circuits in ladder language
CO3	Understand the PLC programming components used in PLC software.
CO4	Understand the use of MULTISIM FOR LADDER DIAGRAMS.
CO5	Understand the working of SCADA.

List of Practical/Assignments/Tutorials:

Sr. No.	Unit	Practical/Assignment	Approx. Hours	CO
1	2	Introduction to PLC Components	2	CO1

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2	1	Introduction to Ladder Diagram	2	CO1
3	3	Ladder Diagram for Logic Gate AND, OR, NOT, NAND, NOR, Ex-NOR, Ex-OR.	2	CO1,CO2, CO4
4	3	Introduction to Logic Gates for following Applications Adder and Subtractor	2	CO1,CO2, CO3,CO4
5	3	Ladder logic for Majority Circuit Application.		CO1,CO2, CO3
6	4,8	Timer using Ladder logic	2	CO3,CO4
7	4,8	Counters using Ladder logic	2	CO3,CO4
8	4	Flip-flops using Ladder logic	2	CO2,CO3, CO4
9	3,4, 8	**Perform Exercises on NI Multisim 11 Software Package like:** Creating a Ladder Diagram. AND Rungs and OR Rungs. Sample circuits: Holding Tank, Conveyor Belt, Traffic Light.	2	CO2,CO3, CO4.
10	7	Demo practical on SCADA or industrial visit.	2	CO5

*Note: Perform at least one program in PLC programming software.

Text Books:

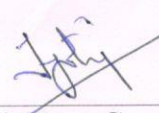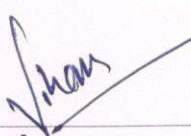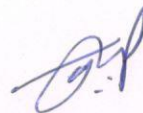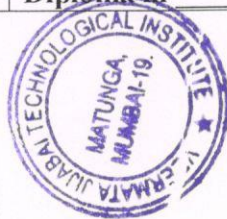| Sr. No.	Author	Title	Publisher and Edition
1	John R. Hackworth & Frederick D. Hackworth, Jr	"Programmable Logic Controllers: Programming Methods and Applications", 1st Edition.	Pearson Education

Reference books:

Sr. No.	Author	Title	Publisher and Edition
1	Terry L. M. Bartelt	Industrial Control Electronics: Devices, Systems and	Thomson Delmar Learning

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		Applications, 2nd Edition.	
2	Gary Dunning	Introduction to Programmable Logic Controllers, 2nd Edition,	Thomson Delmar Learning
3	Madhuchand A Mitra & Samarjit Sen Gupta	-Programmable logic controllers and Industrial automation	Penram International
4	C D Johnson	Process Control Instrumentation Technology	Prentice Hall India
5	Petruzella	Programmable Logic Controller	McGraw Hill
6	NIIT-Programmable Logic control-Principles and applications		Prentice Hall India

Websites:

1.	www.brothersoft.com/download/plc-simulator
2.	www.edusoft.co.za/ladsim.htm

Curriculum Coordinator	Head Diploma in	Dean - Diploma

COURSE NAME	:DIPLOMA IN ELECTRONICS ENGINEERING
COURSE CODE	:DELNE
SEMESTER	:FIFTH
SUBJECT TITLE	:SMART GRID COMMUNICATION
SUBJECT CODE	:173EX56E2

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME												
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Course Objectives:
After completing this course student will able to:

1. Compare Different Smart Grid technologies, different smart meters and advanced metering infrastructure.
2. Describe the issues regarding power quality management in Smart Grid.
3. Apply concepts of high performance computing for Smart Grid applications and communication.

Course Outcomes:
Students will be able to :

CO1	Describe fundamental elements of the smart grid
CO2	To compare and justify various smart transmission and distribution technologies
CO3	Analyse issues regarding smart power measurement and power quality management in Smart grid
CO4	Be introduced to communication, networking, and sensing technologies involved with the smart grid

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Course Content:

SECTION-I								

Unit & Sub-Unit		Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level
1		**Introduction To Smart grid:**						
	1.1	Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid Smart grid drivers, functions, opportunities, challenges and benefits	4	8	1	40%	60%	-
	1.2	Difference between conventional & Smart Grid, Concept of Resilient & Self Healing Grid, Present development & International policies in Smart Grid						
	1.3	Diverse perspectives from experts and global Smart Grid initiatives						
2		**Smart Grid Technology:**						
	2.1	Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation.	10	16	2	30%	40%	30%
	2.2	Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control						
	2.3	Distribution systems: DMS, Volt/VAr control ,Fault Detection, Isolation and service restoration, Outage management, High-Efficiency						
	2.4	Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).						
3		**Smart Meters And Advanced Metering Infrastructure:**						
	5.1	Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits	10	16	3	40%	40%	20%
	5.2	AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU)						
	5.3	Intelligent Electronic Devices(IED) & their application for monitoring & protection						

SECTION-II

4		**Power Quality Management In Smart Grid:**	12	20	3	20%	40%	40%
	4.1	Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources						
	4.2	Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring						
	4.3	Power Quality Audit.						
5		**High Performance Computing And Smart Grid Communication:**	12	20	4	30%	30%	40%
	5.1	Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN)						
	5.2	Broadband over Power line (BPL), IP based Protocols						
	5.3	Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid						
			48	80				

List of Practical/Assignments/Tutorials:

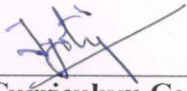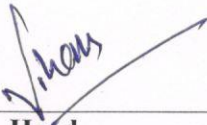| Sr. No.	Unit	Practical/Assignment	Approx. Hours	CO
1	1	To study VI characteristics of solar photo-voltaic (PV) panel.	2	CO1
2	1	To study different types of wind turbines.	2	CO1
3	3	To study various types of phasor measurement units (PMUs)	2	CO3
4	4	Presentation on IEEE standards for power quality	2	CO2
5	5	Visit to substation for study of different communication links and sensing elements.	2	CO4
6	2	To study types of distributed generation based on environmental concern.	2	CO2
7	3	To study applications of smart sensors in future smart grid.	2	CO3
8	3	To study applications of smart meters in future smart grid.	2	CO3
9	3	To study applications of smart automation in future smart grid.	4	CO3
10	1	Case study and test-bed for emerging micro-grid models in India.	2	CO1

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Text Books:

Sr. No.	Author	Title	Publisher and Edition
1	Bharag Modi, Anu Prakash, Yogesh Kumar S.K.Kataria and Sons	Fundamentals of Smart Grid Technology	S.K.Kataria and Sons Edition 1 (2015)
2	James A. Momoh	Smart Grid: Fundamentals of Design and Analysis	1 Edition Wiley, 2012 ISBN

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	India Smart Grid Forum (ISGF)	Smart Grid Handbook For Regular And Policy Makers	

Website:

1. www.indiasmartgrid.org
2. https://ieeexplore.ieee.org/document/6066343

Curriculum Coordinator	Head Diploma	Dean - Diploma

COURSE NAME	DIPLOMA IN ELECTRONICS ENGINEERING
COURSE CODE	DELNE
SEMESTER	FIFTH
SUBJECT TITLE	BIOMEDICAL INSTRUMENTATION
SUBJECT CODE	173EX56E3

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME													
										PR			OR		TW		TOTAL MARKS
L	T	P	CR	PAPER HRS	TH		IST	TOTAL									
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Course Objectives:

1. To have the knowledge of basic physiology of the human body system and related electrical activity.
2. To understand the basic of how signals are obtained from the body that is to be measured by various machine.
3. To introduce the various devices used in medical field.
4. To introduce medical imaging, medical Instrumentation and safety aspects of medical instruments.

Course Outcomes:

CO1	Student should able to understand physical foundations of biomedical Instrumentation.
CO2	Students should get brief idea of bioelectric signal i.e. ECG, EEG, EMG, ERG and EOG.
CO3	Students to learn the basic principles of different instruments/equipment used in the health care industry.

Course Content:

SECTION-I						
Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level

(31)

1		Biopotential Measurement:						
	1.1	Electrode-Electrolyte interface, half-cell potential, Polarization- polarizable and nonpolarizable electrodes, Ag/AgCl electrodes, Electrode circuit model; motion artifact.						
	1.2	Body Surface recording electrodes for ECG, EMG, and EEG. Internal Electrodes: needle and wire electrodes, Micro electrodes, metal microelectrodes.	06	10	CO1 CO2	35%	35%	30%
	1.3	Selection & specifications for the bio transducers to measure parameters, Biosensors.						
2		**Cardiovascular System and Measurements:**						
	2.1	Heart Structure, Cardiac Cycle, ECG Theory, ECG Electrodes, Electrocardiograph, Vectorcardiograph.						
	2.2	Analog Signal Processing of Biosignals, Interference Reduction, Rate Measurement, pacemakers, Defibrillators.	09	15	CO1 CO2 CO3	35%	35%	30%
	2.3	Heart Sounds, Phonocardiography, Blood Pressure Measurement (Invasive and Noninvasive), Sphygmomanometer.						
3		**Central Nervous System:**						
	5.1	Brain & its parts, different waves from different parts of the brain, brain stem, cranium nerves,						
	5.2	Structure of neuron, Neuro muscular transmission, Electroencephalography, EEG amplifier, 10/20 System of Electrode Placement, brain waves.	09	15	CO1 CO2 CO3	35%	35%	30%
	5.3	**Classification of muscles:** Muscle contraction mechanism, Myoelectric voltages, Electromyography (EMG).						
SECTION-II								
4		**Special Senses and Respiratory System**						
	4.1	Ear: Mechanism of Hearing, Types of Hearing loss, Sound Conduction System, Basic Audiometer; Pure tone audiometer; Hearing Aid, cochlear implant.	10	15	CO1 CO2 CO3	35%	35%	30%
	4.2	Vision: Anatomy of Eye, Visual acuity, (Errors in Vision,), Laser Eye Surgery, EOG.						

	4.3	Natural Process of Breathing, O_2 and CO_2 Transport, Regulation of Breathing, Lung Volumes/Capacities, Spirometers, airflow measurement, Ventilators						
5		**Medical Imaging Systems:**						
	5.1	Introduction, X-ray Machines and Digital Radiography, Computed Tomography, CT Scanners.	08	15	CO3	35%	35%	30%
	5.2	Ultrasonic Imaging Systems, MRI & PET Scan, Thermal Imaging Systems.						
6		**Patient Monitoring and Safety Aspect of Medical Instrumentation:**						
	6.1	Patient-Monitoring Equipment – Different types, The Organization of Hospital for Patient-Care Monitoring, Application of biotelemetry in Patient Care.	06	10	CO3	45%	35%	20%
	6.2	Physiological effects of Electric Current, Shock Hazards and Leakage Currents, Safety codes for electro medical equipment, safety standards rays and considerations, safety testing instruments, biological effects of X-rays and precautions.						

Practical Course Outcomes:

CO1	To understand basic physiology of the body systems and associated electrical activity.
CO2	To introduce various devices used in biomedical instrumentation field

Student should be able

List of Practicals/Assignments/Tutorials:

Sr. No.	Unit	Practical/Assignment	Approx. Hours	CO
1	1	Introduction to various Electrode	2	CO2
2	1	Calculate Body Mass Index using body mass index chart.	2	CO1
3	2	Study and analyze a clinical Stethoscope	2	CO2
4	3	To study concept of EEG and placements of its electrodes.	2	CO1, CO2
5	3	To measure the surface activity of muscle using myon-4 channel EMG system.	2	CO1, CO2
6	4	To study Photoplethysmography.	2	CO1, CO2
7	4	To measure the Blood pressure using	2	CO2

		sphygmomanometer.		
8	4	To study Dermal analysis	2	CO2
9	4	To study Spirometer system	2	CO2
10	3	To study Electrocardiograph(ECG) System.	2	CO1, CO2

Text Books:
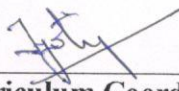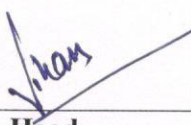
Sr. No.	Author	Title	Publisher and Edition
1	R.S.Khandpur	Handbook of Biomedical Instrumentation	Third Edition 2014, Tata McGraw Hill Education Private Limited
2	Leslie Cromwell, Fred J. Weibell & Erich A. Pfeiffer	Biomedical Instrumentation and Measurements	Edition (2011), Prentice Hall of India publication

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	Joseph J. Carr and John M. Brown,	Introduction to Biomedical Equipment Technology	Fourth Edition(2011), Pearson Education
2	Strong P.	Biophysical measurements	Second Edition, Measurement Concepts publication
3	John G. Webster	Medical Instrumentation Application and Design	Third Edition (2011), Wiley publication
4	Walter Welkowitz, Sid Deutsch & Metin Akay	Biomedical Instruments: Theory and Design	Second Edition, Academic Press
5	G. E. Donovan	Medical Electronics	Butterworth & Co.

Website:

- https://learning.bmj.com/learning/course-intro
- https://www.electrical4u.com/introduction-to-biomedical-instrumentation/

Curriculum Coordinator	Head Diploma	Dean - Diploma

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COURSE NAME	DIPLOMA IN ELECTRONICS ENGINEERING
COURSE CODE	DELNE
SEMESTER	FIFTH
SUBJECT TITLE	Very Large Scale Integration(VLSI)
SUBJECT CODE	173EX56E4

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME						PR		OR		TW		TOTAL MARKS
L	T	P	CR	PAPER HRS	TH		IST	TOTAL								
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Course Objectives:
1. Develop the state diagram, state table and built Moore and Mealy models
2. Implement logical equations using CMOS technology
3. Develop program to implement combinational and sequential logic circuit using VHDL and synthesize and optimum coding style.
4. Act as industry logic designers for imparting standard ICs, ASIC libraries.

Course Outcomes:
Student should be able to:

CO1	Understand the basics of sequential logic, state machine models and CMOS technology
CO2	Analyse the VHDL fundamentals and to write the programs with test benches for various applications.
CO3	Simulate and synthesize the VHDL programs on integrated circuits like ASIC, FPGA, PLD, etc.

Course Content:

SECTION-I						
Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level

35

1		**Introduction to Advanced Digital Design**						
	1.1	1. Review of Sequential Logic : Asynchronous and Synchronous, Metastability, Noise margins, Power Fan-out, Skew (Definitions only)	04	08	CO1	30%	40%	30%
	1.2	2. Moore and Mealy Models, state machine notation, examples on Moore and mealy: counter, sequence detector only						
2		**Introduction to CMOS Technology**						
	2.1	Comparison of BJT and CMOS parameters						
	2.2	Design of Basic gates using CMOS: Inverter, NOR, NAND, MOS transistor switches, transmission gates..						
	2.3	Drawing of complex logic using CMOS (building of logic gate as per the Boolean equation of three variable)	10	20	CO1	20%	20%	60%
	2.4	Estimation of layout resistance and capacitance, switching characteristics,						
	2.5	Fabrication process: Overview of wafer processing, Oxidation, epitaxy, deposition, Ion–Implementation and diffusion, silicon gate process.						
	2.6	Basics of NMOS, PMOS and CMOS: nwell, pwell, twin tub process						
3		**Introduction to VHDL**						
	5.1	Introduction to HDL: History of VHDL, Pro's and Con's of VHDL						
	5.2	VHDL Flow elements of VHDL(Entity, Architecture, configuration, package, library only definitions)	10	12	CO2	40%	40%	20%
	5.3	Data Types, operators, operations						
	5.4	Signal, constant and variables(syntax and use)						
SECTION II								
4		**VHDL Programming**						
	4.1	Concurrent constructs (when, with, process)	06	08	CO2	15%	15%	70%
	4.2	Sequential Constructs (process, if, case, loop, assert, wait)						

	4.3	Simple VHDL program to implement Flip Flop, Counter, shift register, MUX, DEMUX, ENCODER, DECODER, MOORE, MEALY machines						
	4.4	Test bench and its applications						
5		**HDL Simulation and Synthesis**						
	5.1	Event scheduling, sensitivity list, zero modeling, simulation cycle, comparison of software and hardware description language	08	20	CO3	20%	20%	60%
	5.2	delta delay, Types of simulator event based and cycle based						
	5.3	HDL Design flow for synthesis						
	5.4	Efficient Coding Styles, Optimizing arithmetic expression, sharing of complex operator						
6		**Introduction to ASIC, FPGA, PLD**						
	6.1	ASIC design flow						
	6.2	CPLD -Xilinx and Atmel series architecture, Details of internal block diagram	10	12	CO3	10%	10%	80%
	6.3	Introduction to FPGA like Xilinx (FPGA), SPARTAN 3 series and Atmel						
			48	80				

Practical Course Outcomes:

Student should be able

CO1	Design combinational circuits using FPGA
CO2	Design sequential circuits using FPGA
CO3	Interfacing of FPGA with peripherals for desired applications.

List of Practicals/Assignments/Tutorials:

Sr. No.	Unit	Practical/Assignment	Approx. Hours	CO
1	2,3	Write VHDL program for any two basic gates.	2	CO1
2	2,3, 4	Write VHDL program for full adder / subtractor & Synthesize using FPGA	2	CO1
3	3,4, 5	Write VHDL program for 8:1 multiplexer & Synthesize using FPGA	2	CO1
4	3,4, 5	Write VHDL program for 2:4 Decoder & Synthesize using FPGA	2	CO1

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5	3,4, 5	Write VHDL program for 8:3 Encoder & Synthesize using FPGA	2	CO1
6	3,4, 5	Write VHDL program for synchronous counter & Synthesize using FPGA	2	CO2
7	3,4, 5	Write VHDL program for binary to gray code converter & synthesize using FPGA	2	CO1
8	3,4	Interfacing of DAC and ADC using FPGA	2	CO3
9	3,4	Interfacing Stepper motor controller using FPGA	2	CO3
10	3,4, 6	Implement four Bit ALU.	2	CO1
11	3,4, 6	Implement sequence generator.	2	CO2

Text Books:
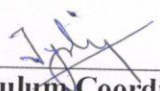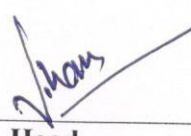
Sr. No.	Author	Title	Publisher and Edition
1	Gaganpreet Kaur	VHDL Basics to programming	Pearson
2	John M. Yarbrough	Digital Logic: Application and design	Thomson
3	William I. Fletcher	An Engineering approach to digital design	Prentice-Hall of India

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	Neil H. E. Weste Kamran Eshraghian	Principals Of CMOS VLSI Design: A Systems Perspective	Pearson Education
2	Douglas Perry	VHDL Programming by example	Tata McGraw-Hill
3	Sarkar & Sarkar	VLSI design and EDA tools	Scitech Publication India Ltd

Website:

- https://nptel.ac.in/courses/117106092/
- http://www.xilinx.com/
- www.altera.com

Curriculum Coordinator	Head Diploma	Dean - Diploma

COURSE NAME	DIPLOMA IN ELECTRONICS ENGINEERING
COURSE CODE	DELNE
SEMESTER	FIFTH
SUBJECT TITLE	Internet of Things(IoT)
SUBJECT CODE	173EX56E5

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME				EXAMINATION SCHEME						PR		OR		TW		TOTAL MARKS
L	T	P	CR	PAPER HRS	TH		IST	TOTAL								
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	5	3	80	32	20	100	40	-	-	25	10	25	10	150

Course Objectives:

1. To assess the vision of IoT.
2. To classify Real World IoT applications in various Domains.
3. To understand design methodology for IoT platforms.

Course Outcomes:

Student should be able to:

CO1	Interpret the vision of IoT from a global context.
CO2	Illustrate the application of IoT in various Domains.
CO3	Understand the differences and Similarities between IoT and M2M.
CO4	Interpretation of different IoT platforms design methodology.
CO5	Illustration of IoT Physical Devices.
CO6	Narration of Ethics in IoT.

Course Content:

SECTION-I						
Unit & Sub-Unit	Topics/Sub-topics	Hours	Marks	CO	R Level	U Level	A Level

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1		Introduction to Internet of Things						
	1.1	Definition and characteristics of IoT, Physical design of IoT, Things in IoT, IoT Protocols, Logical Design of IoT,						
	1.2	IoT functional blocks, IoT communication Models, IoT communication API's	06	08	CO1	50%	40%	10%
	1.3	IoT enabling Technologies Wireless sensor networks, Cloud Computing, Big Data Analytics, Communication protocols, embedded systems.						
2		**Domain specific IoT**						
	2.1	Introduction, Home automation- Smart lighting, smart appliances, intrusion detection, smoke for gas detectors; Cities- Smart Parking, Smart lighting, Smart Roads, Structural Health Monitoring, surveillance, Emergency Response;.						
	2.2	Environment- Weather monitoring, air pollution monitoring, noise pollution monitoring, forest fire detection, river flood's detection;						
	2.3	Energy- Smart grids, renewable energy systems, prognostics;						
	2.4	Retail- Inventory management, smart payments, smart vending machines;	10	20	CO2	25%	25%	50%
	2.5	Logistics- Route generation and scheduling, Fleet tracking, Shipment monitoring, Remote vehicle diagnostics;						
	2.6	Agriculture- Smart Irrigation, Green house control;						
	2.7	Industry- Machine diagnosis and prognosis, indoor air Quality monitoring;						
	2.8	Health and Life Style- Health and fitness monitoring, Wearable electronics						
3		**IoT and M2M**						
	3.1	Introduction, M2M, Difference between IoT and M2M	08	12	CO3	40%	600%	-
	3.2	SDN and NFV for IoT- Software defined networking						

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3.3		network function virtualization						

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SECTION II

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4		**IoT Platforms Design Methodology**						
	4.1	Introduction, IoT Design and Methodology-Purpose and requirements specification, Process specification, Domain model specification, Information model specification, service specification, IoT level specification, functional view specification, Operational view specification, Device and component integration, application development.	10	15	CO4	15%	15%	70%
5		**IoT Physical Devices and Endpoints**						
	5.1	What is an IoT device? , Basic Building blocks of an IoT Device	08	15	CO5	20%	20%	60%
	5.2	Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Other IoT devices.						
6		**Ethics in IoT**						
	6.1	Characterizing the IoT, Privacy, Control – Disrupting Control, Crowd sourcing;	06	10	CO6	40%	50%	10%
	6.2	Environment – Physical thing, Electronics, Internet service;						
	6.3	Solutions – The IoT as a part of the solution, cautious optimism,the open IoT definition						
			48	80				

Practical Course Outcomes:
Student should be able

CO1	Understand the language required for programming a Raspberry pi.
CO2	Interface raspberry pi with peripherals.

List of Practicals/Assignments/Tutorials:

Sr. No.	Unit	Practical/Assignment	Approx. Hours	CO
1	5	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi.	2	CO1,CO2
2	5	Raspberry Pi Based Oscilloscope	2	CO1,CO2

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3	5	Controlling Raspberry Pi with WhatsApp	2	CO1,CO2
4	5,2	Setting up Wireless Access Point using Raspberry Pi	2	CO1,CO2
5	5,2	Fingerprint Sensor interfacing with Raspberry Pi	2	CO1,CO2
6	5	Raspberry Pi GPS Module Interfacing.	2	CO1,CO2
7	5,2	IoT based Web Controlled Home Automation using Raspberry Pi	2	CO1,CO2
8	5,2	Visitor Monitoring with Raspberry Pi and Pi Camera.	2	CO1,CO2
9	5	Interfacing Raspberry Pi with RFID	2	CO1,CO2
10	5,2	Building Google Assistant with Raspberry Pi.	2	CO1,CO2
11	2	Case study on Smart city(e.g. smart parking, Smart lighting, Structural Health Monitoring)	2	CO2

Text Books:
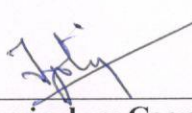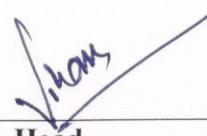
Sr. No.	Author	Title	Publisher and Edition
1	Arshdeep Bahga and Vijay	Internet of Things – A Hands on Approach	Madisetti Universities Pres
2	Adrian McEwen & Hakim Cassimality	Designing the Internet of Things	Wiley India

Reference books and Websites:

Sr. No.	Author	Title	Publisher and Edition
1	Olivier Hersent, David Boswarthick, Omar Elloumi	The Internet of Things – Key Applications and Protocols	Wiley Publication
2	Michael Miller	The Internet of Things	Pearson

Website:

- http://www.cisco.com/c/dam/en_us/solutions/trends/iot/introduction_to_IoT_november.p df

- https://www.bbvaopenmind.com/en/iot-implementation-and-challenges/

- https://www.ftc.gov/system/files/documents/reports/federal-trade-commission-staff-reportnovember-2013-workshop-entitled-internet-things-privacy/150127iotrpt.pdf

Curriculum Coordinator	Head Diploma	Dean - Diploma

DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRONICS ENGINEERING
PROGRAMME CODE	: DEInE
SEMESTER	: FIFTH
COURSE TITLE	: PROJECT I
COURSE CODE	: 173EX57

TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME					EXAMINATION SCHEME											
L	T	P	CR	PAPER HRS	TH		IST	TOTAL		PR		OR		TW		TOTAL MARKS
					Max	Min		Max	Min	Max	Min	Max	Min	Max	Min	
-	-	3	3	-	-	-	-	-	-	-	-	50	20	50	20	100

Course Objectives:

After studying this subject, students will be able to

1. Work in Groups, Plan the work, and Coordinate the work.
2. Develop leadership qualities.
3. Analyze the different types of Case Studies.
4. Develop innovative ideas.
5. Develop basic technical skills by hands on experience.
6. Write project report.
7. Develop skills to use latest technology in Electrical field.

Course Contents:
Following activities related to project are required to be dealt with, during this semester
1. Form project batches & allot project guide to each batch. (Five students per batch)

2. Each project batch should select topic / problem / work by consulting the guide
   Topic / Problem / Work should be approved by Head of Department.
3. Each project batch should prepare action plan of project activities & submit the same to respective guide.
4. At the end of semester, each project batch should submit the action plan and abstract of the project along with list of materials required if project involves fabrication or other facilities required in other kinds of project.
5. Action Plan should be part of the project report.

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NOTE:

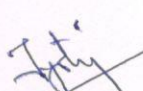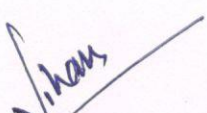The students may select different project for Semester V and Semester VI

OR

This project may be the continued (2nd Part) in Semester VI

Learning Resources:

Books/ Magazines:

1. IEEE Transactions/Journals
2. Electrical India
3. IEEMA Journal
4. Elecrama
5. Technorama
6. Urja
7. Industrial Automation
8. Electronics for You
9. Electronics Projects
10. Computer World
11. Chip
12. Computer Active
13. Any Journal Related to Electrical Engg./Electronics/Computer/Information Technology.

Curriculum Coordinator	Head Diploma	Dean - Diploma

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