



## Veermata Jijabai Technological Institute (V.J.T.I.)

(Central Technological Institute, Maharashtra State, INDIA)

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### Programme Name: Diploma In Electronics Engineering

Programme Code	: DELNE	With Effect From Academic Year	: 2023-24
Duration of Programme	: 6 Semester	Duration	: 16 Weeks
Semester	: FIFTH	Scheme	: R-2023

Sr No	Course Title	Abbreviation	Course Type	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme										Total Marks		
						Actual Contact Hrs./Week			Self-Learning (Term Work + Assignment)	Notional Learning Hrs./Week		Paper Duration (hrs.)	Theory			Based on LL & TL				Based on Self Learning				
						CL	TL	LL					FA-TH (MST)	SA-TH (ESE)	Total		FA-PR		SA-PR		SLA			
															Max	Min	Max	Min	Max	Min	Max		Min	
1	Industrial Training (8 weeks in summer break after 4 semester ) seminar	IT	INP	233EX51	0	3	-	-	5	8	4	-	-	-	-	-	-	100@	40	100#	40	-	-	200
2	Digital Communication	DC	DSC	233EX52	0	3	-	3	-	6	3	3	30	70	28	100	40	25@	10	25#	10	-	-	150
3	Power Electronics	PE	DSC	233EX53	0	3	-	2	-	5	2.5	3	30	70	28	100	40	25@	10	25#	10	-	-	150
4	Microprocessor and Microcontroller	MPMC	DSC	233EX54	0	3	-	3	-	6	3	3	30	70	28	100	40	25@	10	25#	10	-	-	150
5	Management Principles and Entrepreneurship Development	MPED	VEC	233EX55	0	3		1	-	4	2	3	30	70	28	100	40	25@	10	25#	10			150
6	Elective I		SEC	233EX56(x)	0	3	-	2	-	5	2.5	3	30	70	28	100	40	25@	10	25#	10	-	-	150
7	Project I	P1	INP	233EX57	0		-	4	2	6	3	-	-	-		-	-	50@	20	50#	20			100
<b>Total</b>					-	18		15	07	40	20		150	350		500		275		275				1050

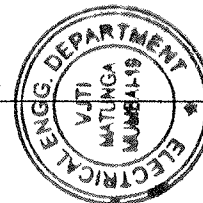
**Abbreviations:** CL- Classroom Learning, TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA-Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

**Course Category:** Discipline Specific Course Core (DSC): 2, Discipline Specific Elective (DSE): 0, Value Education Course (VEC): 1, Intern. /Apprentice /Project /Community (INP): 0, Ability Enhancement Course (AEC): 2, Skill Enhancement Course (SEC): 2, Generic Elective (GE): 0

Curriculum Coordinator

Head Diploma in Electronics Engineering



Dean - Diploma

<b>DIPLOMA PROGRAMME</b>	<b>DIPLOMA IN ELECTRONICS ENGINEERING</b>
<b>PROGRAMME CODE</b>	<b>: DEInE</b>
<b>SEMESTER</b>	<b>: FIFTH</b>
<b>COURSE TITLE</b>	<b>: INDUSTRIAL TRAINING</b>
<b>COURSE CODE</b>	<b>: 233EX51</b>

### I. TEACHING AND EXAMINATION SCHEME

TEACHING SCHEME					EXAMINATION SCHEME													
CL	TL	LL	Self-learning	CR	PAPER HRS	FA-TH (MST)	SA-TH (ESE)			TOTAL		Based on LL & TL Practical				Based on Self-learning		TOTAL MARKS
												FA-PR (CA)		SA-PR (PR/OR)		SLA		
							Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
3	-	-	5	4	-	-	-	-	-	-	-	100 @	40	100 #	40			200

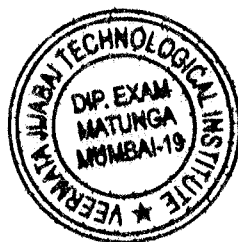
### II. RATIONALE

The industry training is aimed to impart employable skills in the respective field to get a job/employment. Students are expected to learn the work practice and environment of the respective industry and develop a report. On the basis of this report the institute departments will evaluate the student performance.

### III. COURSE OUTCOMES (COs)

Students will be able to achieve the following COs on completion of course based learning

- CO1 - Gain hands-on experience in applying theoretical concepts to real-world tasks, improving their understanding and problem-solving abilities and readiness for the workforce.
- CO2 - Boosts students' self-confidence and encourages them to pursue ambitious career goals. to earn a livelihood for a better status in society.
- CO3 - Interact with industry professionals during training to build valuable connections for job opportunities.



## GENERAL GUIDELINES FOR ORGANISING INDUSTRIAL TRAINING

The Industry/organization selected for Industrial training/ internships shall be Government / Public Limited/ Private limited /Academic Internship/ Startup /Centre of Excellence/Skill Centers/Skill Parks etc.

- a) Duration of Training - 8 weeks student's engagement time (Min. 28-30 hrs./week)
- b) Period of Time slot - After 4th Semester
- c) Industry area - Engineering Programme Allied industries of large, medium or small-scale, Organization / Govt. / Semi Govt Sectors.
- d) Academic Internships to be allocated to students only in rare cases where the students do not find a suitable Industry for the training.

### Role(s) of Training and Placement Office (TPO)- Diploma Programs at the Institute:

The TPO - Diploma Programs shall be responsible for placing the student for industrial training which shall be a Government / Public Limited/ Private limited / Academic Internship/Startup /Centre of Excellence/Skill Centers/Skill Parks etc.

### Role(s) of the respective Heads of Department- Diploma /Faculty Industrial Training Coordinator / Industrial Training Supervisor(s):

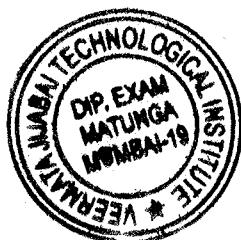
1. Concerned **Head of Department - Diploma** shall appoint a Faculty Industrial Training Coordinator, who can be a permanent / ad-hoc / contractual faculty of the respective department in their departmental faculty meetings before the start of the Mid semester Test for Fourth Semester.

**Heads of Department - Diploma** shall send the decided names of the Departmental Faculty Industrial Training Coordinator to the TPO - Diploma Programs before the start of the Mid Semester Test of the Fourth Semester.

2. The **Faculty Industrial Training Coordinator** shall coordinate with the TPO-Diploma Programs and ensure that all the students of their respective departments are placed by the TPO - Diploma Programs. He/She shall allocate Faculty supervisors to all the students undergoing Industrial Training in their respective departments in consultation with the Diploma Head of Department.

Before the scheduled date as decided by the Diploma Exam Section they shall collect and compile the marks received from the respective Faculty Supervisors for all the students that have undergone the Industrial Training that semester.

The marks shall be submitted to the Diploma Exam Section and the required entries made in the software as per the regular instructions from the Diploma Exam Section. A self signed copy of the final compiled marksheet shall be submitted to the TPO - Diploma Programs and the Diploma Head of Department for records.



3. **Faculty Supervisors** shall coordinate with the allocated industry/organisation and monitor the attendance and progress of the students allocated to them. They shall acquire the undertaking from Parents/Guardians(Format 1) and Student(Format 2). They shall ensure to maintain all records like Internship Diary of each student and complete the evaluation for the students allocated to them in consultation with the **Faculty Industrial Training Coordinator and the Diploma Head of Department**. Maintain the final report submitted by the students at the end of their evaluation. They shall submit the marks to the respective **Departmental Faculty Industrial Training Coordinator**.

**Role(s) and Responsibilities of students:**

a) Students shall interact with the **Faculty Supervisors** allocated to them for suggestions on Industrial Training choices of suitable industry, if any. If students have any contact in industry through their parents or relatives then the same may be utilized for securing placement for themselves and their peers through proper documentation through their Faculty Supervisors and TPO Diploma Programs.

b) Students have to obtain the forms/formats duly signed by institutional authorities along with a training letter and submit it to the training officer/mentor in the industry on the first day of training.

c) Students must submit the undertaking as provided in Format 1 and Format 2 to their faculty Supervisors.

d) Students must carry with him/her Identity card issued by the institute during the training period.

e) Students should follow industrial dressing protocols, if any. In absence of specific protocol students must wear appropriate uniform compulsorily as required by the industry.

f) Students will have to get all necessary information from the training officer/mentor at industry regarding schedule of training, rules and regulation of the industry and safety norms to be followed. Students are expected to observe these rules, regulations and procedures strictly.

g) Students must be fully aware that if they disobey any rule of industry or do not follow the discipline then non-disciplinary action will be taken.

h) Students must maintain a weekly diary (Format 3) by noting daily activities undertaken and get it duly signed from Industry mentor or Industrial training in charge.

i) In case students face any major problems in industry such as an accident or any disciplinary issue then they should immediately report the same to their Faculty Supervisor.

j) Prepare a final report about the training for submission to the department at the time of evaluation, presentation and viva-voce etc. and get it signed by the Faculty Supervisor, Departmental Faculty Industrial Training Coordinator and Diploma Head of Department.

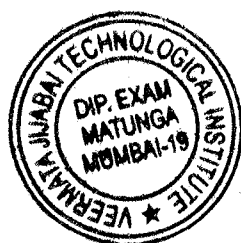
**Typographical guidelines for Industry Training report:**

Following is the suggestive format for preparing the training report. Actual report may differ slightly depending upon the nature of industry. The training report may contain the following

a) The training report shall be computer typed (English-British) and printed on A4 size paper.

b) Text Font -Times New Roman (TNR), Size-12 point

c) Subsection heading TNR- 12 point bold normal



- d) Section heading TNR- 12 capital bold
- e) Chapter Name/ Topic Name – TNR- 14 Capital
- f) All text should be justified. (Settings in the Paragraph)
- g) The report must be typed with 1.5 spacing with a margin 3.5 cm on the left, 2.5 cm on the top, and 1.25 cm on the right and at bottom.
- h) The training report must be Spiralbound. The name of the candidate, diploma (department), year of submission; name of the institute shall be printed on the cover [Refer sample sheet (outer cover)]
- i) The training report, the title page should be given first then the Certificate followed by the acknowledgment and then contents with page numbers.

**Suggestive format of industrial training report:**

Following format may be used for training reports. Actual format may differ slightly depending upon the nature of Industry/ Organization.

- Title Page Certificate Abstract
- Acknowledgement
- Content Page

**Chapter 1**

Organization structure of Industry and general layout.

**Chapter 2**

Introduction to Industry / Organization (history, type of products and services, turn over and number of employees etc.)

**Chapter 3**

Types of Major Equipments/raw materials/ instruments/machines/ hardware/software used in industry with their specifications, approximate cost, specific use and routine maintenance done

**Chapter 4**

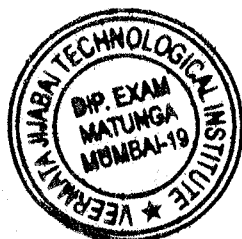
Processes/ Manufacturing Manufacturing techniques and methodologies and material handling procedures

**Chapter 5**

Testing of Hardware/Software/ Raw materials/ Major material handling product (lifts, cranes, slings, pulleys, jacks, conveyor belts etc.) and material handling procedures.

**Chapter 6**

Safety procedures followed and safety gears used by industry.



### **Chapter 7**

Particulars of Practical Experiences in Industry/Organization if any in Production/Assembly/Testing/Maintenance

### **Chapter 8**

Detailed report of the tasks undertaken (during the training).

### **Chapter 9**

Special/challenging experiences encountered during training if any.

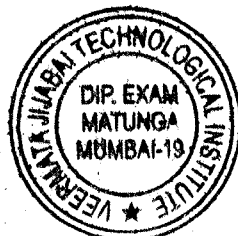
### **Chapter 10**

Conclusion

### **Chapter 11**

References / sources of information

**NOTE: The above Format is only a guideline and the Chapters may change as per the Industry and Department of Training received.**



**Format-1**  
**Consent Letter from parents/guardians**  
**(Undertaking from Parents)**

To,  
The Diploma Head of Department,

\_\_\_\_\_

**Subject: Consent for Industrial Training**

Sir/Madam,

I am fully aware that -

1. My ward studying in \_\_\_\_\_ semester at your institute has to undergo \_\_\_\_\_ weeks of Industrial training for partial fulfillment towards completion of Diploma in Engineering.
2. For this fulfillment he/she has been deputed at \_\_\_\_\_ industry, located at \_\_\_\_\_ for Industrial training /Internship for the period from \_\_\_\_\_ to \_\_\_\_\_.

With respect to above I give my full consent for my ward to travel to and from the mentioned industry. Further I undertake that -

1. My ward will undergo the training at his/her own cost and risk during training and/or stay during the period of training.
2. My ward will be entirely under the discipline of the organization where he/she will be placed and will abide by the rules and regulations in face of the above mentioned industry.
3. My ward is NOT entitled to any leave during the training period.
4. My ward will regularly submit a prescribed weekly diary, duly filled and countersigned by the training supervisor of the industry to the faculty supervisor of the department.

I have explained the contents of the letter to my ward, who has also promised to adhere strictly to the requirements. I assure that my ward has been properly instructed by me to take his own care to avoid any accidents / injuries in the industry. In case of any accident neither industry nor the institute will be held responsible.

Signature of Parent/Guardian : \_\_\_\_\_

Signature of the student: \_\_\_\_\_

Name : \_\_\_\_\_

Name of the Student: \_\_\_\_\_

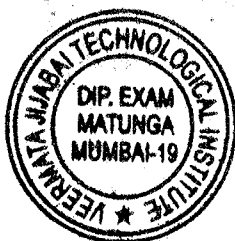
Address : \_\_\_\_\_

Registration No: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Phone Number of student: \_\_\_\_\_

Place and Date : \_\_\_\_\_



Format-2

Undertaking by the Student

To,  
The Diploma Head of Department,

\_\_\_\_\_ Department.

**Subject: Undertaking regarding Placement for Industrial training of 8 weeks duration**

I \_\_\_\_\_ Registration No \_\_\_\_\_ S/o/D/o \_\_\_\_\_

studying in \_\_\_\_\_ Department at Veermata Jijabai Technological Institute am fully aware of the Industrial Training requirements, consequences of the intellectual property violations and related responsibilities, punctuality and participation in the Industrial training at \_\_\_\_\_ (Industry Name and Place).

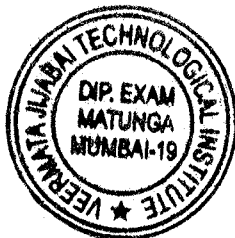
From: \_\_\_\_\_ To \_\_\_\_\_

I assure you that I will be of good behavior and be obedient to the staff and mentor during the training period mentioned above. I will also abide by and will not participate in irresponsible activities. I will also discipline myself within the rules and regulations of the Institution. I am also aware that I am participating in the Industrial Training at my own risk and I will not hold Veermata Jijabai Technological Institute responsible in any way in any eventuality namely Accident /Injury/death or whatever mishap and I myself will be solely responsible for my safety.

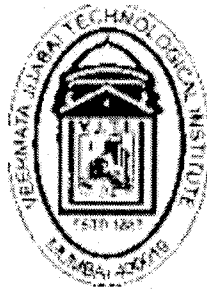
Place : \_\_\_\_\_

Signature of the student: \_\_\_\_\_

Date : \_\_\_\_\_



**Format 3**  
**VEERMATA JIJABAI TECHNOLOGICAL**  
**INSTITUTE**  
[Central Technological Institute, Maharashtra state]  
Matunga, Mumbai-400019



**DIARY**

**Industrial Training and Internship**

**DEPARTMENT OF \_\_\_\_\_ ENGINEERING**

**Year: \_\_\_\_\_**

**Name of Industry: \_\_\_\_\_**

**Address: \_\_\_\_\_**

**Contact No. of Industry Mentor \_\_\_\_\_**

**Name of the Student: \_\_\_\_\_**

**Registration No. \_\_\_\_\_**

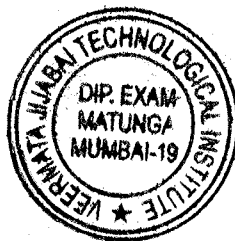


**WEEK NO. \_\_\_\_\_**

<b>Date</b>	<b>Details of Work Allotted</b>	<b>Sign of Industry Mentor</b>

**Institute Faculty Supervisor's Name:** \_\_\_\_\_

**Signature:** \_\_\_\_\_



**IV. ASSESSMENTS METHODOLOGIES /TOOLS**

1. Formative assessment (Assessment for Learning)

**Academic year : 20\_\_-20\_\_**

**Name of the industry: \_\_\_\_\_**

**Marks : Max 100, Min 40**

Based on the following:

- Weekly reports of the Internship Diary in the given format to the Faculty Supervisors (Marks: ).
- Behaviour at the Industry (Marks: ).
- Feedback from the Industry Mentor (Marks: ).

Name of mentor : \_\_\_\_\_

Signature of Mentor : \_\_\_\_\_

2. Summative Assessment (Assessment of Learning)

**Academic year : 20\_\_-20\_\_**

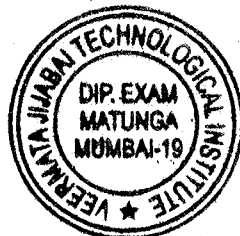
**Name of the industry: \_\_\_\_\_**

**Marks : Max 100, Min 40**

Sr No	Registration No	Name of the Student	Observations from Orals/Presentations				Total Marks Obtained Out of 100
			Knowledge about Industry & Departments  (Marks: )	Knowledge of Layout/M/C Specifications / Components etc  (Marks: )	Skill Developed Presentation /Discipline etc.  (Marks: )	Submitted Report  (Marks: )	

Name of Mentor : \_\_\_\_\_

Signature of Mentor : \_\_\_\_\_

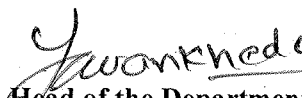


### V. SUGGESTED COS-POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2
CO1									
CO2									
CO3									

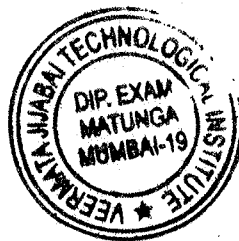
Legends :- High:03, Medium:02,Low:01, No Mapping: -  
 PSO1: Ability to apply knowledge of selecting raw materials, machines and process parameters using standard methods and engineering tools for designing solutions to meet specific needs of the textile industry.  
 PSO2: Understand the impact of textile processes in societal and environmental context and demonstrate the knowledge for sustainable development through teamwork and effective communication for lifelong learning.

  
 Curriculum Coordinator

  
 Head of the Department

  
 Dean Diploma

BOS VJTI Approval Dt. 23/05/2025



<b>DIPLOMA PROGRAMME</b>	<b>: DIPLOMA IN ELECTRONICS ENGINEERING</b>
<b>PROGRAMME CODE</b>	<b>: DELNE</b>
<b>SEMESTER</b>	<b>: FIFTH</b>
<b>COURSE TITLE</b>	<b>: DIGITAL COMMUNICATION</b>
<b>COURSE CODE</b>	<b>: 233EX52</b>

### I. TEACHING AND EXAMINATION SCHEME

TEACHING SCHEME						EXAMINATION SCHEME											
CL	TL	LL	Self-learning	CR	PAPER HRS	FA-TH (MST)	SA-TH (ESE)		TOTAL		Based on LL & TL Practical				Based on Self-learning		TOTAL MARKS
											FA-PR (CA)		SA-PR (PR/OR)		SLA		
						Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
3	-	3	-	3	3	30	70	28	100	40	25@	10	25#	10	-	-	150

### II. COURSE OBJECTIVE

The Digital Communication diploma program aims to provide students with a comprehensive understanding of digital communication systems, encompassing information theory, modulation techniques, coding methods, and multiplexing. By exploring both theoretical concepts and practical applications, the course prepares students to effectively understand, analyze, and manage modern communication systems across.

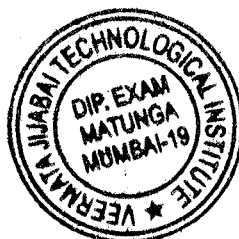
### III. COURSE OUTCOMES (COS)

Students will be able to achieve the following COS on completion of course based learning

- CO1- Identify concepts of different digital communication techniques.
- CO2- Understand fundamentals working of different modulation /demodulation used in communication.
- CO3- Analyze performance of various techniques in transmitter and receiver.

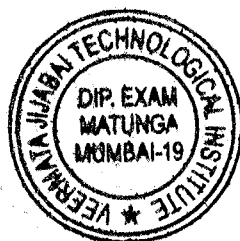
### IV. COURSE CONTENTS WITH SPECIFICATION TABLE

SECTION - I							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	COS	R Level	U Level	A Level
1	<b>Introduction to Digital Communication</b>	3	5				
1.1	Basic digital communication system, block diagram	1		1	40	40	20
1.2	Channel capacity-definition, Hartley's law, Shannon-Hartley theorem, Channel capacity equation, channel noise and its effect, entropy	1		1	40	40	20



1.3	Advantages, disadvantages and applications of digital Communication.	1		1	40	40	20
<b>2</b>	<b>Digital Pulse Communication</b>	<b>10</b>	<b>15</b>				
2.1	Introduction, comparison with Continuous Wave Modulation, advantages	2		1, 2	40	40	20
2.2	Sampling theorem, Nyquist rate, aliasing, natural & flat top sampling. PAM, PWM, PPM definition, waveform analysis	2		1, 2	40	40	20
2.3	Pulse code modulation- block diagram of PCM transmitter & receiver, sampling quantization, quantization error, companding, inter symbol interference	1		1, 2	35	35	30
2.4	Delta modulation- block diagram of DM, slope overload, granular noise.	3		1, 2, 3	30	30	40
2.5	ADM, DPCM, block diagram and working.	2		1, 2, 3	30	30	40
<b>3</b>	<b>Coding methods and Error control</b>	<b>11</b>	<b>15</b>		40	40	20
3.1	Baud rate, Bit rate.	2			40	40	20
3.2	Line coding - unipolar, bipolar – NRZ, RZ, Manchester	3			40	40	20
3.3	Source coding, ASCII, EBCDIC and baudout code.	2			35	35	30
3.4	Channel coding, Error, Causes of error and its effects, error detection & correction using parity, Hamming code & simple numerical.	4			30	30	40

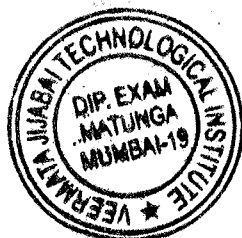
SECTION - II							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
<b>4</b>	<b>Digital Modulation Techniques</b>	<b>8</b>	<b>12</b>		30	30	40
4.1	ASK, FSK, PSK definition & waveforms, their transmitter and receiver block diagram and working.	1		1, 2	40	40	20
4.2	M-ary encoding.	1		2, 3	30	30	40
4.3	QPSK, QAM, DPSK block diagram of transmitter and receiver and working.	3		2, 3	20	20	60
4.4	Bandwidth for each modulation technique and their comparison	3		2, 3	25	25	50
<b>5</b>	<b>Multiplexing and Multiple Access</b>	<b>6</b>	<b>9</b>		35	35	30



5.1	Need of Multiplexing, TDM, FDM definition block diagram and their comparison.	2		1,2	40	40	20
5.2	Introduction to WDM.	2		1,2	40	40	20
5.3	Access technique TDMA, FDMA, CDMA, advantages of TDMA over FDMA.	2		1,2	40	40	20
<b>6</b>	<b>Spread spectrum modulation</b>	<b>10</b>	<b>14</b>				
6.1	Introduction, PN Sequence.	2		2,3	40	40	20
6.2	Model of spread spectrum modulation system.	2		2,3	40	40	20
6.3	Direct sequence spread spectrum signal.	2		2,3	40	40	20
6.4	Frequency hop spread spectrum, slow frequency hopping, and fast frequency hopping.	2		2,3	40	40	20
6.5	Application S. S. modulations	2		2,3	40	40	20

#### V. LIST OF PRACTICALS/ASSIGNMENTS/TUTORIALS

Sr. No.	Practical/Assignment/Tutorial Title	No. of Hours	Relevant COS
1	Observe waveforms of Pulse Amplitude modulation (using natural sampling & flat top sampling).	2	1
2	Observe waveforms of Pulse width modulation (using natural sampling & flat top sampling)	2	1,2
3	Observe waveforms of Pulse Position modulation (using natural sampling.	2	1,2,3
4	Observe waveforms of Pulse code modulation and demodulation.	2	1,2,3
5	Observe waveforms of Delta modulation.	2	1,2,3
6	Observe waveforms of ASK modulation & demodulation.	2	1,2,3
7	Observe waveforms of FSK modulation & demodulation.	2	2,3
8	Observe waveforms of PSK modulation & demodulation.	2	2,3
9	Observe waveforms of QPSK modulation & demodulation.	2	2,3
10	Observe waveforms of QAM modulation & demodulation.	2	1,2,3
11	Any one of the following: 1. Error detection & correction using parity bits. 2. Error detection & correction using hamming codes 3. To generate following different line codes and decode them. 1. NRZ (Unipolar) 2. Bipolar NRZ 3. RZ (Unipolar) 4. Bipolar RZ	2	1,2,3



12	Any one of the following: 1. Time division multiplexing/ de multiplexing system 2. Frequency division multiplexing/ de multiplexing system	2	1,2,3
----	--	---	-------

## VI. ASSESSMENTS METHODOLOGIES /TOOLS

Formative assessment (Assessment for Learning)

- Tutorials
- Midterm Test Exam
- Self-learning
- Term Work
- Seminar/Presentation

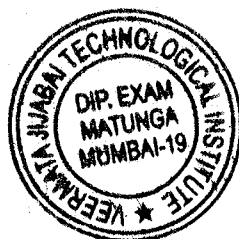
Summative Assessment (Assessment of Learning)

- End Term Exam
- Micro-project/Assignments
- Tutorial Performance

## VII. SUGGESTED COS-POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO - 1	PSO - 2	PSO - 3
CO1	3	1	1	1	-	2	3	2	1	1
CO2	2	3	3	1	-	1	3	1	2	1
CO3	3	2	2	1	2	1	3	1	1	2

Legends :- High:03, Medium:02,Low:01, No Mapping: -



**VIII. SUGGESTED LEARNING MATERIALS TEXTBOOKS/REFERENCE BOOKS/WEBSITES**

No	Author	Title	Publisher
1.	Wayne Tomasi	Electronics Communication System Fundamental Through Advanced	5 <sup>th</sup> Edition Pearson Education
2.	Roddy & Collen	Electronics Communication	4 <sup>th</sup> Edition , Prentice Hall India Pvt. Ltd.
3.	Louis E. Frenzel	Communication Electronics	4 <sup>th</sup> Edition , Tata McGraw-Hill
4.	George Kennedy and Davis	Electronics Communication System	4th Edition , Tata McGraw-Hill
5.	K Sam Shanmugam	Digital & Analog Communication Systems	1st Edition, Wiley India Pvt. Ltd.
6.	B. Sklar & P. Ray	Digital Communications: Fundamentals & Applications	2nd Edition, Pearson Education
7.	Simon Haykin	Digital Communications,	1st Edition, Wiley India Pvt. Ltd.

*B*

Curriculum Coordinator

*Juankhede*

Head of the Department

*f. Pedembar*

Dean Diploma



<b>DIPLOMA PROGRAMME</b>	<b>: DIPLOMA IN ELECTRONICS ENGINEERING</b>
<b>PROGRAMME CODE</b>	<b>: DELNE</b>
<b>SEMESTER</b>	<b>: FIFTH</b>
<b>COURSE TITLE</b>	<b>: POWER ELECTRONICS</b>
<b>COURSE CODE</b>	<b>: 233EX53</b>

### I. TEACHING AND EXAMINATION SCHEME

TEACHING SCHEME						EXAMINATION SCHEME											
CL	TL	LL	Self-learning	CR	PAPER HRS	FA-TH (MST)	SA-TH (ESE)		TOTAL		Based on LL & TL Practical				Based on Self-learning		TOTAL MARKS
							Max	Min	Max	Min	FA-PR (CA)		SA-PR (PR/OR)		SLA		
						Max					Min	Max	Min	Max	Min	Max	
3	-	2	-	2.5	3	30	70	28	100	40	25@	10	25#	10	-	-	150

### II. COURSE OBJECTIVE

Power electronics plays an important role in the efficient use of electrical energy and environmental control. The power electronic circuits are used in industrial automation and in manufacturing sector of control circuits. This course is developed to empower the students to apply their knowledge to solve broad power electronics based industrial application problems.

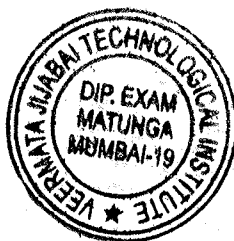
### III. COURSE OUTCOMES (COS)

Students will be able to achieve the following COS on completion of course based learning

- CO1- Identify power semiconductor devices used in different circuits as a switch.
- CO2-Select different devices as a switch based on their characteristics and turn-on turn- off methods.
- CO3-Analyze power converters such as rectifier, chopper, cycloconverter and inverter.

### IV. COURSE CONTENTS WITH SPECIFICATION TABLE

SECTION - I							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	COS	R Level	U Level	A Level
<b>1</b>	<b>Thyristor Family Device</b>	8	12	1	40%	40%	20%
1.1	Construction, working principle, V-I characteristics and applications of Power diode, Power MOSFET and IGBT.						



1.2	SCR: Construction, working principle, V-I characteristics and applications, two transistor analogies, latching and holding current for SCR.						
1.3	Triggering devices: UJT, PUT, Devices such as SUS, SBS, DIAC, TRIAC-Construction, working principle, turn on methods, V-I characteristics and applications						
<b>2</b>	<b>Turn On and Turn Off methods of SCR</b>	<b>8</b>	<b>11</b>	<b>2</b>	<b>30%</b>	<b>30%</b>	<b>40%</b>
2.1	Concept of turn ON mechanism for given SCR: High voltage, thermal triggering, dv/dt triggering, gate triggering of SCR. Gate trigger circuits: resistance triggering circuit, resistance, capacitance triggering circuit SCR triggering Method: UJT/ PUT-relaxation oscillator circuit, synchronized UJT triggering circuit, pulse transformer and opt-coupler.						
2.2	Turn OFF methods: Class A-series resonant commutation circuit, class B- Shunt resonant commutation circuit, class C-Complimentary Symmetry commutation circuit.						
2.3	Protection circuitsof SCR: over voltage, over current, snubber circuit and crowbar						
<b>3</b>	<b>Phase controlled rectifier</b>	<b>8</b>	<b>12</b>	<b>3</b>	<b>30%</b>	<b>30%</b>	<b>40%</b>
3.1	Single-phase half-wave-controlled rectifier: circuit diagram, working and waveforms with R and RL load, effect of freewheeling diode with RL load, numerical, derivations of average, rms Voltages.						
3.2	Single-phase center tapped full-wave controlled rectifier and Bridge rectifier: circuit diagram, working and waveforms with R and RL load, effect of freewheeling diode with RL load, numerical, derivations of average, rms Voltages.						
3.3	Three phase rectifier half and full wave: need, circuit diagram, working and waveforms with R load.						

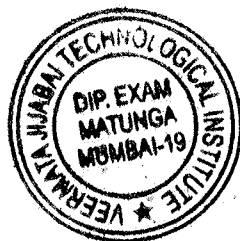
SECTION - II							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level I	U Level I	A Level I
<b>4</b>	<b>Choppers</b>	<b>8</b>	<b>12</b>	<b>3</b>	<b>30%</b>	<b>30%</b>	<b>40%</b>
4.1	Introduction, classification; Control techniques for choppers – TRC and CLC.						



4.2	Block diagram and working of step-up chopper using IGBT, with R load.						
4.3	Block diagram and working of step-down chopper using IGBT, with R load.						
<b>5</b>	<b>Inverters</b>	8	12	3	40%	30%	30%
5.1	Inverter: Introduction, classification, Block diagram and working of Series and parallel inverter.						
5.2	Cyclo-converter: Introduction, Single phase step-up and step-down Cyclo-converter: working principle of Midpoint configuration with R load.						
5.3	Introduction to Solar Inverters, Block diagram and working of Solar Inverter.						
<b>6</b>	<b>Industrial application of power electronics devices</b>	8	11	3	30%	30%	40%
6.1	SMPS: concept, Block diagram and types.						
6.2	UPS: Block diagram and concept of Online and Offline type.						
6.3	Power Electronics in Renewable Energy Systems.						

#### V. LIST OF PRACTICALS/ASSIGNMENTS/TUTORIALS

Sr. No.	Practical/Assignment/Tutorial Title	No. of Hours	Relevant COS
1	To study and plot VI characteristics of Power diode.	2	1,2
2	To study and plot VI characteristics of Power MOSFET.	2	1,2
3	To study and plot VI characteristics of IGBT.	2	1,2
4	To study and plot VI characteristics of SCR.	2	1,2
5	To study single-phase half-wave phase-controlled rectifier with R and RL load.	2	1,3
6	To study single-phase full-wave midpoint type phase-controlled rectifier with R and RL load.	2	1,3
7	To study single-phase step-down cycloconverter with R load.	2	1,3
8	To study single-phase step-up cycloconverter with R load.	2	1,3
9	To study single-phase half-bridge inverter with R and RL load.	2	1,3
10	To study single-phase full-bridge inverter with R and RL load.	2	1,3



11	To study step-down chopper.	2	1,3
12	To study step-up chopper	2	1,3

## VI. ASSESSMENTS METHODOLOGIES /TOOLS

Formative assessment (Assessment for Learning)

- Tutorials
- Midterm Test Exam
- Self-learning
- Term Work
- Seminar/Presentation

Summative Assessment (Assessment of Learning)

- End Term Exam
- Micro-project/Assignments
- Tutorial Performance

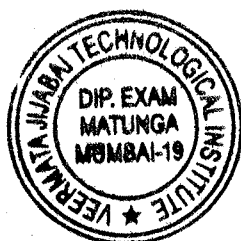
## VII. SUGGESTED COS-POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO -1	PSO -2	PSO -3
CO1	3	3	3	1	-	1	1	3	3	1
CO2	3	2	3	-	1	3	1	3	2	2
CO3	3	3	3	3	-	2	1	1	3	3

Legends :- High:03, Medium:02,Low:01, No Mapping: -

## VIII. SUGGESTED LEARNING MATERIALS TEXTBOOKS

No	Author	Title	Publisher
1.	P.S.Bimbhra	Power Electronics	Khanna Publisher, New Delhi
2.	Rashid, Muhammad H.	Power Electronics Circuits Devices and Applications.	Pearson Education India, New Delhi
3.	M.D. Singh, K. B. Khanchandani	Power Electronics	Tata Mc,Graw Hill

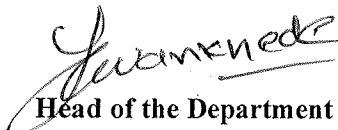


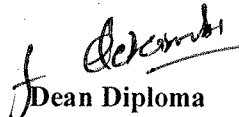
4.	Harish C Rai	Fundamental of Power Electronics	Springer
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**IX: Learning Websites and portals:**

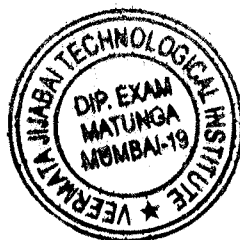
Sr.No	Link /Portal	Description
1	<a href="https://learnaboutelectronics.org/Semiconductors/thyristors_63.php">https://learnaboutelectronics.org/Semiconductors/thyristors_63.php</a>	Thyristor family, Thyristor protection
2	<a href="https://www.electronics-tutorials.ws/power/unijunction-%20trans%20istor.html">https://www.electronics-tutorials.ws/power/unijunction-%20trans%20istor.html</a>	Thyristor family devices, SMPS, Rectifiers.
3	<a href="https://www.electrical4u.com/chopper-dc-to-dc-converter/">https://www.electrical4u.com/chopper-dc-to-dc-converter/</a>	Chopper operation
4	<a href="https://www.elprocus.com/cycloconverters-types-applications/">https://www.elprocus.com/cycloconverters-types-applications/</a>	Cyclo-Converter

  
Curriculum Coordinator

  
Head of the Department

  
Dean Diploma

BOS VJTI Approval Dt. 23/05/2025



<b>DIPLOMA PROGRAMME</b>	<b>: DIPLOMA IN ELECTRONICS ENGINEERING</b>
<b>PROGRAMME CODE</b>	<b>: DELNE</b>
<b>SEMESTER</b>	<b>: FIFTH</b>
<b>COURSE TITLE</b>	<b>: MICROPROCESSOR AND MICROCONTROLLER</b>
<b>COURSE CODE</b>	<b>: 233EX54</b>

### I. TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME						ASSESSMENT SCHEME											
CL	TL	LL	Self-learning	CR	Total IKS Hrs for Sem	PAPER HRS	FA-TH (MST)	SA-TH (ESE)	TOTAL		Based on LL & TL Practical				Based on Self-learning		TOTAL MARKS
							Max	Max	Max	Min	FA-PR (CA)		SA-PR (PR/OR)		SLA		
											Max	Min	Max	Min	Max	Min	
3	-	3	-	3	-	3	30	70	100	40	25@	10	25#	10	-	-	150

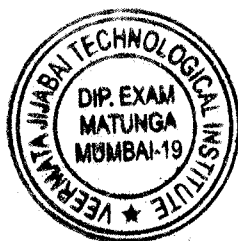
### II. RATIONALE

Microprocessor is the main component of computer where 8085,8086 is the base of all upward developed processors till current processors. This course will cover the basics of 8085 and its architecture along with instruction set, assembly language programming and basics of 8086 and its architecture. Microcontroller plays a very important role in the design, development of embedded systems. To equip students with fundamental knowledge, concepts, and principles of microprocessors and microcontrollers as essential components of embedded systems and industrial automation. To develop practical skills required for programming, interfacing, and troubleshooting microprocessor-based applications.

### III. COURSE OUTCOMES (COS)

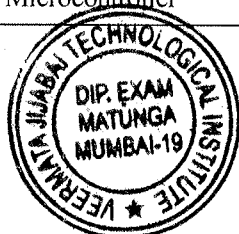
Students will be able to achieve the following COS on completion of course based learning

- CO1- Describe architecture of a typical microprocessor and microcontroller.
- CO2 – Interface with the memory and I/O peripherals.
- CO3 – Design and implement assembly language programs for 8085 microprocessor.



#### IV. COURSE CONTENTS WITH SPECIFICATION TABLE

SECTION-I							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
1	<b>Introduction to 8085 – 8 bit Microprocessor:</b>	6	10	1	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	Pin Description and Architecture of 8085 microprocessor.						
2	<b>8085 Instructions Set, Assembly language Programming.</b>	8	10	1,3	10%	40%	50%
2.1	Instruction Format (one byte, two byte and three-byte instruction), Addressing modes of 8085, 8085 Instruction set with machine cycles and T states. (Arithmetic, logical, data transfer, program control transfer, Machine control, I/O control), Instructions related with interrupts.						
2.2	8085 programming with examples.						
3	<b>8085 Interfacing with Memory and Programmable peripheral interface 8255 with applications.</b>	10	15	1,2,3	10%	40%	50%
3.1	Address decoding techniques						
3.2	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							
Unit & Sub-Unit	Topics/Sub-topics						
4	<b>Introduction to 8086 – 16 bit Microprocessor:</b>	6	10	1	40%	50%	10%
4.1	Silent features of 8086 Microprocessor						
4.2	Pin Description and Functional block diagram, Register organization of 8086						
4.3	Concept of Pipelining						
4.4	Memory Segmentation, Physical address generation						
5	<b>Microcontroller Overview and 8051 Architecture</b>						
5.1	Features and selection factors for Microcontroller						

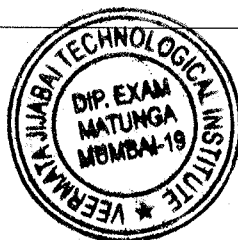


	5.2	Block diagram of 8051 Microcontroller: CPU, input device, output device, memory and buses	8	10	1	40%	50%	10%
	5.3	Comparison of Microcontroller and Microprocessor on basis of: Memory, Complexity, Type of Architecture, Cost, Applications, Typical examples of Microcontrollers and Microprocessors						
	5.4	Architectures of Microcontroller: Harvard, Von Neumann. Concept of pipelining						
	5.5	8051 Microcontroller: Architecture, Pin Configuration, Memory Organisation, Power saving options						
6		<b>8051 Timers, Interrupts, Serial and Parallel Communication, Interfacing with External Memory</b>	10	15	1,2	40%	40%	20%
	6.1	Configuration of Timer/Counter using Special Function Registers [SFRs]: TMOD, TCON, THx, TLx.						
	6.2	Configuration of interrupts using SFRs: IE, IP						
	6.3	Serial Communication SFRs: SCON, SBUF, PCON, Modes of serial communication, Serial Communication using MAX 232						
	6.4	Configuration of I/O Port :P0, P1, P2, P3						
	6.5	External Program and Data memory interfacing with microcontroller						
<b>Legends:</b> R - Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).								

*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.*

#### V. LIST OF PRACTICALS/ASSIGNMENTS/TUTORIALS

Sr. No.	Unit	Practical/Assignment	Approx. Hours	Relevant COS
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 ¾ 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
* Minimum 15 and maximum 16 practical/experiment sessions to be included in a course in a term				

## VI. ASSESSMENTS METHODOLOGIES /TOOLS

### Assignments

- Develop codes for relevant topics suggested by teacher.
- Solve an assignment on any relevant topic given by teacher.

### Micro Project (if any)

- Develop some simple real world application projects.

## VII. ASSESSMENTS METHODOLOGIES /TOOLS

Formative assessment (Assessment for Learning)

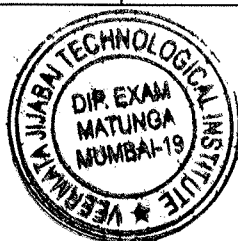
- Experiments performance and journal completion.
- Class Test
- Self-learning
- Term Work
- Seminar/Presentation

Summative Assessment (Assessment of Learning)

- End Term Exam
- Micro-project.
- Assignments.

## VIII. SUGGESTED COS-POS MATRIX FORM

Course Outcomes (Cos)	Programme Outcomes (Pos)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3
CO1	3	1	1	1	2	1	3	2	1	1
CO2	3	3	2	2	2	1	3	3	3	3
CO3	3	3	3	3	2	1	3	3	2	3



Legends :- High:03, Medium:02,Low:01, No Mapping: -

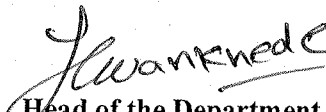
**IX. SUGGESTED LEARNING MATERIALS TEXTBOOKS/REFERENCE BOOKS/WEBSITES**

Sr. No.	Author	Title	Publisher and Edition
1	Ramesh S. Gaonkar,	Microprocessor Architecture, Programming, and Applications with the 8085, 5 <sup>th</sup> Edition	Penram Internation Publisher.
2	Kenneth J Ayala	The 8086 Microprocessor, Programming & Interfacing the PC	Cengage Publisher (India).
3	Kenneth J Ayala	The 8051 Microcontroller, Architecture Programming and Application, 2 <sup>nd</sup> Edition	Penram International Publishers (India).
4	Muhammad Ali Mazidi Janice Gillispie Mazidi Rolin D. McKinlay	The 8051 Microcontroller and Embedded Systems	Pearson publication

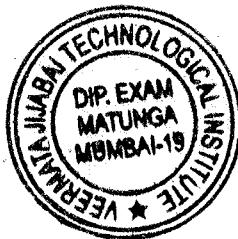
**X. LEARNING WEBSITES & PORTALS**

SR NO	LINK /PORTAL	DESCRIPTION
1	<a href="https://www.intel.com/">https://www.intel.com/</a>	8085,8086,8051
2	<a href="https://www.alldatasheet.com">https://www.alldatasheet.com</a>	8085,8086,8051

  
Curriculum Coordinator

  
Head of the Department

  
Dean Diploma



DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRONICS ENGINEERING
PROGRAMME CODE	: DELNE
SEMESTER	: FIFTH
COURSE TITLE	: MANAGEMENT PRINCIPLES AND ENTREPRENEURSHIP DEVELOPMENT
COURSE CODE	: 233EX55

### I. TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME						ASSESSMENT SCHEME											
CL	TL	LL	Self-learning	CR	Total IKS Hrs for Sem	PAPER HRS	FA-TH (ESE)	SA-TH (ESE)	TOTAL		Based on LL & TL Practical				Based on Self-learning		TOTAL MARKS
							Max	Max	Max	Min	FA-PR (CA)		SA-PR (PR/OR)		SLA		
											Max	Min	Max	Min	Max	Min	
3	-	1	-	2	-	3	30	70	100	40	25@	10	25#	10			150

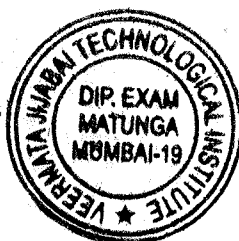
### II. RATIONALE

The subject of Management and Entrepreneurship Development provides a comprehensive understanding of management functions, decision-making, leadership, and organizational communication, which are essential for effective business operations. It also fosters entrepreneurship development by focusing on creativity, innovation, business structures, and market strategies. By integrating management principles with entrepreneurship development concepts, this subject equips individuals with the ability to lead organizations, make strategic decisions, and overcome challenges in the competitive business environment, ultimately promoting business growth and sustainability.

### III. COURSE OUTCOMES (COS)

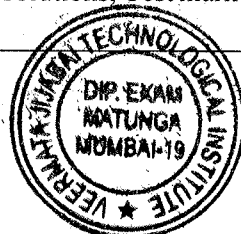
Students will be able to achieve the following COS on completion of course based learning

- CO1- Able to explain management concepts, functions, decision-making models, leadership theories and organizational communication.
- CO2 -Understand entrepreneurship, business structures, challenge and apply creativity, innovation and design thinking for idea evaluation.
- CO3 – Analyze market environments, conduct research and develop effective marketing strategies for business growth and sustainability.



**IV. COURSE CONTENTS WITH SPECIFICATION TABLE**

SECTION-I							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
<b>1</b>	<b>Principles of Management</b>	<b>9</b>	<b>14</b>				
1.1	Management: Definition, Functions: Planning, Staffing, Organizing, Directing, Controlling			1	60%	20%	20%
1.2	Management Levels: Top Level, Middle, First Level			1	60%	20%	20%
1.3	Management Skills			1	20%	20%	60%
1.4	Decision Making: Types, Model			1	20%	20%	60%
<b>2</b>	<b>Process of Management</b>	<b>9</b>	<b>13</b>				
2.1	Communication & its Types, Barriers & its Types			1	40%	40%	20%
2.2	Motivation: Maslow's and Herzberg's theories.			1	40%	40%	20%
2.3	Leadership: Types, Managerial Grid			1	40%	40%	20%
<b>3</b>	<b>Material Management</b>	<b>6</b>	<b>8</b>				
3.1	Inventory Concept, Classification			1	20%	60%	20%
3.2	EOQ: Economic Order Quantity concept, Graphical Representation.			1	20%	60%	20%
3.3	Standard steps in Purchasing			1	20%	20%	60%
SECTION-II							
Unit & Sub-Unit	Topics/Sub-topics						
<b>4</b>	<b>Introduction to Entrepreneurship</b>	<b>10</b>	<b>14</b>				
4.1	Definition of Entrepreneurship and Start-up, Functions of an entrepreneur			2	20%	60%	20%
4.2	Qualities of an entrepreneur.			2	20%	60%	20%
4.3	Problems and Barriers faced by Entrepreneurs			2	40%	20%	40%
4.4	Types of Business Structures for start-Up: Sole Proprietorship, Partnership firm, One-person Company, Limited Liability Partnership, Private Limited Company, Public Limited Company			2	20%	20%	60%
<b>5</b>	<b>Business/Start-up ideas: Generation and Evaluation</b>	<b>8</b>	<b>13</b>				
5.1	Business Idea Generation: Creativity Process, Innovation, Value creation, Concept of Business Opportunity, Search for Business Opportunity			2	20%	60%	20%
5.2	Idea Evaluation: Dynamics of Project Identification, Design thinking for finding solutions, Test marketing & Customer validation			2	20%	60%	20%



	<b>5.3</b>	Organizational Management Policies-HR policies, Financial policies. Government Policies-National and Regional startup policies.(Startup India, MSME Scheme)						
	<b>5.4</b>	Introduction of Project Management, Definition, Scope Importance, Project life cycle and phases						
	<b>6</b>	<b>Marketing strategies for Enterprises</b>	<b>6</b>	<b>8</b>				
	<b>6.1</b>	Market - Concept, Types 6.3 6.4			3	20%	20%	60%
	<b>6.2</b>	Micro and Macro Market Environment			3	20%	20%	60%
	<b>6.3</b>	Market Research: Concept, Importance and Process			3	20%	20%	60%
	<b>6.4</b>	Marketing Mix, Market segmentation			3	20%	20%	60%
<b>Legends:</b> R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).								

*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.*

#### V. ASSESSMENTS METHODOLOGIES /TOOLS

- Seminar/Presentation
- Model/Chart making
- Surveys
- Case Study
- Quiz

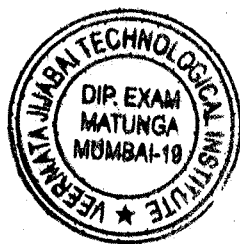
#### VI. ASSESSMENTS METHODOLOGIES /TOOLS

Formative assessment (Assessment for Learning)

- Experiments performance and journal completion.
- Class Test
- Self-learning
- Term Work
- Seminar/Presentation

Summative Assessment (Assessment of Learning)

- End Term Exam
- Assignments.



## VII. SUGGESTED COS-POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3
CO1	2	2	1	2	2	1	2	1	2	2
CO2	2	2	1	1	2	1	2	1	2	1
CO3	1	2	2	1	2	1	2	1	1	1

Legends :- High:03, Medium:02,Low:01, No Mapping: -

## VIII. SUGGESTED LEARNING MATERIALS TEXTBOOKS/REFERENCE BOOKS/WEBSITES

Sr No	Author	Title	Publisher
1	Telsang M.T.	Industrial and Business Management	S Chand Publisher
2	Koontz	Essential For Management: An International Perspective	Mhe Publisher
3	Entrepreneurship Development	Sangita Sharma	PHI Learning Publication ISBN-978-81-203-5270-4
4	Entrepreneurship Development	S, Anil Kumar	New Age International, New Delhi. ISBN: 978-81-2241-434-9

## IX. LEARNING WEBSITES & PORTALS

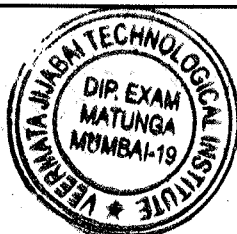
Sr No	Link /Portal	Description
1	<a href="http://www.startupindia.gov.in">http://www.startupindia.gov.in</a>	Entrepreneurship
2	<a href="https://www.nstedb.com/index.htm">https://www.nstedb.com/index.htm</a>	Entrepreneurship
3	NSIC : National Small Industries Corporation	Entrepreneurship
4	<a href="https://www.startupindia.gov.in">https://www.startupindia.gov.in</a>	Entrepreneurship

*AB*  
Curriculum Coordinator

*Jwanknede*  
Head of the Department

*f. Debnath*  
Dean Diploma

BOS VJTI Approval Dt. 23/05/2025



**Elective I subjects (Skill based subject 04) any one out of four  
V semester**

Sr. No	Subject code	Subject name	Abbreviation
1	233EX56(a)	Biomedical and Instrumentation	BMI
2	233EX56(b)	PLC-SCADA	PS
3	233EX56(c)	Introduction to solar cell	RB
4	233EX56(d)	Industry 4.0	IN

**Elective II subjects(Skill based subject 04) any one out of four  
VI semester**

Sr. No	Subject code	Subject name	Abbreviation
1	233EX64(a)	Signal Processing	SP
2	233EX64(b)	Computer Peripheral and Hardware Maintenance	CPHM
3	233EX64(c)	Virtual Instrumentation	VI
4	233EX64(d)	Optical Fiber Communication	OFC

*[Signature]*

Curriculum Coordinator

*[Signature]*

Head Diploma in Electronics Engineering



*[Signature]*  
Dean - Diploma

<b>DIPLOMA PROGRAMME</b>	: DIPLOMA IN ELECTRONICS ENGINEERING
<b>PROGRAMME CODE</b>	: DELNE
<b>SEMESTER</b>	: FIFTH
<b>COURSE TITLE</b>	: BIOMEDICAL INSTRUMENTATION
<b>COURSE CODE</b>	: 233EX56(a)

### I. TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME						ASSESSMENT SCHEME											
CL	TL	LL	Self-learning	CR	Total IKS Hrs for Sem	PAPER HRS	FA-TH (MST)	SA-TH (ESE)	TOTAL		Based on LL & TL Practical				Based on Self-learning		TOTAL MARKS
							Max	Max	Max	Min	FA-PR (CA)		SA-PR (PR/OR)		SLA		
											Max	Min	Max	Min	Max	Min	
3	-	2	-	2.5	-	3	30	70	100	40	25@	10	25#	10	-	-	150

### II. RATIONALE

To equip students with fundamental knowledge, concepts, and principles of Biomedical Instrumentation as essential tools for healthcare technology and medical diagnostics. To develop practical skills required for designing, operating, and maintaining biomedical devices, enabling students to analyze physiological signals and apply instrumentation techniques in medical applications. This course prepares students for advanced studies and careers in biomedical engineering, healthcare technology, and medical research.

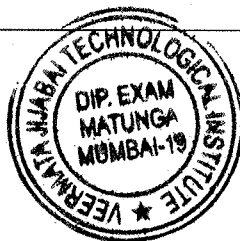
### III. COURSE OUTCOMES (COS)

Students will be able to achieve the following COS on completion of course based learning

- CO1- To understand the basic principles and working of different biomedical monitoring systems.
- CO2- To develop core competency and skill in the field of Biomedical Engineering to design and develop new health care systems.
- CO3- To develop skills enabling Biomedical Engineers to serve the health care industry.

### IV. COURSE CONTENTS WITH SPECIFICATION TABLE

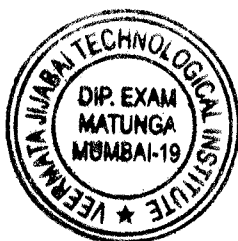
SECTION-I												
Unit & Sub-Unit	Topics/Sub-topics					Hrs	Marks	CO	R Level	U Level	A Level	
1	Biomedical Measurements					6	8					
	1.1	Electrode-Electrolyte interface, half-cell potential, Polarization, polarizable and non-polarizable electrodes, Ag/AgCl electrodes, Electrodes circuits model, motion artifact.							1,2	35%	35%	30%



	1.2	Body surface recoding electrodes for ECG, EMG and EEG, Internal electrodes: needle and wire electrodes, Micro electrodes, metal microelectrodes.			1,2	35%	35%	30%
	1.3	Selection and Specification for the bio transducers to measure parameters, Biosensors.			1,2	35%	35%	30%
2		<b>Cardiovascular system and Measurements</b>	9	13				
	2.1	Heart Structure, Cardiac cycle, ECG Theory, ECG Electrodes: Electrocardiograph, Vector cardiograph			1,2,3	35%	35%	30%
	2.2	Analog Signal Processing of bio signals, Interference Reduction Rate Measurements, Pacemakers, Defibrillators			1,2,3	35%	35%	30%
	2.3	Heart Sounds, Phonocardiography, Blood pressure Measurement(Invasive and Noninvasive ), Sphygmomanometer			1,2,3	35%	35%	30%
3		<b>Central Nervous System</b>	9	14				
	3.1	Brain and its parts, different waves from different parts of brain, brain stem, cranium nerves			1,2,3	35%	35%	30%
	3.2	Structures of Neurons, Neurons muscular transmission, Electroencephalography, ECG amplifier, 10/20 system of Electrode Placement.			1,2,3	35%	35%	30%
	3.3	Classification of muscles: Muscle contraction mechanism, Myoelectric voltages, Electromyography			1,2,3	35%	35%	30%

## SECTION-II

Unit & Sub-Unit	Topics/Sub-topics							
4	<b>Special Senses and Respiratory System</b>	10	14					
	4.1 Ear: Mechanism of Hearing, Types of Hearing loss, Sound conduction system, Basic Audio meter, pure tone Audio meter, Hearing Aid, Cochlear implant			3	20%	50%	30%	
	4.2 Vision: Anatomy of Eye, Visual acuity, Error in Vision, Laser EYE surgery, EOG			3	20%	50%	30%	
	4.3 Natural process of Breathing, O <sub>2</sub> and CO <sub>2</sub> transport, regulation of breathing, Lungs Volumes/Capacities, Spirometers, airflow measurements, Ventilators			3	20%	50%	30%	
5	<b>Medical Imaging System</b>	8	13					
	5.1 Introduction X-Ray machines and Digital Radiography, Computed Tomography, CT scanners			3	35%	35%	30%	
	5.2 Ultrasonic Imaging Systems, MRI & PET scan, Thermal Imaging System.			3	35%	35%	30%	
6	<b>Patient Monitoring and safety Aspect of Medical Instrumentation</b>	6	8					
	6.1 Patient Monitoring Equipment- different types, The organization of Hospital for patient-care Monitoring, Application of biotelemetry in Patient care.			3	45%	35%	20%	



6.2	Physiological effects of Electric currents, Shock Hazards and Leakage Currents, safety codes for electro medical, equipment, safety standards rays and consideration, safety testing instruments, biological effects of X-ray and precautions.			3	45%	35%	20%
<b>Legends:</b> R- Remember, U – Understand, A – Apply and above levels (Blooms’s Revised Taxonomy).							

*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.*

#### V. LIST OF PRACTICALS/ASSIGNMENTS/TUTORIALS

Sr. No.	Unit	Practical/Assignment	Approx. Hours	Relevant COS
1	1	Introduction to various Electrodes	2	2
2	1	Calculate Body mass Index using Body mass index chart	2	1
3	2	Study and analyze a clinical Stethoscope	2	2
4	3	To study concept of EEG and placements of its electrodes	2	1,2
5	3	To measure the surface activity of muscle using myon-4 channel EMG system	2	1,2
6	4	To study Photoplethysmography.	2	1,2
7	4	To measure Blood Pressure using Sphygmomanometer	2	2
8	4	To study Dermal analysis	2	1,2
9	4	To study Spirometer System	2	2
10	3	To study Electrocardiograph(ECG) system	2	1,2
* Minimum 7 and maximum 8 practical/experiment sessions to be included in a course in a term				

#### VI. ASSESMENTS METHODOLOGIES /TOOLS

##### Assignments

- Develop codes for relevant topics suggested by teacher.
- Solve an assignment on any relevant topic given by teacher.

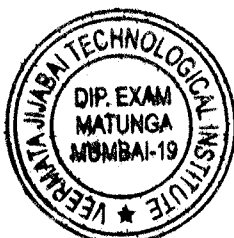
##### Micro Project (if any)

- Develop some simple real world application projects.

#### VII. ASSESMENTS METHODOLOGIES /TOOLS

Formative assessment (Assessment for Learning)

- Experiments performance and journal completion.
- Class Test
- Self-learning
- Term Work



- Seminar/Presentation

Summative Assessment (Assessment of Learning)

- End Term Exam
- Micro-project.
- Assignments.

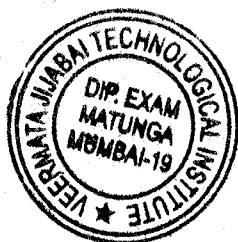
### VIII. SUGGESTED COS-POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3
CO1										
CO2										
CO3										

Legends :- High:03, Medium:02,Low:01, No Mapping: -

### IX. SUGGESTED LEARNING MATERIALS TEXTBOOKS/REFERENCE BOOKS/WEBSITES

No	Author	Title	Publisher
1	R.S. Khandpur	Handbook of Biomedical Instrumentation	Third Edition 2014, Tata McGraw Hill Education Pvt Ltd.
2	Joseph J. Carr and John M. Brown	Introduction to Biomedical equipment Technology	Fourth Edition 2011, Pearson Education
3	John G. Webster	Medical Instrumentation Application and Design	Third Edition 2011, Wiley Publication.

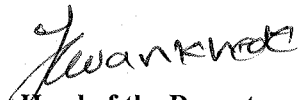


**X. LEARNING WEBSITES & PORTALS**

SR NO	LINK /PORTAL	DESCRIPTION
1	<a href="https://learning.bmg.com/learning">https://learning.bmg.com/learning</a>	Biomedical Instrumentation
2	<a href="https://www.vidyarthiplus.com">https://www.vidyarthiplus.com</a>	Biomedical Instrumentation
3	<a href="https://electrical4u.com/introduction-to-biomedical-instrumentation">https://electrical4u.com/introduction-to-biomedical-instrumentation</a>	Biomedical Instrumentation



Curriculum Coordinator

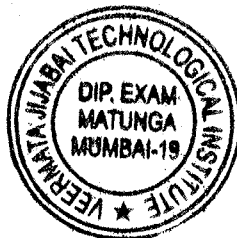


Head of the Department



Dean Diploma

BOS VJTI Approval Dt. 23/05/2025



DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRONICS ENGINEERING
PROGRAMME CODE	: DELNE
SEMESTER	: FIFTH
COURSE TITLE	: PLC AND SCADA
COURSE CODE	: 233EX56(b)

### I. TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME						ASSESSMENT SCHEME											
CL	TL	LL	Self-learning	CR	Total IKS Hrs for Sem	PAPER HRS	FA-TH (MST)	SA-TH (ESE)	TOTAL		Based on LL & TL Practical				Based on Self-learning		TOTAL MARKS
							Max	Max	Max	Min	FA-PR (CA)		SA-PR (PR/OR)		SLA		
											Max	Min	Max	Min	Max	Min	
3	-	2	-	2.5	-	3	30	70	100	40	25@	10	25#	10			150

### II. RATIONALE

To equip students with fundamental knowledge, concepts, and principles of **Programmable Logic Controllers (PLC) and Supervisory Control and Data Acquisition (SCADA)** as essential tools for automation and industrial control systems. To develop practical skills required for designing, programming, and troubleshooting automated systems, preparing students for advanced studies and careers in industrial automation and electronics engineering.

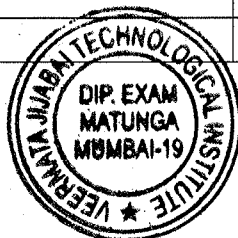
### III. COURSE OUTCOMES (COS)

Students will be able to achieve the following COS on completion of course based learning

- CO1- Depict the operation of basic components used in ladder diagram.
- CO2 - Explore the various input and output devices, virtual logic circuits and wiring connections.
- CO3 - Define the functions of SCADA, it's communication with PLC and applications in various fields.

### IV. COURSE CONTENTS WITH SPECIFICATION TABLE

SECTION-I								
Unit & Sub-Unit	Topics/Sub-topics		Hrs	Marks	CO	R Level	U Level	A Level
1	Introduction to Automation and Ladder Diagram		4	7				
	1.1	Definition and Needs of Automation			1	30%	40%	10%
	1.2	Advantages of Automation			1	30%	40%	10%
	1.3	Basic components and their symbols			1	30%	40%	10%

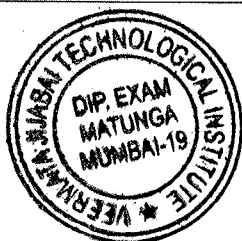


	1.4	Fundamentals of Ladder diagram			1	30%	40%	10%
2		<b>Programmable Logic Controller</b>	4	7				
	2.1	History of PLC			1,2	30%	40%	10%
	2.2	Block Diagram and application of PLC			1,2	30%	40%	10%
	2.3	Execution of Ladder diagram			1,2	30%	40%	10%
3		<b>Fundamentals of PLC programming</b>	8	11				
	3.1	Physical Components vs. Program Components of PLC wiring diagram			1,2	20%	60%	20%
	3.2	Ladder diagram for logic gates			1,2	20%	60%	20%
	3.3	Oscillator circuits, Disagreement circuits, Majority circuits etc.			1,2	20%	60%	20%
	3.4	Ladder diagram more than one rung			1,2	20%	60%	20%
4		<b>Mnemonics coding and Advance programming Techniques</b>	10	10				
	4.1	Introduction			1,2	20%	50%	30%
	4.2	Flip flop using PLC Program			1,2	20%	50%	30%
	4.3	Automatic one shot			1,2	20%	50%	30%
	4.4	Counters			1,2	20%	50%	30%
	4.5	Timers			1,2	20%	50%	30%

## SECTION-II

Unit & Sub-Unit	Topics/Sub-topics						
5	<b>Wiring Techniques</b>	12	14				
	5.1 PLC power connection			1,2	20%	60%	20%
	5.2 Input wiring			1,2	20%	60%	20%
	5.3 Solid State Output			1,2	20%	50%	30%
	5.4 Output wiring			1,2	20%	20%	60%
6	<b>Discrete Position Sensors</b>	10	13				
	6.1 Sensor output classification						
	6.2 Connecting Discrete sensors to PLC Inputs			1,2	20%	60%	20%
	6.3 Types of Sensors			1,2	20%	60%	20%
	6.4 PLC program using sensor						
7	<b>SCADA</b>	4	8				
	7.1 Introduction			3	20%	60%	20%
	7.2 Block diagram			3	20%	60%	20%
	7.3 Connection between PLC and SCADA			3	20%	60%	20%
	7.4 SCADA applications			3	20%	60%	20%

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



## V. LIST OF PRACTICALS/ASSIGNMENTS/TUTORIALS

Sr. No.	Unit	Practical/Assignment	Approx. Hours	Relevant COS
1	1	Introduction to PLC Components	2	1
2	1	Introduction to Ladder Diagram	2	1,2
3	3	Ladder diagram for Logic gates	2	1,2
4	3	Ladder diagram for adder and sub-tractor	2	1,2
5	4	Ladder Logic for Majority Circuit Applications	2	1,2
6	4	Timers using ladder logic	2	1,2
7	4	Real World Application using PLC	2	1,2
8	4	Counters using ladder logic	2	1,2
9	4	Flip-Flop using ladder logic	2	1,2
10	4	Using Multisim perform experiments.	2	1,2
11	4	Introduction to SCADA	2	3

\* Minimum 7 and maximum 8 practical/experiment sessions to be included in a course in a term

## VI. ASSESMENTS METHODOLOGIES /TOOLS

### Assignments

- Develop codes for relevant topics suggested by teacher.
- Solve an assignment on any relevant topic given by teacher.

### Micro Project (if any)

- Develop some simple real world application projects.

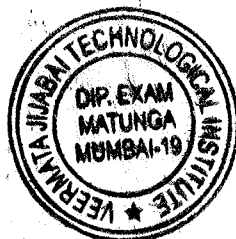
## VII. ASSESMENTS METHODOLOGIES /TOOLS

### Formative assessment (Assessment for Learning)

- Experiments performance and journal completion.
- Class Test
- Self-learning
- Term Work
- Seminar/Presentation

### Summative Assessment (Assessment of Learning)

- End Term Exam
- Micro-project.
- Assignments.



**VIII. SUGGESTED COS-POS MATRIX FORM**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3
CO1	1	-	-	3	-	1	2	1	-	2
CO2	1	2	1	3	1	1	2	1	-	1
CO3	1	2	2	3	-	1	2	-	1	1

Legends :- High:03, Medium:02,Low:01, No Mapping: -

**IX. SUGGESTED LEARNING MATERIALS TEXTBOOKS/REFERENCE BOOKS/WEBSITES**

No	Author	Title	Publisher
1	John R. Hackworth & Fredrick D. Hackworth	Programmable Logic Controller	Pearson Education
2	Terry L.M. Bartelt	Industrial Control Electronics: Devices, systems and applications	Thomson Delmar Learning
3	Gary Dunning	Introduction to Programmable Logic Controller	Thomson Delmar Learning

**X. LEARNING WEBSITES & PORTALS**

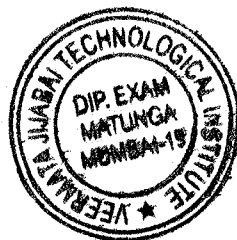
SR NO	LINK /PORTAL	DESCRIPTION
1	<a href="https://www.kopykitab.com/">https://www.kopykitab.com/</a>	PLC-SCADA
2	<a href="https://testbook.com/">https://testbook.com/</a>	PLC-SCADA
3	<a href="https://www.academia.edu/">https://www.academia.edu/</a>	PLC-SCADA

Curriculum Coordinator

Head of the Department

Dean Diploma

BOS VJTI Approval Dt. 23/05/2025



<b>DIPLOMA PROGRAMME</b>	<b>: DIPLOMA IN ELECTRONICS ENGINEERING</b>
<b>PROGRAMME CODE</b>	<b>: DELNE</b>
<b>SEMESTER</b>	<b>: SIXTH</b>
<b>COURSE TITLE</b>	<b>: INTRODUCTION TO SOLAR CELL</b>
<b>COURSE CODE</b>	<b>: 233EX56(c)</b>

### I. TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME						ASSESSMENT SCHEME											
CL	TL	LL	Self-learning	CR	Total IKS Hrs for Sem	PAPER HRS	FA-TH (ESE)	SA-TH (ESE)	TOTAL		Based on LL & TL Practical				Based on Self-learning		TOTAL MARKS
											FA-PR (CA)		SA-PR (PR/OR)		SLA		
									Max	Min	Max	Min	Max	Min	Max	Min	
3	-	2	-	2.5	-	3	30	70	100	40	25@	10	25#	10	-	-	150

### II. RATIONALE

This course introduces students to the basic principles of solar cells, focusing on their working mechanisms, types, and practical applications. Students will also learn about the materials, manufacturing processes, and systems used in solar energy conversion. By the end of the course, students will have hands-on knowledge of solar panel systems and how to integrate them into real-world applications.

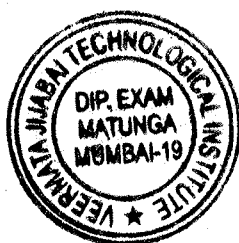
### III. COURSE OUTCOMES (COS)

Students will be able to achieve the following COS on completion of course based learning

CO1- Understand the basic principles of solar energy conversion with environmental aspects.

CO2- Learn about the types of solar cells and their materials.

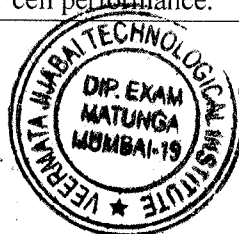
CO3- Gain practical knowledge in solar panel installation and troubleshooting.



#### IV. COURSE CONTENTS WITH SPECIFICATION TABLE

SECTION-I							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
<b>1</b>	<b>Introduction to Solar Energy and its History</b>	<b>5</b>	<b>6</b>				
	1.1 Overview of renewable energy sources.			1,2	35%	35%	30%
	1.2 Importance of solar energy in modern energy solutions with respect to its history.			1,2	35%	35%	30%
	1.3 Solar radiation and global potential.			1,2	35%	35%	30%
	1.4 Introduction to photovoltaic (PV) technology.			1	40%	40%	20%
	1.5 Basic semiconductor physics: p-n junctions, charge carriers, and energy bands.			1,2	35%	35%	30%
<b>2</b>	<b>Working of solar cell</b>	<b>10</b>	<b>15</b>				
	2.1 Working principle of solar cells.			1,2,3	35%	35%	30%
	2.2 Structure of a solar cell: Layers and their functions. The role of anti-reflective coatings and light trapping techniques. The importance of electrodes, contacts, and interconnections.			1,2,3	35%	35%	30%
	2.3 Key performance indicators of Solar cell :efficiency, power output, fill factor, and voltage.			2,3	35%	35%	30%
	2.4 Solar module parameters: efficiency, rating.			2,3	35%	35%	30%
	2.5 Measurement techniques: Current-voltage (I-V) characteristics, power output calculations.			2	30%	40%	30%
	2.6 Factors affecting solar cell performance: Temperature, shading, and angle of incidence.			2	30%	40%	30%
<b>3</b>	<b>PV module and Batteries</b>	<b>9</b>	<b>14</b>				
	3.1 Connection of PV module in series and parallel, estimation and measurement of module power.			2,3	35%	35%	30%
	3.2 Types, parameters and function of batteries for PV system			2,3	35%	35%	30%
	3.3 Series parallel combination of batteries , their maintenance and measurement.			2,3	35%	35%	30%
	3.4 Battery management system			2,3	20%	30%	50%

SECTION-II							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
<b>4</b>	<b>Materials Used in and Types of Solar Cell</b>	<b>10</b>	<b>12</b>				
	4.1 Overview of materials: Crystalline Silicon (Mono and Poly), Thin Films (CdTe, CIGS). Emerging materials: Perovskites, organic solar cells.			2	20%	50%	30%
	4.2 Material properties affecting solar cell performance.			2,3	20%	50%	30%

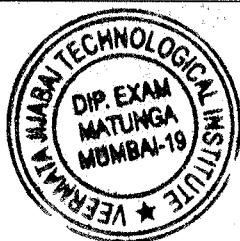


	4.3	Monocrystalline vs. Polycrystalline vs. Thin-film solar cells.			2,3	20%	50%	30%
	4.4	Comparison of efficiency, cost, and application of different types of solar cells. Advantages and disadvantages of each type			2	30%	50%	20%
<b>5</b>		<b>Solar Panel Installation and Maintenance</b>	<b>9</b>	<b>18</b>				
	5.1	Installation process of solar panels: Site selection, panel orientation, and tilt angle.			2,3	25%	35%	40%
	5.2	Electrical wiring and connection techniques for solar systems.			2,3	25%	35%	40%
	5.3	Maintenance: Cleaning, troubleshooting, and fault detection.			3	20%	40%	40%
	5.4	Safety considerations during installation and operation.			3	30%	40%	30%
	5.5	Real-Time applications in agricultural sector- i Solar-Powered Irrigation System ii Green House Heating And Ventilation iii Solar Powered Lightening			2,3	15%	35%	50%
<b>6</b>		<b>Economic and Environmental Aspects</b>	<b>5</b>	<b>5</b>				
	6.1	Cost-benefit analysis: Payback period, return on investment (ROI), and system performance.			1,2	45%	35%	20%
	6.2	Environmental impact: Carbon footprint and recycling of solar panels.			1	45%	35%	20%
	6.3	Government policies, incentives, and subsidies for solar energy.			1	50%	30%	20%
<b>Legends:</b> R- Remember, U – Understand, A – Apply and above levels (B!ooms’s Revised Taxonomy).								

*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.*

## V. LIST OF PRACTICALS/ASSIGNMENTS/TUTORIALS

Sr. No.	Unit	Practical/Assignment	Approx. Hours	Relevant COS
1	2	Understanding the structure of a solar cell through dissection and analysis.	3	1,2
2	2	Measuring the I-V characteristics of a solar cell.	3	2
3	3	Battery installation	3	2,3
4	3	Troubleshooting of Battery faults	3	2,3
5	3	Battery connections and their performance	3	2,3
6	4	Comparison and parameters of different types solar cells	3	1,2
7	5	Installation and configuration of a small solar power system	3	2,3
8	5	Case study on installed solar power system (Troubleshooting common solar system issues)	3	3
9	5	DCDB and ACDB configuration and placement	3	3
* Minimum 7 and maximum 8 practical/experiment sessions to be included in a course in a term				



## VI. ASSESSMENTS METHODOLOGIES /TOOLS

### Assignments

- Troubleshoot some simple real world application suggested by teacher.
- Solve an assignment on any relevant topic given by teacher.

### Micro Project (if any)

- Designing and implementing a basic solar energy system for a small application.

## VII. ASSESSMENTS METHODOLOGIES /TOOLS

### Formative assessment (Assessment for Learning)

- Experiments performance and journal completion.
- Mid semester Test
- Self-learning
- Term Work
- Seminar/Presentation

### Summative Assessment (Assessment of Learning)

- End Term Exam
- Micro-project.
- Assignments.

## VIII. SUGGESTED COS-POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3
CO1	3	-	-	1	3	1	1	1	2	3
CO2	2	2	1	2	2	2	3	3	3	3
CO3	1	3	3	3	1	3	3	2	3	1

Legends :- High:03, Medium:02,Low:01, No Mapping: -



**IX. SUGGESTED LEARNING MATERIALS TEXTBOOKS/  
REFERENCE BOOKS / WEBSITES**

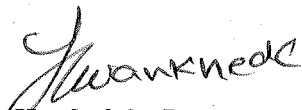
No	Author	Title	Publisher
1	M. A. Green.	"Introduction to Solar Cells"	
2	H. S. Rauschenbach.	"Solar Energy: Fundamentals and Applications"	
3	James P. Dunlop.	"Photovoltaic Systems"	
4	C. S. Solanki.	"Solar Cells: From Basic to Advanced Systems"	

**X. LEARNING WEBSITES & PORTALS**

SR NO	LINK /PORTAL	DESCRIPTION
1	Online resources such as instructional videos and interactive tutorials.	
2	Case studies on solar installations in various sectors (residential, commercial, agriculture).	
3	Practical guides and manuals for solar panel installation and maintenance.	



Curriculum Coordinator

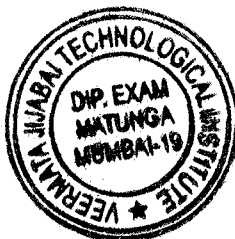


Head of the Department



Dean Diploma

BOS VJTI Approval Dt. 23/05/2025



DIPLOMA PROGRAMME	: DIPLOMA IN ELECTRONICS ENGINEERING
PROGRAMME CODE	: DELNE
SEMESTER	: FIFTH
COURSE TITLE	: INDUSTRY 4.0
COURSE CODE	: 233EX56(d)

### I. TEACHING AND EXAMINATION SCHEME:

TEACHING SCHEME						ASSESSMENT SCHEME											
CL	TL	LL	Self-learning	CR	Total IKS Hrs for Sem	PAPER HRS	FA-TH (MST)	SA-TH (ESE)	TOTAL		Based on LL & TL Practical				Based on Self-learning		TOTAL MARKS
											FA-PR (CA)		SA-PR (PR/OR)		SLA		
											Max	Min	Max	Min	Max	Min	
3	-	2	-	5	-	3	30	70	100	40	25@	10	25#	10	-	-	150

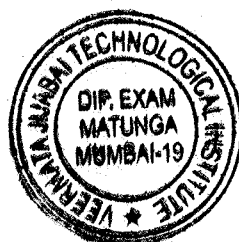
### II. RATIONALE

To equip students with fundamental knowledge, concepts, and principles of **Industry 4.0** as essential tools for automation and industrial control systems. To develop practical skills required for designing, programming, and troubleshooting automated systems, preparing students for advanced studies and careers in industrial automation and electronics engineering.

### III. COURSE OUTCOMES (COS)

Students will be able to achieve the following COS on completion of course based learning

- CO1- Understand and apply basic concepts of Industry 4.0 technologies.
- CO2 – Analyze Industry 4.0 systems and processes.
- CO3 – Analyze role of cybersecurity in Industry 4.0, communication protocols in Industry 4.0 and applications of Industry 4.0.

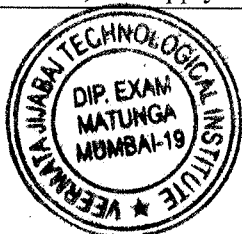


#### IV. COURSE CONTENTS WITH SPECIFICATION TABLE

SECTION-I							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
1	<b>Introduction to Industry 4.0</b>	5	08				
	1.1 Evolution of Industry 1.0 to 4.0			1	30%	50%	20%
	1.2 Key characteristics and principles of Industry 4.0			1	30%	50%	20%
	1.3 Overview of Industry 4.0 technologies and applications			1	30%	50%	20%
2	<b>Enabling Technologies of Industry 4.0</b>	10	16				
	2.1 Internet of Things (IoT)			1,2	30%	50%	20%
	2.2 Artificial Intelligence (AI) and Machine Learning (ML)			1,2	30%	50%	20%
	2.3 Big Data and Analytics			1,2	30%	50%	20%
	2.4 Cyber-Physical Systems (CPS)			1,2	30%	50%	20%
	2.5 Digital Twin Technology			1,2	30%	50%	20%
3	<b>Industrial Automation and Smart Manufacturing</b>	9	11				
	3.1 Sensors and Actuators			1,2	20%	60%	20%
	3.2 Industrial Robotics and smart factories.			1,2	20%	60%	20%
	3.3 Human-Machine Interaction			1,2	20%	60%	20%
	3.4 Advanced Process Control			1,2	20%	60%	20%

SECTION-II							
Unit & Sub-Unit	Topics/Sub-topics	Hrs	Marks	CO	R Level	U Level	A Level
4	<b>Communication Protocols in Industry 4.0</b>	08	12				
	4.1 Industrial IoT Communication Standards			1,3	20%	60%	20%
	4.2 5G and Wireless Technologies			1,3	20%	60%	20%
	4.3 OPC UA, MQTT, and Other Protocols						
5	<b>Additive Manufacturing and 3D Printing</b>	08	12				
	5.1 Role in Industry 4.0			1,3	20%	60%	20%
	5.2 Technologies and Materials . concept of sustainability .			1,3	20%	60%	20%
	5.3 Applications and Case Studies						
6	<b>Cybersecurity in Industry 4.0</b>	08	11	1,3	20%	60%	20%
	6.1 Threats and Challenges			1,3	20%	60%	20%
	6.2 Security Protocols and Risk Management			1,3	20%	60%	20%

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



*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.*

#### V. LIST OF PRACTICALS/ASSIGNMENTS/TUTORIALS

Sr. No.	Unit	Practical/Assignment	Approx. Hours	Relevant COS
1	1	Develop an IoT-based system to monitor and display temperature data using sensors and cloud integration.	2	1
2	2	Design a machine learning model for predictive maintenance by analyzing machine performance data.	2	1,2
3	2	Design a digital twin of an industrial process for simulation, analysis, and optimization using real-time data.	2	1,2
4	3	Implement an industrial automation system using PLC and SCADA for real-time monitoring and control.	2	1,2
5	3	Build an Arduino-controlled industrial robot arm with sensors for object detection and movement automation.	2	1,2
6	4	Implement an industrial IoT communication system using MQTT for real-time data exchange.	2	1,3
7	5	Case study on Additive manufacturing machines with IOT to enable real monitoring, predictive maintenance and remote operation.	2	1,2
8	6	Create an AI-based cybersecurity system to detect potential network threats using anomaly detection.	2	1,3
9	6	Develop cyber security awareness and policies for Industry 4.0	2	1,3
* Minimum 7 and maximum 8 practical/experiment sessions to be included in a course in a term				

#### VI. ASSESSMENTS METHODOLOGIES /TOOLS Assignments

- Develop codes for relevant topics suggested by teacher.
- Solve an assignment on any relevant topic given by teacher.
- Develop some simple real world application projects.

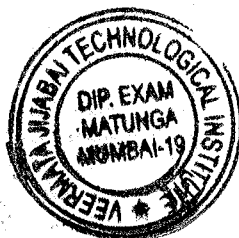
#### VII. ASSESSMENTS METHODOLOGIES /TOOLS

Formative assessment (Assessment for Learning)

- Class Test
- Self-learning
- Term Work
- Seminar/Presentation

Summative Assessment (Assessment of Learning)

- End Term Exam
- Micro-project.
- Assignments.



### VIII. SUGGESTED COS-POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3
CO1	1	-	-	3	-	1	2	1	-	2
CO2	1	2	1	3	1	1	2	1	-	1
CO3	1	2	2	3	-	1	2	-	1	1

Legends :- High:03, Medium:02,Low:01, No Mapping: -

### IX. SUGGESTED LEARNING MATERIALS TEXTBOOKS/REFERENCE BOOKS/WEBSITES


No	Author	Title	Publisher
1	Klaus Schwab	Klaus Schwab	Crown Business
2	David L. Rogers	Industry 4.0 : A guide for business leaders	Wiley
3	Hermann Kopetz	Cyber Physical Systems : A guide for industrial leaders	Springer

### X. LEARNING WEBSITES & PORTALS

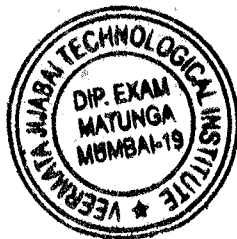
SR NO	LINK /PORTAL	DESCRIPTION
1	<a href="https://www.ibm.com">https://www.ibm.com</a>	Basics of Industry 4.0
2	<a href="https://www.geeksforgeeks.org">https://www.geeksforgeeks.org</a>	AI & ML in Manufacturing
3	<a href="https://onlinecourses.nptel.ac.in">https://onlinecourses.nptel.ac.in</a>	Industry 4.0

  
Curriculum Coordinator

  
Head of the Department

  
Dean Diploma

BOS VJTI Approval Dt. 23/05/2025



<b>PROGRAMME</b>	<b>DIPLOMA IN ELECTRONICS ENGINEERING</b>
<b>PROGRAMME CODE</b>	<b>: DEInE</b>
<b>SEMESTER</b>	<b>: SIXTH</b>
<b>COURSE TITLE</b>	<b>: PROJECT I</b>
<b>COURSE CODE</b>	<b>: 233EX57</b>

### I. TEACHING AND EXAMINATION SCHEME

TEACHING SCHEME					EXAMINATION SCHEME													
C L	T L	L L	Self - lear ning	CR	PAPER HRS	FA-TH (MST)	SA-TH (ESE)			Based on LL & TL Practical				Based on Self- learning		TOTAL MARKS		
						Max	Max	Min	TOTAL		FA-PR (CA)		SA-PR (PR/OR)		SLA			
									Max	Min	Max	Min	Max	Min	Max		Min	
-	-	4	2	3	-	-	-	-	-	-	-	50@	20	50#	20	-	-	100

### II. RATIONALE

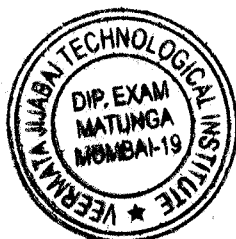
Students are introduced to the subject of Project to improve their confidence and fluency levels. The project provides an opportunity to read research papers and orient themselves for presentations, research paper writing and interact verbally and present their work in front of a gathering with expert help. Seminar presentation boosts the confidence of the students and prepares them precisely for facing the interview panels and group discussions. Through this subject on Project, students will develop new ideas and perspectives of the subject /themes of emerging technologies and services of their area of studies. Projects may even lead to innovations and startups due to their deep study in their chosen subject during the term.

### III. COURSE OUTCOMES (COs)

Students will be able to achieve the following COs on completion of course based learning

- CO1 - Collect relevant and updated research-based data and information to prepare a statement of purpose for the project.
- CO2 - Establish the action plan for the successful completion of the project under the guidance of an expert guide in the department.
- CO3 - Use various presentation tools and skills for presenting the project work in front of an expert panel.

### IV. GENERAL GUIDELINES FOR PROJECT PREPARATION, PRESENTATION AND SUBMISSION OF THE FINAL PROJECT REPORT



- a) Batches of students/sometimes individuals shall be formed for projects as decided by the Project Supervisor. The Project Supervisor shall be a faculty of the respective department.
- b) Students shall Identify the problem statement and finalise the topic for the project in consultation with their faculty supervisors.
- c) Students shall study and assess the feasibility of different solutions and the financial implications.
- d) Students should collect relevant data from different sources books / internet / market / suppliers / experts through surveys / interviews). Students shall prepare required drawings/ designs and detailed plans for the successful execution of the work.
- e) Students shall present their work on the project at the end of the term in front of the expert panel as framed by the department. They shall submit their ppts to their Project Supervisors for records.
- f) Students shall submit two copies of their final Project Reports bound in Maroon colour hardbound book format to their Project Supervisor. One copy shall be retained by the Supervisor and the other copy shall be kept with the Department Head. Students may prepare multiple copies for their own records as required.

### 1. Organisation of the Project report

The report shall be presented in a number of chapters, starting with Introduction and ending with Summary and Conclusions. Each of the other chapters will have a precise title reflecting the contents of the chapter.

A chapter can be subdivided into sections, subsections and sub-subsections so as to present the content discretely and with due emphasis.

When the work comprises two or more mutually independent investigations, the report may be divided into two or more parts, each with an appropriate title. However, the numbering of chapters will be continuous right through, for example Part 1 may comprise Chapters 2-5, Part Two, Chapters 6-9.

The report shall be presented in following sequence:

1. Title sheet
2. Dedication sheet (if desired)
3. Declaration of the Candidate
4. Approval Sheet
5. Abstract
6. Table of contents
7. List of tables (if desired)
8. List of Figures (if desired)
9. Abbreviations / Notations / Nomenclature (if desired)
10. Chapter One : Introduction



11. Chapter Two: Literature Review
12. Chapter/s : Report of Materials and Methods used in the Project work
13. Chapter : Results & Discussions
14. Chapter : Summary & Conclusions
15. Appendix / Appendices (if any)
16. References
17. Acknowledgements

### **Maroon Hard Binding / Spiral Binding Front Cover**

The front cover shall contain the following details:

- Full title of report in 6 mm 22 point's size font properly centered and positioned at the top.
- Full name of the candidate/s in 4.5 mm 15 point's size font properly centered at the middle of the page.
- A 40 mm dia replica of the Institute emblem followed by the name of department, name of the Institute and the year of submission, each in a separate line and properly centered and located at the bottom of page.
- All lettering shall be embossed in gold.

#### **Side of the Hardbound Cover**

- The Diploma awarded e.g. DCE / DEE / DELNE / DME / DCHE / DTE , the name of the candidate and the year of submission shall also be embossed on the bound (side) in gold.
- Blank Sheets In addition to the white sheets (binding requirement) two white sheets shall be put at the beginning and the end of the thesis.

#### **1. Title Sheet**

This shall be the first printed page of the report and shall contain the submission statement:

The Project Report submitted in partial fulfillment of the requirements of the Diploma in (name of the Diploma awarded), by (the name of candidate) and Roll No. (of the candidate), name(s) of the Project Supervisor / Co- supervisor (s) / Co-Guide(s) (if any), Department, Institute and year of submission.

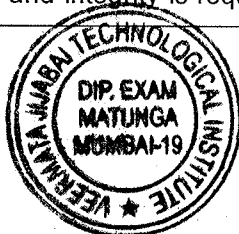
Sample copy of the 'Title Sheet' is appended (Specimen 'A')

#### **2. Dedication Sheet**

If the candidate so desires(s) he may dedicate his/her thesis, which statement shall follow the title page. If included, this shall form the page 1 of the auxiliary sheets but shall not have a page number.

#### **3. Declaration of the Candidate**

A declaration of Academic honesty and integrity is required to be included along with every report



before the approval sheet.

The format of this declaration is given in Specimen `B' attached.

#### **4. Approval Sheet**

In the absence of a dedication sheet this will form the first page and in that case shall not have a page number. Otherwise, this will bear the number two in Roman lower case "ii" at the center of the footer.

Sample copy of the 'Approval Sheet' is appended (Specimen `C')

#### **5. Abstract**

The 500 word abstract shall highlight the important features of the report and shall correspond to the electronic version to be submitted to the Library for inclusion in the website. The Abstract in the project report, however, shall have two more parts, namely, the layout of the thesis giving a brief chapter wise description of the work and the key words.

#### **6. Table of Contents**

The contents shall follow the Abstract and shall enlist the titles of the chapters, section and subsection using decimal notation, as in the text, with corresponding page number against them, flushed to the right.

#### **7. & 8. List of Figures and Tables**

Two separate lists of Figure captions and Table titles along with their numbers and corresponding page numbers against them shall follow the Contents.

#### **9. Abbreviation Notation and Nomenclature**

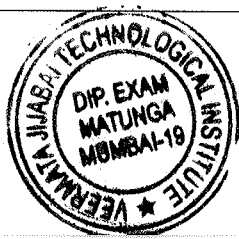
In general no abbreviations should be used in the text except for Technical terms. A complete and comprehensive list of all abbreviations, notations and nomenclature including Greek alphabets with subscripts and superscripts shall be provided after the list of tables and figures. (As far as possible, generally accepted symbols and notation should be used).

#### **10. Introduction**

The title of Chapter 1 shall be Introduction. It shall justify and highlight the problem posed, define the topic and explain the aim and scope of the work presented in the thesis. It may also highlight the significant contributions from the investigation.

#### **11. Review of Literature**

This shall normally form Chapter 2 and shall present a critical appraisal of the previous work



published in the literature pertaining to the topic of the investigation. The extent and emphasis of the chapter shall depend on the nature of the investigation.

## **12. Report of Materials and Methods used in the Project work**

The reporting on the investigation shall be presented in one or more chapters with appropriate chapter titles. Due importance shall be given to experimental setups, procedures adopted, techniques developed, methodologies developed and adopted.

While important derivations / formulae should normally be presented in the text of these chapters, extensive and long treatments, copious details and tedious information, detailed results in tabular and graphical forms may be presented in Appendices.

- Representative data in tables and figures may, however, be included in appropriate chapters.
- Figures and tables should be presented immediately following their first mention in the text. Short tables and figures (say, less than half the writing area of the page) should be presented within the text, while large tables and figures may be presented in separate pages.
- Equations should form separate lines with appropriate paragraph separation above and below the equation line, with equation numbers flushed to the right.

## **13. Results and Discussions**

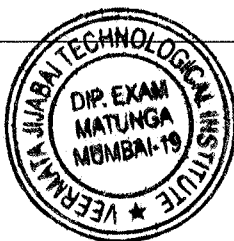
This shall form the penultimate chapter of the thesis and shall include a thorough evaluation of the investigation carried out and bring out the contributions from the study. The discussion shall logically lead to inferences and conclusions as well as scope for possible further future work.

## **14. Summary and Conclusions**

This will be the final chapter of the thesis. A brief report of the work carried out shall form the first part of the Chapter. Conclusions derived from the logical analysis presented in the Results and Discussions Chapter shall be presented and clearly enumerated, each point stated separately. Scope for future work should be stated lucidly in the last part of the chapter.

## **15. Appendix**

Detailed information, lengthy derivations, raw experimental observations etc. are to be presented in the separate appendices, which shall be numbered in Roman Capitals (e.g. "Appendix IV"). Since reference can be drawn to published / unpublished literature in the appendices these should precede the "Literature Cited" section.



## 16. References / Literature Cited

This should follow the Appendices, if any, otherwise the Summary and Conclusions Chapter. The candidates shall follow the style of citation and style of listing in one of the standard journals in the subject area consistently throughout his / her thesis, for example, IEEE in the Department of Electrical Engineering, Materials Transactions in Department of Metallurgical Engineering and Materials Science. However, the names of all the authors along with their initials and the full title of the article / monogram / book etc. have to be given in addition to the journals / publishers, volume, number, pages(s) and year of publication. Citation from websites should include the names(s) of author(s) (including the initials), full title of the article, website reference and when last accessed. Reference to personal communications, similarly, shall include the author, title of the communication (if any) and date of receipt.

Publications by the candidate, articles, technical notes etc. in the topic of the thesis published by the candidate may be separately listed after the literature cited. This may also be included in the contents. The candidates may also include reprints of his / her publications after the literature citation.

Format for Entry in reference / Bibliography:

*For paper published in Journal:*

Name/s of Author/s, (Year of Publication), "Title of the paper", Title of the Journal, Volume No, page no e.g.

Berny, J. (1889), "A new distribution function for risk analysis", Journal of the Operational Research Society, Vol. 40, pp.1121-7

*For text/reference book:*

Name/s of Author/s, (Year of Publication), Title of the book, Name of Publisher, Place e.g.

Canavos, G.C. (1984), Applied probability and statistical methods, Little, Brown & Company, Boston

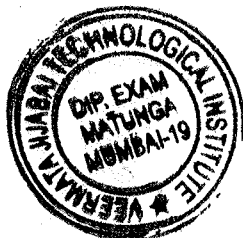
*For Thesis / Dissertation:*

Name of the researcher, (Year of submission), Name of University, Place e.g.

Dey, P.K. (1997), "Symbiosis of organizational re-engineering for effective implementation of projects" Doctoral thesis, Jadavpur University, Calcutta

## 17. Acknowledgements

The acknowledgments by the candidate shall follow the citation of literature, signed by him/her, with date.



# **1 THESIS FORMAT**

## **1.1 Paper**

### **1.1.1 Quality**

The thesis shall be printed / xeroxed on white bond paper, whiteness 95% or above, weight 70 gram or more per square meter.

### **1.1.2 Size**

The size of the paper shall be standard A 4; height 297 mm, width 210 mm.

### **1.1.3 Type, Setting, Text Processing and Printing**

The text shall be printed with Portrait orientation employing laser-jet or Inkjet printer, the text having been processed using a standard text processor. The standard font shall be Times New Roman of 12 pts with 1.5 line spacing and Justified alignment.

### **1.1.4 Page Format**

The Printed Sheets shall have the following written area and margins: Top Margin  
15 mm

Head Height 3 mm Head Separation 12

mm Bottom Margin 22 mm Footer 3 mm

Foot Separation 10 mm Text Height 245

mm Text Width 160 mm

When header is not used the top margin shall be 30 mm. Left and Right  
margins

The candidates shall have the options of single or double sided printing.

- Single sided/odd number page (in double sided printing) Left

Margin 30mm

Right Margin 20 mm

- Double sided even numbered page Left

Margin 20mm

Right Margin 30mm

### **1.1.5 Pagination**

Page numbering in the text of the thesis shall be Hindu Arabic numerals at the center of the footer. But when the candidate opts for header style the page number shall appear at the right and left top corner for the odd and even number pages, respectively.

Page number "1" for the first page of the Introduction chapter shall not appear in print, only the second page will bear the number "2".

The subsequent chapters shall begin on a fresh page (fresh odd number page in case of double sided printing). When header style is chosen the first page of each chapter will not have the header and the page number shall be printed at the center of the footer.





As far as possible tables and figures should be presented in portrait style. Small size table and figures (less than half of writing area of a page) should be incorporated within the text, while larger ones may be presented on separate pages. Table and figures shall be numbered chapter wise. For example, the fourth figure in chapter 5 will bear the number Figure 5.4 or Fig 5.4

Table number and title will be placed above the table while the figure number and caption will be located below the figure. Reference for Tables and Figures reproduced from elsewhere shall be cited in the last and separate line in the table and figure caption, e.g. (after McGregor [12]).

## **2 Auxiliary Format**

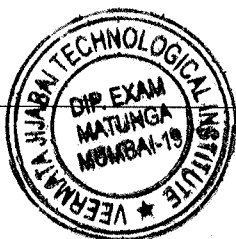
### **2.1 Binding**

The evaluation copies of the thesis / dissertation / report may be spiral bound or soft bound. The final hard bound copies to be submitted after the viva-voce examination will be accepted during the submission of report with the Maroon colour binding.

### **Typographical guidelines for Project Report:**

Following is the suggestive format for preparing the Project report. Actual report may differ slightly depending upon the nature of project. The project report may contain the following

- a) The project report shall be computer typed (English-British) and printed on A4 size paper.
- b) Text Font -Times New Roman (TNR), Size-12 point
- c) Subsection heading TNR- 12 point bold normal
- d) Section heading TNR- 12 capital bold
- e) Chapter Name/ Topic Name - TNR- 14 Capital
- f) All text should be justified. (Settings in the Paragraph)
- g) The report must be typed with 1.5 spacing with a margin 3.5 cm on the left, 2.5 cm on the top, and 1.25 cm on the right and at bottom.
- h) The project report must be hardbound in maroon colour. The name of the candidate, diploma (department), year of submission, name of the institute shall be printed on the cover [Refer sample sheet (outer cover)]
- i) The training report, the title page should be given first then the Certificate followed by the acknowledgment and then contents with page numbers.



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**Specimen 'A': Title Sheet**

**Title of the diploma programme: (examples)**

Diploma in Civil Engineering (DCE), Diploma in Electrical Engineering (DEE), Diploma in Electronics Engineering (DEInE), Diploma in Mechanical Engineering (DME), Diploma in Chemical Engineering (DChE) Diploma in Textile Engineering (DTE)

Project Report Titled  
(Title of the Report)

submitted in partial fulfillment of  
the requirements of

Diploma in (branch)

by

(Name of the student)  
(Registration number)

under the guidance of  
(Name of the Supervisor)

(Name of the Department)

Veermata Jijabai Technological Institute

Mumbai 400 019

(Year of Submission)



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**Specimen `B' Declaration of the Candidate**

**Declaration of the Candidate**

I declare that this written submission represents my ideas in my own words, where others' ideas or words have been included. I have adequately cited and referenced the original sources.

I also declare that I have adhered to all principles of academic honesty, integrity and have not misrepresented or fabricated or falsified any idea/ data/ fact/ source in my submission.

I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Signature of the candidate : \_\_\_\_\_

Name of the candidate: \_\_\_\_\_

Registration Number: \_\_\_\_\_

Date: \_\_\_\_\_



Specimen 'C' Approval Sheet

**CERTIFICATE**

This is to certify that (Name of the Student), a student of (name of the Programme), has completed the Project report entitled “(Title of the project)” to our satisfaction.

The project report submitted by (Name of the student) is approved for the Diploma in (branch) Engineering (short form of branch).

(Name & Signature)  
Supervisor

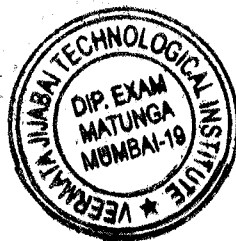
(Name & Signature)  
External Examiner

(Name & Signature)  
Co- Supervisor

(Name & Signature)  
Head, Name of Department

Date: \_\_\_\_\_

Place: \_\_\_\_\_



## V. ASSESSMENTS METHODOLOGIES /TOOLS

### 1. Formative assessment (Assessment for Learning)

#### A. Suggestive RUBRICS for assessment

Academic year : 20\_\_-20\_\_  
Title of the Project: \_\_\_\_\_  
Marks : Max 50, Min 20

Based on the following criteria

Sr No	Criteria	Marks
		<b>50</b>
1	Selection of Topic	5
2	Literature review and data collection	5
3	Quality of preparation during the Project period	5
4	Time Management	5
5	Innovativeness of the Topic	10
6	Stages of development of the action plan	10
7	Seminar Presentation report	10

Name of Supervisor : \_\_\_\_\_

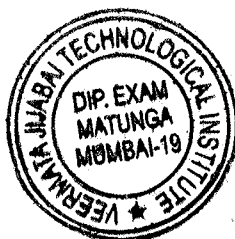
Signature of Supervisor : \_\_\_\_\_

#### B. Suggestive RUBRICS for summative assessment

Academic year : 20\_\_-20\_\_  
Title of the Project: \_\_\_\_\_  
Marks : Max 50, Min 20

Based on the following

The summative assessment of the students shall be based on the Presentation of the Project at the End of the Term in the form of Powerpoint presentation, Project report and Assessment by the External Examiner. Out of the Total 100 marks 50 marks shall be allotted by the Supervisor and 50 marks will be awarded by the External Examiner on the basis of the following criteria. The total marks of 20 shown in the column below shall be equally divided between the Supervisor and the External Examiner.



Sr No	Criteria	Marks 50
1	Quality of information/Knowledge/Creativity/Innovation presented in the Project Work.	10
2	Type of the project (Industrial / Practically implemented / Study etc.)	10
3	Response to the question during the presentation	10
4	Response to the question during seminar presentation	10
5	Quality / Timely submission of the Final Project report	10

Name of Supervisor : \_\_\_\_\_ Name of External Examiner: \_\_\_\_\_

Signature of Supervisor : \_\_\_\_\_ Signature of External Examiner: \_\_\_\_\_


#### VI. SUGGESTED COS-POS MATRIX FORM

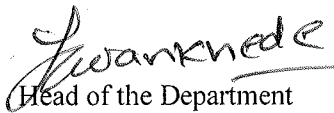
Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes * (PSOs)	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO - 2
CO1									
CO2									
CO3									

Legends :- High:03, Medium:02,Low:01, No Mapping: -

PSO1: Ability to apply knowledge of selecting raw materials, machines and process parameters using standard methods and engineering tools for designing solutions to meet specific needs of the textile industry.

PSO2: Understand the impact of textile processes in societal and environmental context and demonstrate the knowledge for sustainable development through teamwork and effective communication for lifelong learning.

  
Curriculum Coordinator

  
Head of the Department

  
Dean Diploma

BOS VJTI Approval Dt. 23/05/2025

