

Department of Electrical Engineering

P-16 Curriculum [Out Come Based (OBE)]

Semester-VI (Course Contents)

(Academically Autonomous Institute of Maharashtra Government)

49, Ali Yawar Jung Marg, Kherwadi, Bandra (E)

gpmumbai@gpmumbai.ac.in

Programme: Electrical Engineering

Sixth Semester

With effect from June 2018

Teaching & Examination Scheme for the Students admitted in Third Year in 2018-19

Seme	ster vi													
		Course Title			Teaching Scheme (Hrs /				Examination Scheme (Marks)					
Sr.	Course		Awards of Class	Compulsory	Wee	k)								
No.	Code			/ Optional	L	TU	Р	Total Credits	ТН	TS	PR	OR	TW	Total
1	EE 16 309	Electrical Estimation & Costing	1	C	3	2	0	5	70	30	0	50*	0	150
2	EE 16 310	Project & Seminar-II	1	С	0	0	4	4	0	0	0	50*	50	100
3	EE 16 311	Testing & Maintenance of Electrical Equipments	1	С	3	0	4	7	70	30	50*	0	0	150
4	(Elective-II) EE 16 408 EE 16 406	a. Microcontroller & Applicationsb. Special Machines	1	О	3	0	2	5	70	30	50*	0	0	150
5	EE 16 407	Industrial Automation	1	C	3	0	2	5	70	30	50*	0	0	150
6	EE 16 313	Industrial Training - II	1	C	0	0	2	2	0	0	0	25*	25	50
7	MG 16 502	Entrepreneurship Development	1	C	1	2	0	3	0	0	0	25*	25	50
8	MG 16 501	Industrial Organization & Management [#]	1	С	3	0	0	3	70#	30#	0	0	0	100
					16	4	14		350	150	150	150	100	
Total	Total Credits34Total Marks900									900				

Abbreviations: C- Compulsory; O- Optional; L- Theory Lecture; P-Practical; TU-Tutorial; TH- Theory Paper; TS- Term Tests (02); PR-Practical Exam; OR-Oral Exam; TW- Term Work. *Indicates assessment by External Examiner. # Indicates on line theory exam.

Academic Co-ordinator

Head of Electrical Engg. Dept.

Principal

Programme Code: EE									
Course Code: EE 16 309 Course Title: Electrical Estimation & Costing									
Compu	Compulsory / Optional: Compulsory								
Teachi	ng Schei	me and C	redits	Examination	Scheme				
TH TU PR Total TH TS PR OR TW Total									
03	03 02 05 70 30 50* 150								

* Indicates External Examiner

Rationale:

Role of Electrical diploma holder is to work as Technicians & Supervisors for Electrical Installations of residential, commercial and industrial electrification schemes and prepare estimates for these schemes. Has opportunity to work as independent electrical contractors and execute illumination and electrification schemes. Knowledge of electrical engineering drawing, IE rules, NEC (National Electric Code), professional ethics, different types of electrical installation their design considerations equips the students with the capability to prepare the schedule of materials with specifications and estimates for different types of electrical installations. The contents of this subject have been designed keeping in view developing requisite knowledge and skills of estimation and costing in students of diploma in electrical engineering.

Course Outcomes:

EE16309.1	Understand various types of electrical symbols, diagrams, IE rules and Important terms related to electrical installation.
EE16309.2	Recognize various types of materials required for wiring
EE16309.3	Prepare the schedule of materials with specifications and estimates for service mains.
EE16309.4	Draw the wiring plan; prepare the schedule of materials with specifications and estimates for residential and commercial buildings.
EE16309.5	Draw the layout of machines, wiring plan, prepare the schedule of materials with specifications for industries.
EE16309.6	Exercise of contractor ship and tendering

Contents:

1 : Electrical Symbols, Diagrams and IE Rules

- 1.1 Need of Symbols
 - **1.1.1** List of symbols for electrical equipment's and accessories used in electrical Works.
 - **1.1.2** Light, fan and power circuits, alarm and indicating circuit, contactor control circuits as per I.S.S.
- 1.2 Type of Diagrams
 - **1.2.1** Wiring diagrams (multiple and single line representation) and schematic diagrams as per I.S.S.
 - 1.2.2 Plans & Layouts
- **1.3** Wiring Materials and Accessories
 - **1.3.1** Brief description, general specifications (as per I.S.S.) and approximate cost of different types of wires, cables, switches, distribution board, switch board, boxes, batten and its accessories, conduit and its accessories, lamp holders, socket out lets, plug ceiling roses.
 - **1.3.2** Fuse and energy meter used in domestic and power wiring installations.
- 1.4 Important Terms & IE rules related to Electrical Installation

2 : Service Mains

- 2.1 Meaning of service mains and their types, I.S. specification and I.E. rules.
- 2.2 Over Head Service Mains –materials, main components and specifications.
- 2.3 UG Service Mains –materials, main components and specifications.
- 2.4 Estimation of overhead and underground service connection system. (Simple Numerical)

3 : Estimation and Costing of Residential and Commercial Buildings

- 3.1 General requirements of electrical installations for Residential flats and Commercial Buildings
 - **3.1.1** Relevant IE rules and IS standard practices
 - 3.1.2 Lighting and power sub circuits with their circuit designs
 - **3.1.3** Diversity factor for sub circuits
 - 3.1.4 Location of outlets and Control switches
 - **3.1.5** Main board and distribution boards with their selection of rating & numbers
 - 3.1.6 Load calculation, Cable selection and Conduit selection
 - 3.1.7 Permissible Voltage drops and size of wires and conductors
 - **3.1.8** Need of earthing and point to be earthed as per IE rules.
 - **3.1.9** Difference between Residential & Commercial installation.
- **3.2** Steps to be followed in preparing electrical estimate.
- **3.3** Detailed estimates and costing of Residential & Commercial Buildings. (Simple Numerical)

4 : Estimation and Costing of Industrial Installation

- **4.1** General requirements of electrical installations for industries.
- **4.2** Relevant IE rules and IS standard practices
- **4.3** Concept of industry load as per small, medium and large scale industries.
 - **4.3.1** Concept of single line diagram and motor wiring circuit & Electrical circuit diagram
- **4.4** Design considerations of electrical installation in industries.

- **4.4.1** Motor current calculations
- **4.4.2** Points considered for the location of motor, starter and cable route
- 4.4.3 Selection and rating of wire, cable and size of conductor
- 4.4.4 Selection of rating of fuse wire, starter, main board, distribution board
- **4.4.5** Determination of length of Wire, Cable and Conduit
- **4.4.6** Need of industry earthing and point to be earthed as per IE rules.
- 4.5 Essential requirements for the design of foundation of static and rotating machines.
 - **4.5.1** Factors considered for the design of foundation
 - **4.5.2** Procedure of levelling and alignment of two shafts of directly and indirectly coupled drives
 - 4.5.3 Effects of Misalignment
 - 4.5.4 Installation of rotating machines as per Code of Practice 900:1992
 - 4.5.5 Installation of small Substations
 - **4.5.6** Introduction to installation of Solar roof panel
- **4.6** Steps to be followed in preparing electrical estimate.
- 4.7 Detailed estimates and costing of small scale industries/workshop (Simple Numerical)

5 : Contracting and Tenders

- 5.1 Contacting
 - 5.1.1 Concept of Contracts, their types and Contractors
 - 5.1.2 Contract Documents Valid Contracts
- 5.2 Tenders
 - **5.2.1** Concept of Tenders and their types
 - 5.2.2 Tender notices and general conditions in Tender forms
 - 5.2.3 Procedure for submission and opening of Tenders
 - **5.2.4** Comparative Statements and Criterion for selecting Contractors
 - 5.2.5 Administrative approval and Technical sanctions
 - **5.2.6** Principles of Execution of work
 - 5.2.7 Billing of Executed work
 - 5.2.7.1 Compare various methods of Billing

Suggested specification table with Hours and Marks (Theory)

Unit		Teaching	Distribution of Theory Marks					
No	Topic Title	Hours	R Level	U Level	A Level	Total Marks		
1	Electrical Symbols, Diagrams and IE Rules	04	02	02	04	08		
2	Service Mains	08	02	04	06	12		
3	Estimation and Costing of Residential and Commercial Buildings	18	04	10	12	24		
4	Estimation and Costing of Industrial Installation	12	02	04	08	16		
5	Contracting and Tenders	06	02	04	04	10		
	Total	48	12	24	34	70		

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom'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. Numerical questions are to be asked only if specified

List of Tutorials/Assignments:

Sr.	Unit	Title
No.	No.	
1	1	Drawing sheet containing List of symbols for electrical equipment's.
2	1	Drawing sheet containing Light, fan and power circuits, alarm and indicating circuit, contactor control circuits as per I.S.S.
3	1	Drawing sheet containing wiring diagrams and single line diagrams.
1	2	Drawing sheet containing overhead service mains and underground service mains
4	Δ	connection with required accessories.
5	3	Practice to draw layout (Single line diagram) of Residential & Commercial Buildings.
6	3	Wiring diagram (real time problem) of Residential & Commercial Buildings.
7	4	Practice to draw layout (Single line diagram) of Industrial installation
0	1	Wiring diagram (real time problem) of Industrial installation with minimum two
0	4	machines.
9	4	Drawing sheet containing installation of small substation
10	4	Drawing sheet containing installation of Solar Roof Panel

Reference Books:

- 1. Electrical Installation, Estimating and Costing by JB Gupta, SK Kataria and Sons, New Delhi.
- 2. Estimating and Costing by SK Bhattacharya, Tata McGraw Hill, New Delhi.
- 3. Estimating and Costing by Surjeet Singh, Dhanpat Rai & Co., New Delhi.
- 4. Estimating and Costing by SL Uppal, Khanna Publishers, New Delhi.
- 5. Electrical Estimating and Costing by N Alagappan and B Ekambaram, TMH, New Delhi.
- 6. Estimating and Costing by Qurashi

Websites:

www.mahatransco.com www.mhedcl.com

Course Curriculum Development Committee:

a. Internal Faculty

- i. Dr. P.N. Padghan
- ii. Mrs.V.U. Bhosale

b. External Faculty

i. Mrs R.U. Patil (VPM Polytechnic, Thane)

Academic Coordinator

Head of Department (Electrical Engineering) Principal Govt. Polytechnic, Mumbai

CO VS PO Matrix

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
EE16309. 1	3	1	3	3	1	1	1	1	1	3
EE16309. 2	1	2	2	2	1	2	1	1	1	3
EE16309. 3	3	3	3	2	2	3	2	2	2	3
EE16309. 4	3	3	3	2	2	3	2	2	2	3
EE16309. 5	3	3	3	2	2	3	2	2	2	3
EE16309. 6	3	3	3	1	3	3	3	3	3	3
Avg. of POs	2.67	2. 5	2.83	2	1.83	2.5	1.83	1.83	1.83	3

CO Vs PSO Matrix

СО	PSO1	PSO2	PSO3
EE16309.1	2	2	3
EE16309.2	2	2	2
EE16309.3	2	3	2
EE16309.4	2	3	3
EE16309.5	2	3	3
EE16309.6	1	3	3
Avg. of PSOs	1.833	2.667	2.667

Unit Vs CO Matrix

Unit	EE16309.1	EE16309.2	EE16309.3	EE16309.4	EE16309.5	EE16309.6
1	3	3	2	2	2	1
2	2	2	3			3
3	2	2		3		3
4	2	2			3	3
5	2	2	3	3	3	3
Avg. of COs	2.2	2.2	1.6	1.6	1.6	2.6

Programme: Diploma in Electrical Engineering								
Course Code: EE16310 Course Title: Project & Seminar II								
Compuls	Compulsory / Optional: Compulsory							
Teach	Teaching Scheme and Credits Examination Scheme							
TH TU PR Total TH TS PR OR TW Total								Total
-	4 4 50* 50 100							

Rationale:

The aim of the project is to provide an opportunity to the students to work on an open-ended engineering problem. The students will be able to apply knowledge from different areas or courses, which they have studied in their curriculum to a real-world scenario. The scientific way of solving the problems and ability to apply it to find alternative solutions for the problems will help them in their professional life. This course will help to inculcate leadership skills, decision making, participative learning, resource management, cost considerations, documentation and report writing skills with effective communication.

Course Outcomes: Student should be able to:

EE16310.1	Propose projects with innovative ideas in a clear and concise manner
FE16310.2	Identify and summarize an appropriate list of literature review, analyze previous work
EE10510.2	done and relate them to current project
EE16310.3	Plan and coordinate work in a group.
EE16310.4	Implement the skills acquired in the previous semesters to solve complex engineering problems.
EE16310.5	Test the designed project model and evaluate its performance.
EE16310.6	Communicate effectively in oral or written format to present the working of their project/product.

Course Details:

• The Project groups of fifth semester will continue the project work in sixth semester and complete project in all respect

1. Activity plan

Sr.	Activity	Week
No.		No
1	Prepare activity plan	1
2	Allocation of work responsibility to individual/team	2
3	Visits to Industries / Institutions / Market/field work/sites	3
4	Collection of Data /Survey/Analysis	4
5	Design of Components, preparation of drawing, estimates wherever	5,6
	required, printed circuits design, its checking,	
6	Fabrication, Assembling, Model/Prototype development, Testing as per	7,8,9,10
	project requirements	
7	Consolidation of work allotted to individual or team	11
8	Presentation of initial draft: pre-submission draft	12
9	Final Project Report: Printed: Submission: soft & Hard copy	13
10	Group presentation of project work at the time of final evaluation	16

The project work along with project report should be submitted as part of term work in third year sixth semester on or before the term end date.

2. Project Execution:

1. Guide shall monitor the work and help the students from time to time.

2. A project diary is to be maintained by each student, giving details of planning, work executed, information collected etc., on weekly basis and the same should be shown to the guide concerned

4. The guide should maintain a record of progressive / continuous assessment of project work and observe the progress of each group member on weekly basis.

5. The same shall be kept ready for submission to the external examiner before the final examination.

3. Project Report:

1. The student shall get the initial draft copy of the project approved from the Project Guide.

2. Structure: It shall be as follows

Project Report Structure

- Title page
- Inner title page (white)
- Certificate
- Certificate from Industry
- Index/Content/Intent
- List of Abbreviations/Symbols
- List of Figures
- List of Graphs
- List of Tables
- List of if any other inclusion
- Introduction
- Literature Survey/Review
- System Development
- Performance Analysis
- Conclusion
- References
- Appendices
- Acknowledgement
- 1. Introduction (2-3 pages)
 - 1.1 Introduction
 - 1.2 Need/Necessity/Motivation
 - 1.3 Objectives
- 2. Literature Survey/Review (5-10 pages)

Related information available in standard Books, Journals, Transactions, and Internet Websites.

3. System Development (20-25 pages)

- The reporting shall be presented in one or more chapters with appropriate chapter titles.
- Experimental setups, procedures adopted, techniques developed, methodologies adopted. Important derivations/formulae
- Figures and tables should be presented immediately following their first mention in the text.

4. Performance Analysis (5-15)

• Test results

5. Conclusions (1 page)

- 5.1. Conclusion
- 5.2. Future Scope
- 5.3. Applications/Utility

6. References (1-2 pages)

- Author, "Title", Name of Journal/Transactions/ Book, Edition/Volume, Publisher, Year of Publication, pp.___.
- In case of web pages complete web page address with assessing date has to be enlisted
- List of references should be as per use in the text of the report

7. Appendices (5-7 pages)

- Related data or specifications or referred charts, details computer
- Code/program, etc.

8. Acknowledgement (1 page)

• Expression of gratitude and thankfulness for helping in completion of the said task with names starting from Guide, HOD, Principal and related persons Signed by the candidate.

9. General Guidelines

- Text should be printed on front and correct side of the watermark on quality white bond paper
- Paper size-A4
- Font : Times New Roman
- Report heading :- All capital-16 font
- Chapter heading :- All capital-14 font
- Subchapter :- Title case-12 font
- Sub-subchapter :- First alphabet capital case-12 font
- Content : -Sentence case-12 font
- Title of the Report should not be more than two lines
- Spacing between lines-1.5
- Left Margin-1.5"

- Right Margin-1/2"
- Top Margin-1"

10 Flap

Suitable flap with name of the candidate, Department, Institute, symbol of can be used with nylon strip

Course Curriculum Development Committee:

a. Internal Faculty

i.	Ms. V.U. Bhosale	LEE
ii.	Mr. I.N. Khuspe	LEE

b. External Faculty

i. Mr N.D. Adate SBM Polytechnic Mumbai.

Academic Coordinator	Head of Department	Principal
	Electrical Engg.	Govt. polytechnic Mumbai

CO Vs PO Matrix:

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
EE16310.1	2	2		2				2	3	2
EE16310.2	1	1	1	1	1	1	1	3	3	2
EE16310.3								3	3	2
EE16310.4			3	3				3	3	2
EE16310.5	1	1	3	3				3	3	2
EE16310.6								3	3	2

CO Vs PSO Matrix:

СО	PSO1	PSO2	PSO3
EE16310.1		2	2
EE16310.2		2	2
EE16310.3			3
EE16310.4	3	3	3
EE16310.5	3	3	3
EE16310.6			3

Programme : Diploma in Electrical Engineering									
Course Code: EE 16 311 Course Title: Testing and Maintenance of Electrical Equipment									
Compul	Compulsory / Optional: Compulsory								
Teachi	ng Sche	eme and	l Credits		Exa	minatio	n Scheme		
TH	TU	PR	Total	TH TS PR OR TW Total					
03		04	07	70 30 50* 150					

(*) indicates assessment by External examiner

Rationale:

This is applied technology level subject with application in industry, commercial, public utility departments of government / municipal councils, residential buildings etc. After studying this subject student will be able to inspect / test / troubleshoot electrical machines. They will be conversant about Indian Electricity Act, safety rules, safety of machines & persons, prevention of accident. Also students will be able to carry out routine and preventive maintenance of electrical equipment.

Course Outcomes:

EE 16 311.01	Know safety measures & state safety precautions.
EE 16 311.02	Test and troubleshoot Transformer, AC machine as per IS code of practise
EE 16 311.03	Identify / Locate common troubles in electrical machines & switch gear.
EE 16 311.04	Plan & carry out routine & preventive maintenance.
EE 16 311.05	Diagnosis and recondition of Insulating materials resistance as per IS code.

Unit	Topics/Subtopics					
No.						
1	Safety & Prevention:					
	1.1 Definition of terminology used in safety; safety, hazard, accident, major accident					
	hazard, responsibility, authority, accountability, monitoring.					
	1.2 Indian Electricity Act 1956 - Chapter IV General Safety Requirements					
	Section-29 Construction, installation, protection, operation & maintenance of					
	electric supply lines and apparatus, Section 30- Service lines and apparatus on					
	consumers premises, Section 36- Handling of electric supply line and					
	apparatus, General Electricity Safety precautions (Do's & Don't's).					
	1.3 Meaning & causes of electrical accidents; factors on which severity of					

	Shock depends, Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration.1.4 Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers.
2	General Introduction: 2.1 Objectives of testing significance of I.S. Concept of tolerance, routine tests, type
	 tests, special tests 2.2 Concept of routine, preventive & breakdown maintenance, advantages of preventive maintenance, procedure for developing preventive maintenance schedule, Factors affecting preventive maintenance schedule. Computerised Maintenance Management System (CMMS), Total Productive Maintenance 2.3 Earth resistance and earth resistivity, factors affecting earth resistance, earth resistivity of different soil composition, methods for reducing soil resistance 2.4 Testing of earth resistance and earth pit electrode: Basic earth resistance test method
	four terminal method, fall of potential method, permissible resistance of the earthing
	required for different electrical installations
3	 Transformers: 3.1 Enlisting type test, routine test & special test as per I.S. 2026-1981. 3.2 Procedure for conducting following tests: Measurement of winding resistance, no load losses, & no load current, Impedance voltage, load losses, Insulation resistance, Induced over voltage withstand test, separate source voltage withstand test, Impulse voltage withstand test, Temperature rise test of oil & winding, 3.3 Preventive maintenance & routine maintenance of distribution transformer as per I.S. 10028(part III): 1981. 3.4 Periodic checks for replacement of oil, silica gel 3.5 Causes of failure of transformer, Various types of faults (mechanical, electrical & magnetic), reason of occurrences 3.6 Trouble shooting charts for single phase and three phase transformer
4	 Induction Motors: 4.1 Enlist of type tests, routine tests & special tests of 1 & 3 phase Induction motors. 4.2 Procedures of routine test on single phase and three phase induction motors as per IS7572:1984 and IS code 4029:2010 respectively 4.3 Routine, Preventive, & breakdown maintenance of 1 & 3 phase Induction motors
	 as per IS 9001:1992. 4.4 Maintenance schedule of alternators & synchronous machines as per IS 4884- 1968. 4.5 Causes of failure of induction motor, Various types of faults (mechanical, electrical & magnetic), reason of occurrences 4.6 Trouble shooting charts for single phase and three phase induction motor

5	Insulation:
	5.1 Factors affecting life of insulating materials, classifications of insulating
	materials
	as per IS:1271-1958
	5.2 Measuring insulation resistance by different methods such as i) Polarization,
	ii)Dielectric absorption, Prediction of the of insulation condition from measurement data
	5.3 Reconditioning of insulation - cleaning and drying the insulation, re-
	varnishing,
	vacuum impregnation.
	5.4 Insulating oil - properties of insulating oil, causes of deterioration of oil,
	testing of
	transformer oil as per IS 1866- 1961, purification of insulating oil.

Suggested Specifications Table with Hours and Marks (Theory):

Unit	Topic Title	Teaching	Distribution of Theory Marks				
No		Hours	R	U	Α	Total	
			Level	Level	Level	Marks	
1	Safety & Prevention	4	2	2	4	8	
2	General Introduction	8	2	4	4	10	
3	Transformers	16	4	8	10	22	
4	Induction Motors	14	4	8	8	20	
5	Insulation	6	2	4	4	10	
	Total	48	14	26	30	70	

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom'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. Numerical questions are to be asked only if specified.

List of Practical :

Sr. No	Unit	Experiment/Assignment	Approx Hours
1	1	Demonstration and practise of artificial respiration technique after electrocution	2
2	1	Demonstration of use in fire extinguisher in case of fire due to electrical abnormal conditions	2
3	2	Measurement of resistance of earth pit electrode which available at institute	6
4	2	Measurement of earth resistivity and locate best spot for earthing pit	6

5	3	Perform routine test on transformer as per latest IS code 2026- 1981 (min three test)	6
6	4	Perform routine test on 1- phase induction motor as per code IS7572:1984 (min three test, other than insulation resistance test)	6
7	4	Perform routine test on 3- phase induction motor as per cod IS4029:2010 (min three test, other than insulation resistance test)	6
8	4	Observe & carry out weekly, monthly & yearly maintenance of motor in your workshop & prepare its report	4
9	5	Prepare trouble-shooting chart for single and three phase transformers	4
10	5	Prepare trouble-shooting chart for single and three phase motors.	4
11	6	Determine breakdown strength of transformer oil.	2
12	6	Perform insulation resistance test on motor as per IS code	4
13	3	Perform temperature rise test on transformer as per IS code	6
14	3	Perform temperature rise test on motor as per IS code	6

Reference Books:

Sr. No.	Book Title	Author	Publication
1	Operation & Maintenance Of Electrical Machines (Volume I and II)	B.V.S.,Rao	Media Promoters &
			Publishers
			Ltd. Mumbai
2	Preventive Maintenance Hand Books & Journals	C.J.Hubert	
3	Introduction to industrial safety	K.T.Kulkarni.	
4	Latest IS Codes	BIS	BIS
5	Design &Testing of Electrical Machines	M. V. Deshpande.	PHI Learning Pvt. Ltd., 2010
6	Installation, Maintenance and Repair of Electrical Machines	M. Gupta,	S.K. Kataria & Sons, Edition 2014
7	Maintenance & Repairs	Rosenberg.	Mc GRAW- HILL, 1st Edition, May 2003

8	Preventive Maintenance of	S.K. Sharotri,	Mcgraw-
	Electrical Apparatus	Gielicoe	2 _{nd} Edition.
			June
			1969

Course Curriculum Development Committee:

a. Internal Faculty

- i. I. N Khuspe
- ii. Mr. M. S. Narkhede

b. External Faculty

i. Dr. Dilip Lulekar

Academic Coordinator	Head of Department	Principal
	(Electrical Engineering)	Govt. Polytechnic,

Mumbai

Programme: EE										
Course Code: EE16 408 Course Title: Microcontroller & Applications										
Compuls	Compulsory / Optional: Optional									
Teach	Teaching Scheme and Credits Examination Scheme									
TH	TU	PR	Total	TH TS PR OR TW Total						
3	-	2	5	70	30	50 *	-	-	150	

Rationale:

This course deals with architecture and application of 8051 microcontroller. As the technology is changing, many electrical applications are now microcontroller based so it will be beneficial for students to learn the architecture, programming, interfacing & real world applications of microcontroller in the field of Electrical engineering.

Course Outcomes:

Student should be able to:

EE16408.1	Comprehend the concepts and basic architecture of 8051 microcontroller
EE16408.2	Interpret the difference between microprocessor and microcontroller
EE16408.3	Recalls 8051 instruction set & composes programs of 8051 microcontroller
EE16408.4	Analyzes and Interface different external devices to the processor according to the user requirements
EE16408.5	Implementation of 8051 in the field of Electrical Engineering

Course Content Details:

Unit No	Topics / Sub-topics							
1	Introduction Microcontrollers							
	1.1 What is Microcontrollers							
	1.2 Microcontrollers Vs Microprocessors							
	1.3 Basic architecture							
	1.3.1 microcontroller chips							
	1.3.2 features of modern microcontroller							
	1.3.3 internal structure of microcontroller							
	1.3.4 Harvard Vs Princeton architecture							
	1.3.5 Micro coded and hard coded processor							
	1.4 Memory Types							
	1.4.1 ROM							
	1.4.2 EPROM							
	1.4.3 EEPROM							
	1.4.4 Flash							
	1.5 Memory Organization,							
	1.6 External Memory Interfacing, Stacks							
2	8051 Microcontrollers							
	2.1 Introduction to Intel 8051 Microcontrollers							
	2.1.1Basic 8051 Architecture (Block Diagram & Features)							

	2.1.2 Clock and Instruction Cycle
	2.2 Internal RAM Structure
	2.3 Internal Data Memory Map
	2.4 Special Function Register map
	2.5 Processor Status Word
	2.6 Addressing Modes
	2.6.1 Immediate
	2.6.2 Direct
	2.6.3 Register
	2.6.4 Register Indirect
	2.7 I/O Port Configuration (port0, port1, port2, port3)
	2.8 Interfacing of External Memory
2	0071 D '
3	8051 Programming:
	3.2805 INitcrocontroller Instructions:
	2.2.2. A still wastin Lester stillers
	3.2.2 Arithmetic Instructions,
	3.2.4 Logical Instructions,
	3.2.5 Branch Instructions,
	3.2.0 Subjourne instructions,
	3.3 Assembler Directives.
	3.4 Assembly Language Programs
	3.5 Time Delay Calculations.
4	Interfacing with 8051 and Applications:
	4.1Basics of I/O Concepts, I/O Port Operation,
	4.2 Interfacing 8051 to LCD, Keyboard,
	4.3 Interfacing with ADC, DAC,
	4.4 Stepper Motor Interfacing
	4.5 DC Motor Interfacing and Programming
5	8051 Interrupts and Timors/counters:
0	5.1 Basics of Interrunts
	5.1.1 Schematic Representation
	5.1.1 Schematic Representation
	5.1.2 Types
	5.1.5 Interrupt Enable Register (IE)
	5.1.4 Priority Level Structure
	5.1.5 Interrupt Priority Register (IP)
	5.2 Timers / Counters
	5.2.1 Timer Control (TCON)
	5.2.2 Timer Modes
	5.2.3 Timer Mode Control (TMOD)

6	8051 Serial Communication:					
	6.1 Serial Interface					
	6.1.1 Serial Port Control Register (SCON)					
	6.1.2 Power Mode Control Register (PCON)					
	6.1.3 Data Transmission and Reception (only in mode 0 and 1)					
	6.2 8051 Serial Communication, Connections to RS-232,					
	6.3 Serial Communication Programming					
	6.4 8255A Programmable Peripheral Interface:,					
	6.5 Architecture of 8255A,					
	6.7 I/O Addressing,					
	6.8 I/O Devices Interfacing With 8051 Using 8255A.					

Suggested Specifications Table with Hours and Marks (Theory):

Unit		Teaching	Distribution of Theory Marks				
No	Topic Title	Hours	R Level	U Level	A Level	Total Marks	
1	Introduction Microcontrollers	06	04	04	02	10	
2	8051 Microcontrollers	12	02	04	02	08	
3	8051 Programming	08	02	06	06	14	
4	Interfacing with 8051 and Applications	08	04	02	06	12	
5	8051 Interrupts and Timers/counters	08	04	04	06	14	
6	8051 Serial Communication	08	02	04	06	12	
	Total	48	17	25	28	70	

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

List of Experiments/Assignments: (Please note that perform any 10 Experiments)

1	Develop a program to Blink LED for 1Second	02
2	Develop a program to interface Input Switches and output LEDs with development board (arduino).	02
3	Write a program for interfacing LCD to Microcontroller	04
4	Write a program for interfacing Keyboard to microcontroller	02
5	Write a program for Relay interfacing with microcontroller	02
6	Write a program for DC motor interfacing with microcontroller	02
7	Write a program for interfacing with Stepper Motor microcontroller	04
8	Write a program for temperature sensor LM35	02
9	Interfacing to 8051 and programming to Control stepper motor	04

10	Interfacing ADC to 8051	02
11	Interfacing DAC to 8051	02
12	Interfacing of Servomotor with 8051	04
	Total	32

References/ Books:

Sr.No.	Name of Book	Author	Publisher
1	Microcontrollers	Rajkamal	Pearson Education
2	The 8051 Microcontroller and embedded system using assembly and C	Muhammad Ali Mazidi	Pearson
3	The 8051 Microcontroller	Kenneth J. Aayala	Thomson
4	Programming and customizing The 8051 Microcontroller	Myke Predko	Tata McGraw-Hill

Course Curriculum Development Committee:

a. Internal Faculty

- 1) Ms. Pritam A. Khande
- 2) Dr. P.N. Padghan

b. External Faculty

i. Dr. N.D.Chavan KJ Somaiya Polytechnic, Mumbai

Academic Coordinator

Head of Department (Electrical) Principal Govt. Polytechnic, Mumbai

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
EE16408.1	3	2	2	2	-	-	-	-	-	-
EE16408.2	3	1	2	1	-	-	-	-	-	-
EE16408.3	1	1	2	2	-	-	-	1	-	1
EE16408.4	1	2	2	1	-	-	-	1	-	1
EE16408.5	2	2	3	2	-	1	1	1	-	2

CO Vs PO matrix

CO Vs PSO Matrix

CO/PSO	PSO1	PSO2	PSO3
EE16408.1	-	1	1
EE16408.2	-	-	-
EE16408.3	-	-	-
EE16408.4	-	-	1
EE16408.5	2	1	2

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction Microcontrollers	EE16408.1, EE16408.2
2	2	8051 Microcontrollers	EE16408.1, EE16408.2, EE16408.4
3	3	8051 Programming	EE16408.3, EE16408.4
4	4	Interfacing with 8051 and Applications	EE16408.2, EE16408.3, EE16408.4, EE16408.5
5	5	8051 Interrupts and Timers/Counters	EE16408.3, EE16408.4
6	6	8051 Serial Communication	EE16408.4, EE16408.5

Programme : Diploma in Electrical Engineering									
Course Code: EE 16 406 Course Title: Special Machines									
Compul	Compulsory / Optional: Optional								
Teachi	Teaching Scheme and Credits Examination Scheme								
TH	TU	PR	Total	TH TS PR OR TW Total					
03	00	02	05	70 (3 Hrs.)	30	50*(Ext)	-	-	150

Rationale:

In the changing scenario of today's highly automated world day by day the interest on special machines is increasing. These machines serve for several applications. Students are being introduced with special machines as these machines have wide applications in industry, robotic and automation. It is expected that the knowledge of construction, working principles, basic characteristics of these motor will bring deep sight ness in the students, which will enable them to work comfortably in the highly changing industry.

Course Outcomes:

Student should be able to

EE16406.1	Explain the construction, working and starting methods of 1 ϕ Induction Motors						
EE16406.2	Describe concept of revolving field						
EE16406.3	State advantages/ disadvantages of 1¢ IM over 3¢ IM						
EE16406.4	Describe the construction and working of 1ϕ synchronous motors						
EE16406.5	Describe working and phasor diagrams of compensated and repulsion motor.						
EE16406.6	Describe construction, working and classify LIM, stepping motor						
EE16406.7	Describe construction, working and classify Synchronous Reluctance Motor,						
	Switched Reluctance Motor, BLDC, Permanent Magnet Synchronous Motors						
	and their applications.						

Unit No	Topics / Sub-topics
01	Single Phase Induction Motors:
	1.1 Constructional details
	1.2 Revolving field theory
	1.3 Classification
	1.4 Starting methods for Split Split Phase, Shaded Pole, Repulsion, Reluctance motors
	1.5 Comparison with 3\u00e9 induction motors
	1.6 Characteristics of split phase, shaded pole, repulsion, reluctance type 1¢ induction
	motor and their applications.
02	Single Phase Synchronous Motors:
	Working principle, construction and applications of
	2.1 1¢ Reluctance Motor
	2.2 Hysteresis motor
	2.3 2ϕ servo motor
	2.4 AC tachometers

03	AC Commutator Machines:							
	3.1 Necessity/ advantages of AC commutator motors							
	3.2 EMFs induced in commutator windings (E_r and E_t)							
	3.3 Emfs produced by rotating magnetic field E_{RT}							
	3.4 Torque Expression							
	3.5 Commutation in AC machines and EMF's under commutation							
	3.6 1¢ Series Motors.							
	3.7 Phasor Diagram & Simplified Phasor Diagram (no derivation)							
	3.8 Compensated AC series motor							
	3.9 Phasor Diagram & Simplified Phasor Diagram (no derivation)							
	3.10Repulsion motor, Phasor Diagram & Simplified Phasor Diagram (no derivation)							
04	Linear Induction and Stepper motors:							
	4.1 Classification, Construction and Working of linear induction motor.							
	4.2 Comparison between LIM and RIM (Advantages, disadvantages of LIM)							
	4.3 Derivation of linear force							
	4.4 Applications of linear Induction motor							
	4.5 Construction and Working of Stepper motor							
	4.6 Variable reluctance type, Permanent magnet type & Hybrid stepper motor.							
	4.7 Applications of Stepper motor							
05	Advanced Electrical Machines:							
00	5.1 Synchronous Reluctance Motors Constructional features – Types – Axial and radial							
	air gan motors – Operating principle. Applications							
	5.2 Switched Reluctance Motors Constructional features – Principle of operation							
	Applications							
	5.3 Permanent Magnet Brushless DC Motors, Principle of operation Types and							
	Applications							
	5.4 Permanent Magnet Synchronous Motors, Principle of operation – EMF and torque							
	equations. Applications							
	5.5 Amorphous core transformer							
	5.6 Introductions of soft starters							
L	1							

Suggested Specifications Table with Hours and Marks (Theory):

Unit	Topic Title	Teaching	Distribution of Theory Marks				
No		Hours	R	U	A	Total	
110			Level	Level	Level	Marks	
1	Single Phase Induction Motors	12	08	04	04	16	
2	Single Phase Synchronous Motors	08	02	04	04	10	
3	AC Commutator Machines	10	06	04	04	14	
4	Linear Induction and Stepper motors	08	06	04	04	14	
5	Advanced Electrical Machines	10	08	04	04	16	
	Total	48	30	20	20	70	

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom'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. Numerical questions are to be asked only if specified. **List of experiments/Assignments:**

Sr.UnitExperiment/AssignmentApprox.

EE 16 406 Special Machines

No.			Hours						
1	1	Plot torque speed characteristic of split phase I. M. by conducting brake test on the motor	02						
2	1	Plot torque speed characteristics of single phase capacitor start induction run induction motor by conducting brake test on the motor	ot torque speed characteristics of single phase capacitor start 02 duction run induction motor by conducting brake test on the ptor 02						
3	1	Plot torque speed characteristic of single phase capacitor start and run induction motor by conducting brake test on the motor.	04						
4	1	Plot torque speed characteristics of shaded pole induction motor by conducting brake test on the motor	02						
5	1	Plot torque speed characteristic of repulsion motor by conducting brake test on the motor	04						
6	1	Plot torque and Speed characteristic of universal motor. (on AC & DC supply)	02						
7	1	Dismantling and reassembling of single phase motors used for ceiling fans or universal motor for mixer	06						
8	2	Plot torque speed characteristic of reluctance motor by conducting brake test on the motor	02						
9	2	Plot torque speed characteristic of Hysteresis motor by conducting brake test on the motor	04						
10	5	Demonstration of speed and reversal of direction of stepper motor	04						
			32						

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	The Performance and Design of	M.G.Say	CBS Publishers, New
	Alternating Current Machines		Delhi
2	Generalized theory of Electrical	Dr. P. S. Bimbhra	Prentice Hall India
	Machines		
3	Electrical Machines	S. K. Bhattacharya	Jaico Publication
4	AC Commutator machines	Taylor	New Age International
5	A Text book of Electrical	B. L. Theraja & A. K.	S.Chand, New Delhi
	Technology	Theraja	

Course Curriculum Development Committee:

a. Internal Faculty

- i. Dr.M.S.Narkhede
- ii. Mr.S.B.Vishwarupe

b. External Faculty

i. Dr.S.V.Bhangale (Government Polytechnic, Awasari)

Academic Coordinator

Head of Department (Electrical Engineering) Principal Govt. polytechnic Mumbai

Unit and CO mapping:

S.N.	Unit	COs
1	Single Phase Induction Motors	EE16406.1,EE16406.2, EE16406.3
2	Single Phase Synchronous Motors	EE16406.4
3	AC Commutator Machines	EE16406.5
4	Linear Induction and Stepper motors	EE16406.6
5	Advanced Electrical Machines	EE16406.7

CO Vs PO matrix:

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
EE16406.1	3	3	2	1	1	1	1	1	1	1
EE16406.2	3	3	2	1	1	1	3	1	1	1
EE16406.3	3	3	3	1	3	1	1	1	1	1
EE16406.4	3	3	3	1	3	1	1	1	1	1
EE16406.5	3	3	3	1	1	1	1	1	1	1
EE16406.6	3	3	1	1	1	1	1	1	1	1
EE16406.7	3	3	1	1	1	1	1	1	1	1

CO Vs PSO Matrix:

СО	PSO1	PSO2	PSO3
EE16406.1	3	1	1
EE16406.2	3	3	1
EE16406.3	3	2	1
EE16406.4	3	1	1
EE16406.5	3	1	1
EE16406.6	3	1	1
EE16406.7	3	1	1

Programme : Diploma in Electrical Engineering									
Course Code: EE 16 407 Course Title: Industrial Automation									
Compulsory / Optional: Compulsory									
Teaching Scheme and Credits Examination Scheme									
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
03	00	02	05	70 (3 Hrs.)	30	50*(Ext)	-	-	150

Rationale:

In changing economy now, a day more and more stress is being given up in increasing the throughput in industries. The basic tool for achieving this is automation. The aim of this course is to develop the technician to carry out the responsibilities in the industries related to industrial automation. Diploma holder employed in industry needs to operate, test and maintain the industrial drives and its power control. It is very essential for him to know the electrical logic, Input devices, Control supply, control devices and designing control circuits.

This subject covers design of electromagnetic control circuit, basics of PLC programming and introduction to SCADA, operation of hydraulic and pneumatic control systems. This knowledge will help the diploma holder to work as an automation engineer in the industry.

Course Outcomes:

Student should	be able to
EE16407.1	Explain significance of Automation.
EE16407.2	Draw block diagram of PLC
EE16407.3	Understand ladder diagram development
EE16407.4	Know the working of SCADA and DCS
EE16407.5	Develop power and control circuit for different examples like Skip Hoist, Overhead Crane, Conveyor belt, compressor motor
EE16407.6	Understand use of potentiometer, synchros as error detector
EE16407.7	Know fundamentals of hydraulic system and Pneumatics systems

Unit No		Topics / Sub-topics
01	Introduction	to Industrial Automation:
	1.1	Importance of automation.
	1.2	Advantages of Automation
	1.3	Disadvantages of Automation
	1.4	Classes (Types) of Automation
	1.5	Requirements of Automation
	1.6	General idea of control, manufacturing and assembly processes.
02	Programma	ble logic controllers:
	2.1	Introduction definition and history of the PLC.
	2.2	PLC advantages and disadvantages.
	2.3	Types of PLC-Fixed and modular.
	2.4	List of PLC manufacturers.
	2.5	PLC Specifications.

	2.6	Comparison between PC and PLC.
	2.7	PLC block diagram- Central processing unit, Power supplies, I/O
		modules, Programming devices, Memory.
	2.8	Scan cycle of PLC.
	2.9	List of remote digital and analog I/Os.
	2.10	Comparison between Relay based and PLC based control systems.
	2.11	Comparison between PLC and PC
		1
03	PLC pro	gramming:
	3.1	PLC programming languages.
	3.2	Development of PLC ladder diagrams.
	3.3	Basic concept of ladder.
	3.4	Rules of ladder.
	3.5	Classification of PLC instructions.
	3.6	Bit type instructions- XIC, XIO, OTE, OTL, OUT, OSR.
	3.7	Logical instructions- OR AND NOT XOR
	3.8	Comparison instructions- FOU NEO LES LEO GRT GERO LIM
	3.0	Timer instructions- TON TOFF RTO
	3 10	Counter instructions- CTU CTD
	3 11	Scaling instructions- SCP
	3.11	Industrial process examples- Bottle filling plant Starting of an Induction Motor
	5.12	with forward and reverse control. Traffic light control
		with forward and reverse control, frame light control.
04	Introduc	ction to advanced control systems:
	4.1	SCADA- brief introduction to hardware & software used.
	4.2	Distributed Control System(DCS)-brief introduction to hardware &
		software used.
05	Electrica	il control system components:
	5.1	The contactors- Working. Contact types according to application, position,
	5.1	The contactors- Working. Contact types according to application, position, Load utilization categories.
	5.1 5.2	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications
	5.1 5.2 5.3	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and
	5.1 5.2 5.3	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working
	5.1 5.2 5.3 5.4	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches,
	5.1 5.2 5.3 5.4	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level
	5.1 5.2 5.3 5.4	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch.
	5.1 5.2 5.3 5.4 5.6	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot
	5.1 5.2 5.3 5.4 5.6	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps.
	5.1 5.2 5.3 5.4 5.6 5.7	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule
	5.1 5.2 5.3 5.4 5.6 5.7 5.8	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule Control supply – control transformer – Definition, Use, specifications
	5.1 5.2 5.3 5.4 5.6 5.7 5.8 5.9	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule Control supply – control transformer – Definition, Use, specifications Power and control circuits for Skip Hoist, Overhead Crane, conveyor belt,
	5.1 5.2 5.3 5.4 5.6 5.7 5.8 5.9	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule Control supply – control transformer – Definition, Use, specifications Power and control circuits for Skip Hoist, Overhead Crane, conveyor belt, compressor motor
	5.1 5.2 5.3 5.4 5.6 5.7 5.8 5.9	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule Control supply – control transformer – Definition, Use, specifications Power and control circuits for Skip Hoist, Overhead Crane, conveyor belt, compressor motor
06	5.1 5.2 5.3 5.4 5.6 5.7 5.8 5.9 Electrica	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule Control supply – control transformer – Definition, Use, specifications Power and control circuits for Skip Hoist, Overhead Crane, conveyor belt, compressor motor
06	5.1 5.2 5.3 5.4 5.6 5.7 5.8 5.9 Electrics	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule Control supply – control transformer – Definition, Use, specifications Power and control circuits for Skip Hoist, Overhead Crane, conveyor belt, compressor motor
06	5.1 5.2 5.3 5.4 5.6 5.7 5.8 5.9 Electrica 6.1 6.2	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule Control supply – control transformer – Definition, Use, specifications Power and control circuits for Skip Hoist, Overhead Crane, conveyor belt, compressor motor
06	5.1 5.2 5.3 5.4 5.6 5.7 5.8 5.9 Electrics 6.1 6.2 6.3	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule Control supply – control transformer – Definition, Use, specifications Power and control circuits for Skip Hoist, Overhead Crane, conveyor belt, compressor motor
06	5.1 5.2 5.3 5.4 5.6 5.7 5.8 5.9 Electrica 6.1 6.2 6.3 6.4	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule Control supply – control transformer – Definition, Use, specifications Power and control circuits for Skip Hoist, Overhead Crane, conveyor belt, compressor motor
06	5.1 5.2 5.3 5.4 5.6 5.7 5.8 5.9 Electrica 6.1 6.2 6.3 6.4	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule Control supply – control transformer – Definition, Use, specifications Power and control circuits for Skip Hoist, Overhead Crane, conveyor belt, compressor motor
06	5.1 5.2 5.3 5.4 5.6 5.7 5.8 5.9 Electrica 6.1 6.2 6.3 6.4 6.5	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule Control supply – control transformer – Definition, Use, specifications Power and control circuits for Skip Hoist, Overhead Crane, conveyor belt, compressor motor Il Actuators: Potentiometers – working and use as error detector Servomotors –ac and dc working principle. Synchros – transmitter, control transformer, use of as error detector. Stepper motor – PM & variable reluctance – working principle Tacho – generator
06	5.1 5.2 5.3 5.4 5.6 5.7 5.8 5.9 Electrica 6.1 6.2 6.3 6.4 6.5 6.6	The contactors- Working. Contact types according to application, position, Load utilization categories. The solenoid- Types - AC/DC, construction, working, applications Manual control switches- push buttons, selector switches – construction and working Pilot switches- Construction, Working and Applications of Limit switches, proximity switches, photoelectric switch, temperature actuated switches, level control switch, pressure-sensing switch, Overload sensing switch. Output devices – Applications of Contactors, Solenoid actuated valves, pilot lamps. Control circuit development – Basics and Thumb rule Control supply – control transformer – Definition, Use, specifications Power and control circuits for Skip Hoist, Overhead Crane, conveyor belt, compressor motor Attactors: Potentiometers – working and use as error detector Servomotors –ac and dc working principle. Synchros – transmitter, control transformer, use of as error detector. Stepper motor – PM & variable reluctance – working principle Tacho – generator Applications of above components as AC/DC control system.

07	Hydrau	lic and pneumatic systems:
	7.1	Brief comparison between electrical, hydraulic and pneumatic control system-merits and demerits.
	7.2	Construction and working of different types of Hydraulic pumps – Hydrodynamic and Positive displacement (Gear, Lobe, Vane)
	7.3	Need of accumulator and types of filters in hydraulic circuits
	7.4	Components of Pneumatic system – Types of compressors, FRL unit and It's working.
	7.5	Pneumatic output devices - Working of Single acting, double acting cylinder, Gear Motor, Vane motor.
	7.6	Hydraulic and pneumatic control devices – Construction and working of different types of control valves (Globe, angle, spool, puppet). Classification and working of direction control valves, working of pressure control valve, working of flow control valves (plug, butterfly and ball).
	7.7	Examples of application of hydraulic circuit – shaper circuit, sequence circuit.

Suggested Specifications Table with Hours and Marks (Theory):

Unit		Teaching	Distribution of Theory Marks				
No	Topic Title	Hours	R Level	U Level	A Level	Total Marks	
1	Introduction to Industrial Automation	03	02	02	00	04	
2	Programmable logic controllers	08	04	06	02	12	
3	PLC programming	10	04	08	04	16	
4	Introduction to advanced control systems	03	00	02	02	04	
5	Electrical control system components	08	06	02	04	12	
6	Electrical Actuators	06	04	02	02	08	
7	Hydraulic and pneumatic systems	10	06	04	04	14	
	Total	48	26	26	18	70	

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom'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. Numerical questions are to be asked only if specified.

List of experiments/Assignments:

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	1	To develop ladder diagrams for ON/OFF inputs to	02
		produce ON/OFF outputs.	
2	1	To develop ladder diagrams for logic gates OR,	02
		AND, NOT, XOR.	
3	1	To develop ladder diagrams for traffic light control	04
		system.	
4	2	To develop ladder diagrams for counting objects.	02

5	2	To develop ladder diagrams for temperature measurement.	04
6	2	Measure step angle for a stepper motor in forward and reverse direction.	02
7	2	To develop simple programmes for comparison instruction.	02
8	2	Collect data from market- PLC brands and manufacturers	04
9	2	A) To plot the characteristics of potentiometerB) Use of potentiometer as error detector	04
10	3	Draw the Symbol sheet for different pneumatic and Hydraulic components	06
			32

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Programmable Logic	John W. Webb Ronald A	Prentice Hall India
	Controllers, Principles and	Reis	
	applications		
2	Hydraulics & Pneumatics	by Andrew Parr,	Jaico Publication
3	Control of Electrical Machines	S. K. Bhattacharya	New Age International
		Brijinder Singh	Publishers

Course Curriculum Development Committee:

a. Internal Faculty

- i. Dr.M.S.Narkhede
- ii. Mr.S.B.Vishwarupe

b. External Faculty

i. Mr. L.S.Patil (Government Polytechnic, Nashik)

Academic Coordinator	Head of Department	Principal
	(Electrical Engineering)	Govt. polytechnic Mumbai

Unit and CO mapping:

S.N.	Unit	COs
1	Introduction to Industrial Automation	EE16407.1
2	Programmable logic controllers	EE16407.2
3	PLC programming	EE16407.3
4	Introduction to advanced control systems	EE16407.4
5	Electrical control system components	EE16407.5
6	Electrical Actuators	EE16407.6
7	Hydraulic and pneumatic systems	EE16407.7

CO Vs PO matrix:

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
EE16407.1	3	3	2	1	1	1	1	1	1	1
EE16407.2	3	3	2	1	1	1	3	1	1	1
EE16407.3	3	3	3	1	3	1	1	1	1	1
EE16407.4	3	3	3	1	3	1	1	1	1	1
EE16407.5	3	3	3	1	1	1	1	1	1	1
EE16407.6	3	3	1	1	1	1	1	1	1	1
EE16407.7	3	3	1	1	1	1	1	1	1	1

CO Vs PSO Matrix:

CO	DSO1	DSO2	DSO2
	r501	F302	F305
EE16407.1	3	1	1
EE16407.2	3	3	1
EE16407.3	3	2	1
EE16407.4	3	1	1
EE16407.5	3	1	1
EE16407.6	3	1	1
EE16407.7	3	1	1

Programme : Diploma in Electrical Engineering									
Course Code: EE 16 313 Course Title: Industrial Training - II									
Compul	Compulsory / Optional: Compulsory								
Teachi	Teaching Scheme and Credits Examination Scheme								
TH	TU	PR	Total	TH TS PR OR TW Total				Total	
00	00	02	02	-	-	-	25*	25	50

Rationale:

The diploma engineers are required to work in industry to manufacture and test Semi finished/Finished Products, and in substations etc for diagnose problems and technical resolutions. The students need to have industry and workshop exposure, where they can experience real life equipment, materials, instruments and various kinds of Process & related Equipments. This course has been designed for the students to have real life experiences to help them prepare for their career. The Electrical sector needs skilled and managerial personnel who have technical expertise as well as entrepreneurial qualities to manage the industry and substation.

Course Outcomes:

EE 16 313.1	To give students the opportunity to apply the knowledge and skills they have
	acquired on campus in a real-life work situation.
EE 16 313.2	To provide students with opportunities for practical, hands-on learning from
	practitioners in the students' areas of specialization.
EE 16 313.3	To expose students to a work environment, common practices,
	employment opportunities and work ethics in their relevant field.
EE 16 313.4	To enhance the employability skills of the students.
EE 16 313.5	To provide opportunities for students to be offered jobs in the
	organizations in which they undergo their Industrial Training.

DURATION OF INDUSTRIAL TRAINING :

Total no. of weeks: 2 weeks before the beginning of 6^{th} semester after finishing of final exam of 5^{th} semester (during winter vacation of 6^{th} Semester).

Training Area: Students can be trained in

- 1. electrical machines production units,
- 2. Generating stations,
- 3. electrical substations,
- 4. domestic rewiring,
- 5. Electrical appliances maintenance shops/workshops,
- 6. Power system protection,
- 7. Locomotives,
- 8. Industry Automation,

- 9. Lifts / Elevators maintenance
- 10. Repairing of electrical measuring instruments
- 11. Renewable energy sources
- 12. Electrical contractor,
- 13. Authorized Testing Laboratories workshop,
- 14. Technical Consultant etc.

Role of Department:

- 1. Department have to send training request letter to various industries well in advance before commencement of training.
- 2. After getting sufficient number of seats from the industries, students will be placed in different industries for their 6^{th} semester training (during winter vacation).
- 3. Students will have to fill up training form.
- **4.** Department will issue an order letter to industry for the said training mentioning the name and registration number of students.
- **5.** All above activities have to be carried out in advance of previous semester as plan out of placement in consultation with students. The students would normally be placed as per their choices, in case of more demand for a particular industry/service centre, students would be allocated place based on their relative merit (based on third semester results)
- 6. During the training period, the head of the department will maintain a schedule for follow up of industrial training and according to it he/she will send the faculty members to various industries.
- **7.** The faculty member in touch with industry will check the progress of the student in the training, his/ her attendance, discipline and project report preparation.
- **8.** At the end of the training internal faculty member will assess the work done by student based on his presentation at the institute and training report.

Role of Industry:

- 1. Industry will give effective training to the students for improving their practical skills
- **2.** Industry is expected to assign group of the students under training to some middle management level person for supervision and guidance (Training-in-charge).
- **3.** Training in-charge has to sign weekly diary (To certify the work done by students) with appropriate remarks.
- **4.** Industry may allot project to individual or group of students under training and students has to prepare report on the same project.
- 5. Training in-charge are requested to guide students for preparing their project report.
- **6.** Industry is expected to maintain attendance for the student under training and report any irregularity of the students to their parent college.
- 7. Industry is also expected to issue a certificate of attending training on their letter head with comments if any for student's record and motivation.

Guidelines for the Students

- **1.** Students would interact with the identified faculty of the department to suggest his choices for suitable industry/service centre
- **2.** Students have to fill the forms duly sealed and signed by authorities along with training order letter and submit it to training officer in the industry on the first day of training.

- **3.** Student would carry with him/her the Identity card issued by institute during training period
- **4.** He/she will have to get all the necessary information from the training officer regarding schedule of the training, rules and regulations of the industry. Student is expected to follow these rules, regulations, procedures etc obediently.
- **5.** During the training period students has to keep record of all the useful information in Log book and maintain the weekly diary (attached here with form-1).
- **6.** Prepare final report about the whole training for submitting to the department at the time of final presentation i.e. seminar.

Seminar

- Every student will prepare the Industrial training report and deliver the seminar.
- Seminar will be on the Industrial training completed by the student in the industry .
- Use of audio visual and / or power point presentation is desirable.
- Presentation will be for @ 15 minutes including 5 minutes of question and answer.
- Seminar should be presented during fifth semester.

FORM-1 GOVERNMENT POLYTECHNIC, MUMBAI ELECTRICAL ENGINEERING DEPARTMENT

TRAINEES WEEKLY REPORT

Trainee Name:-

Name of Organization:-

Enrollment No:-

Dept. Sec:-

Week commencing from date _____ to date _____

Day & Date	Abstract of Work done (Details	Remarks from	Sign of
	of work with details of	training supervisor:	Training
	Electrical)	Excellent / very	Supervisor
		good / good/ average	
		/ below average	
		/poor	

Course Curriculum Development Committee:

- a. Internal Faculty
 - i. Mrs. J. D. Waghmare
 - ii. Dr. P. N. Padghan
 - iii. Dr. M.S.Narkhede
- b. External Faculty

i. Mr.

Academic Coordinator Head of Department (Electrical Engineering) Principal Govt. polytechnic Mumbai

CO Vs PO matrix:

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
EE 16	3	3	3	3	3	3	3	3	3	3
313.1										
EE 16	3	3	3	3	3	3	3	3	3	3
313.2										
EE 16	3	3	3	3	3	3	3	3	3	3
313.3										
EE 16	3	3	3	3	3	3	3	3	3	3
313.4										
EE 16	3	3	3	3	3	3	3	3	3	3
313.5										

CO Vs PSO Matrix:

CO	PSO1	PSO2	PSO3
EE 16 313.1	3	3	3
EE 16 313.2	3	3	3
EE 16 313.3	3	3	3
EE 16 313.4	3	3	3
EE 16 313.5	3	3	3

Undertaking Form

I hereby declare that during my Industrial Training at _______, during the period from ______ to _____, I will obey all the rules and regulations of the Industry. It will be my sole responsibility for my acts, deeds, any injury or accidents during this Industrial training.

Signature of Candidate

Name:-_____

Enroll No:-____

Date: _____

Undertaking from Parents / Guardians

I the undersigned father/guardian of ______ am well aware that my ward studying in 3rd/2nd year Electrical Engg. is going for Industrial Training at _______ , during the period from ______ to _____ , I will obey all the rules and regulations of the Industry . It will be fully responsibility of my ward for his acts , deeds , any injury or accidents during this Industrial training.

Address with Mobile No

Mobile No:	
------------	--

Date:

EE 16 313 Industrial Training-II

Name of Parent

Industrial Training Report Format

- 1. Cover Page
- 2. Inner Pages
 - a) Certificate with signature and seal by Industry/ Company/Factory
 - b) Declaration by student
 - c) Acknowledgement
- 3. Introduction about Industry/ Company/Factory
- 4. Training schedule
- 5. Table of Contents
- 6. List of Tables
- 7. List of Figures
- 8. Abbreviations and Nomenclature (If any)
- 9. Chapters
- 1 Introduction to Project
- 2 Tools & Technology Used
- 3 Snapshots
- 4 Work Done / Observations
- 5 Specific Assignment / Project Handled
- 4. Results and Discussions
- 5. Conclusions and Future Scope
- 10. References
- 11. Data Sheet(If any)
- 12. Appendices (If any)

INSTRUCTIONS FOR TRAINING REPORT

- 1. A chapter may be further divided into several divisions and sub-divisions depending on type & volume of work.
- 2. The length of the training report may be about 20 to 30 pages.
- 3. The training report shall be computer typed (English- British, Font -Times Roman, Size-12 point) and printed on A4 size paper.
- 4. The training report shall be Hard Copy of Training Report (Spiral Binding) The training report shall be typed with 1.5 line 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. Every page in the report must be

of the introductory chapter, should be printed in small Roman numbers, i.e, i, ii, iii, iv..... The page number of the first page of each chapter should not be printed (but must be accounted for). All page numbers from the second page of each chapter should be printed using Arabic numerals, i.e. 2,3,4,5... All printed page numbers should be located at the bottom centre of the page.

- 5. The table of contents should list all headings and sub-headings.
- 6. **The list of tables** should use exactly the same captions as they appear above the tables in the text. One and a half spacing should be adopted for typing the matter under this head.
- 7. **The list of figures** should use exactly the same captions as they appear below the figures in the text. One and a half spacing should be adopted for typing the matter under this head.
- 8. The list of symbols, abbreviation & nomenclature should be typed with one and a half line spacing. Standard symbols, abbreviation etc should be used.
- 9. Subject matter must be typed on single side of the page.
- All the pages must be numbered properly

INDUSTRIAL TRAINING REPORT

(Times New Roman, 24 pt. Bold)

TITLE OF THE PROJECT

(Times New Roman, 16 pt. Bold)

Submitted in partial fulfillment of the Requirements for the award of **Diploma in Electrical Engineering**

College LOGO

Submitted By (14 size)

Name: _____

Enrollment No._____

(Times New Roman, 14 pt. Bold)

SUBMITTED TO:

Department of Electrical Engineering (16 size) GOVERNMENT POLYTECHNIC, MUMBAI

DECLARATION (16 Times New Roman)

I hereby declare that the Industrial Training Report entitled ("Title of the project") is an authentic record of my own work as requirements of Industrial Training during the period from ______ to _____ for the award of Diploma in Electrical Engineering, Government Polytechnic, Mumbai under the guidance of (Name of Project Guide).

(12 size)

(Signature of student) (Name of Student) (Enrollment No.)

Date: _____

CERTIFICATE

(16 Times New Roman, bold)

This is to certify that Mr. / Ms._____has partially completed / completed Industrial Training during the period from ______to____ in our Organization / Industry as a Partial Fulfillment of for the award of Diploma in Electrical Engineering, Government Polytechnic, Mumbai . He / She was trained in the field of

Signature & Seal of Training Manager

Note: This certificate must be typed on the company letter head.

ACKNOWLEDGEMENT

(16 Times New Roman, bold)

CERTIFICATE

I hereby declare that the Industrial Training Report being presented in this report	t
entitled " " is an authentic record of my own work carried of	ut
under the supervision of Dr. Mr. / Ms. " SUPERVISOR NAME"	

Enrollment No:-

Sign & Name of Student.

Date:-

Attended and submitted for the final oral examination held on

(Internal Examiner)

Name:-

Designation:-

(External Examiner)

Name:-

Designation:-

Mechanical Engineering Department

Program	nme: C	CE/ME	/EC/CO/I	F/IS/EE/LG/L	_T				
Course Code: MG:16 502 Course Title: Entrepreneurship Development						ent			
Compu	sory / C	Optiona	l: Comp	ulsory			2	=	
Teaching Scheme and Credits Examination Scheme									
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
1	2	-	3	-	-	-	25*	25	50

*External Examiner

Rationale:

Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as- BPO, Contract Manufacturing, Trading, Service sectors etc. The student community also needs to explore the emerging opportunities. It is therefore necessary to inculcate the entrepreneurial values during their educational tenure. This will help the younger generation in changing their attitude and take the challenging growth oriented tasks instead of waiting for white- collar jobs. The educational institutions should also demonstrate their uniqueness in the creation of enterprising personalities in their colleges. This subject will help in developing the awareness and interest in entrepreneurship and create employment for others.

Course Outcomes:

Student should be able to

Stateme b	
CO1	Appreciate the concept of Entrepreneurship
CO2	Identify entrepreneurship opportunity
CO3	Understand the Marketing Strtegy.
CO4	Collect and use the information to prepare project report for business venture.
CO5	Develop awareness about enterprise management

Course Content Details:

Sr. No.	Contents
1.	INTRODUCTION
	• Definition of Entrepreneur.
	Characteristics of Entrepreneur.
	• Functions of an Entrepreneur.
	Barriers to Entrepreneur.
	 Distinction between Entrepreneur, Manager and Intrapreneur
	 Women Entrepreneur-problems and developing trends.
	Entrepreneurship-definition, need.
2.	FROM BUSINESS IDEA TO OPPORTUNITY
	 Identifying trends, opportunities and ideas.
	Creativity techniques for idea generation.
	 Evaluate business opportunities
	• Use of SWOT analysis.

Entrepreneurship Development

Approved Copy Academic Co-ordinator

Mechanical Engineering Department

3.	MARKET ASSESSMENT AND PRODUCT FEASIBILITY
	 Marketing -Concept and Importance
	Market Identification,
	• Customer need assessment,
	Market Survey
	 Meaning and definition of product feasibility
	 Technical, Market, Financial feasibility including break even analysis.
4.	SUPPORT SYSTEMS
	 Information Sources
	Information related to project, procedures and formalities
	Support Systems
	 Business Planning & Requirements for setting up an SSI
	 Govt. & Institutional Agencies (Like MSFC, DIC, MSME,
	MCED, MSSIDC, MIDC, LEAD BANKS), Statutory requirements and
	agencies.
	PROJECT/BUSINESS PLAN
5.	Meaning and Importance
	 Concept of vision and mission
	Components of project report/profile
6.	ENTERPRISE MANAGEMENT AND MODERN TRENDS
	 Essential roles of Entrepreneur in managing enterprise
	• E-Commerce: Concept and process
	Global trends and opportunities.
	 Steps in starting small scale industry
	Causes Of Sickness

Suggested Specifications Table with Hours and Marks (Theory):

TT-24		Teaching	Distri	bution of	Theory	Marks
No	Topic Title	Hours	R Level	U Level	A Level	Total Marks
1	INTRODUCTION	01	114	51		
2	FROM BUSINESS IDEA TO OPPORTUNITY	02				
3	MARKET ASSESSMENT AND PRODUCT FEASIBILITY	03	97			8
4	SUPPORT SYSTEMS	02				
5	PROJECT/BUSINESS PLAN	04				
6	ENTERPRISE MANAGEMENT AND MODERN TRENDS	04				
	Total	16				

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom'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. Numerical questions are to be asked only if specified.

Entrepreneurship Development

Approved Copy Academic Co-ordinator

Term Work

Term work consists of following interactive type assignments. Faculty acts as a facilitator in providing conducive, dynamic environment, exposing students to various aspects of entrepreneurship. Assignments are aimed at compelling the students to critically think and apply the concepts learnt, leading to better insight development.

Sr. No	Unit	Assignments	Hours
1		Assimilation Of Profile Of A Successful Entrepreneurs Every student will study the biography of a successful entrepreneur and make a write up of two pages, indicating milestone achievements. Summarize the important traits and share their understanding in the peer group.	
2		Assess yourself as an entrepreneur? Several skills and traits are essential in an entrepreneur, to achieve success. What is your potential in this regard?Assess yourself and reflect upon the findings. Faculty will provide you a suitable instrument.	
3		 Brain Storm To Generate Business Ideas. Brain storming is a group creativity exercise designed to come out with a number of solutions to a problem. Follow the steps. ✓ State the problem (Ex. What business would you start if you are given Rs Lacs?) ✓ Select the participants ✓ Select a leader ✓ Set the stage Rules to be followed are, Focus on quantity Postpone criticism Build on others ideas Encourage crazy ideas Work with a dead line 	
4		 Identify A Business Opportunity Suitable For You ✓ This activity will help you to identify opportunity that may be right for you. Once identified you will use this business idea to carry out the mini project, throughout the session. ✓ List your interests and hobbies. List the business ideas that relate to each interest. Use the following steps to end up with the opportunity. ✓ Make SWOT analysis of self, cross out those ideas that no longer seem suitable for you. ✓ Assess your aptitude and identify those ideas that match with 	

Entrepreneurship Development

Approved Copy

Mechanical Engineering Department

-		r
	 your aptitude ✓ Make a matrix of advantages and disadvantages of remaining ideas, find which one is of maximum advantage ✓ Use internet or library and find out at least one source of information for each idea. ✓ Choose one of the business opportunities that suit your life style requirements. ✓ Write vision and mission statement. Set personal financial and non financial goals you hope to achieve in five years perspective. Be realistic and be sure to include specific activities for each plan. 	
5	 Begin To Develop Your Business Plan ✓ Write a vision and mission statement for the business enterprise ✓ Describe one page report that fully describes your product or service and how it differs from what is currently available. ✓ List your short, medium and long term goals. What steps do you need to achieve each of these goals? Do you foresee any obstacles in attaining them? What are they? ✓ What are the economic, technological or growth trends in this industry? Is the location of your business is a critical factor in its success? Why or why not? 	
6	 Design A Market Strategy ✓ Identify the market for your business. Use the secondary data source that could help you assess demand for your product or service. ✓ Based on secondary data, develop a customer profile. Figure out which market segment of your industry you are targeting. be specific. ✓ Develop a questionnaire to conduct primary data research.Coduct a mock survey and analyze the results. Determine what course of action you will take? ✓ Determine who your competitor are, both direct and indirect. Analyse each competitor in terms of price, location, facility, strength and weakness. Determine strategy to deal with each competitor. ✓ Write down your strategies for maintaining customer loyalty, and describe why you think each one will work. 	
7	Find Out Break Even Point For Your Business Perform a break even analysis for your business. How many units you are required to sell to break even? Is this a feasible number? Why or Why not? Can you think of ways to lower the breakeven point?	
8	Feasibility Study Reports Make a feasibility study analysis of sample reports provided and discuss your observations in the class.(Group work each consisting 4 students)	÷
9	Interactive Session With An Entrepreneur In live conversation with an entrepreneur raise the issues of your interest pertaining to various aspects of entrepreneurship and make	

Entrepreneurship Development

Approved Copy -1 Academic Co-ordinator

	a report on it.
10	Mini Project Develop a mini project on a business opportunity incorporating various aspects as per the standard format provided. This activity
	should be carried out on continual basis, under the guidance of the concerned faculty.
	Components of Project Report:
	1. Project Summary (One page summary of entire project)
	2. Introduction (Promoters, Market Scope/ requirement)
	3. Project Concept & Product (Details of product)
	4. Promoters (Details of all Promoters- Qualifications,
	Experience, Financial strength)
	5. Manufacturing Process & Technology
	6. Plant & Machinery Required
	7. Location & Infrastructure required
	8. Manpower (Skilled, unskilled)
	9. Raw materials, Consumables & Utilities
	10. Working Capital Requirement (Assumptions, requirements)
	11. Market (Survey, Demand & Supply)
	12. Cost of Project, Source of Finance
	13. Projected Profitability & Break Even Analysis
	14. Conclusion.

Notes: If possible an industrial visit should be arranged or videos should be shown of different die and operations.

Learning Resources:

1) Reference Books:

Entrepreneurship Development

Sr.No.	Name of Book	Author	Publisher
1	Entrepreneurship Development	Preferred by Colombo plan staff college for Technical education.	Tata Mc Graw Hill Publishing co. ltd. New Delhi.
2	A Manual on How to Prepare a Project Report	J.B.Patel D.G.Allampally	EDI STUDY MATERIAL Ahmadabad (Near Village
3	A Manual on Business Opportunity Identification & Selection	J.B.Patel S.S.Modi	Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India
4	National Directory of Entrepreneur Motivator & Resource Persons.	S.B.Sareen H. Anil Kumar	P.H. (079) 3969163, 3969153 E-mail :
5	New Initiatives in Entrepreneurship Education & Training	Gautam Jain Debmuni Gupta	ediindia@sancharnet.in/olpe@ ediindia.org
6	A Handbook of New Entrepreneurs	P.C.Jain	Website :



Mechanical Engineering Department

7	Evaluation of Entrepreneurship Development Programmes	D.N.Awasthi , Jose Sebeastian	http://www.ediindia.org
8	The Seven Business Crisis & How to Beat Them.	V.G.Patel	
9	Entrepreneurship Development	Special Edition for MSBTE	McGraw Hill Publication
10	Entrepreneurship Development	-	TTTI, Bhopal / Chandigarh

2) VIDEO CASSETTES

NO	SUBJECT	SOURCE
1	Five success Stories of First	EDI STUDY MATERIAL
1	Generation Entrepreneurs	Ahmedabad (Near Village Bhat , Via
2	Assessing Entrepreneurial Competencies	Ahmadabad Airport & Indira Bridge), P.O.
2	Business Opportunity Selection and	Bhat 382428 , Gujrat,India P.H. (079)
2	Guidance	3969163, 3969153
4	Planning for completion & Growth	E-mail :
	Problem solving-An Entrepreneur	ediindia@sancharnet.in/olpe@ediindia.org
5	skill	Website : http://www.ediindia.org

Course Curriculum Development Committee:

a. Internal Faculty

- i. Mr. S.V.Joshi.
- ii. Mr. B.B.Kulkarni.
- b. External Faculty

Academic Coordinator (Dr. R. A. Patil)

Head of Department (Mechanical Engineering)

Principal Govt. polytechnic Mumbai

Approved Copy Academic Co-ordinator G. P. Mumbai

ME16502

Entrepreneurship Development

Mechanical Engineering Department

Course Name:- Entrepreneurship Development Course Code:- me 16 502

CO Vs PO matrix

СО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	-	-	- 1	-	2	2	2	3
CO2	1	3		-	1	-	2	2	2	3
CO3	1	3	-	-	1	-	2	2	2	3
CO4	1	2	-	-	1	-	2	2	2	3
CO5	1	3	-	-	1		2	2	2	3

CO Vs PSO matrix

	CO/POs	PSO1	PSO2	PSO3
CO1	Appreciate the concept of Entrepreneurship	-	3	2
CO2	Identify entrepreneurship opportunity	-	3	2
CO3	Understand the Marketing Strtegy.	-	3	2
CO4	Collect and use the information to prepare project report for business venture.	-	2	2
CO5	Develop awareness about enterprise management		3	2

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	INTRODUCTION	CO1
2	2	FROM BUSINESS IDEA TO OPPORTUNITY	CO1 & 2
3	3	MARKET ASSESSMENT AND PRODUCT FEASIBILITY	CO2 & 3
4	4	SUPPORT SYSTEMS	CO3 & 4
5	5	PROJECT/BUSINESS PLAN	CO4 & 5
6	6	ENTERPRISE MANAGEMENT AND MODERN TRENDS	CO1, 2 & 4

Approved Copy 1 Academic Co-ordinator G. P. Mumbai

Entrepreneurship Development

1

Course	Code: M	G1650	1	Course Title:	Industria	al Organ	nization	and Man	agemer
Compul	sory / Op	otional:	Compulso	ry	a 1 0				ē.
Teach	ning Sche	me and	Credits		Exa	aminatio	n Scheme		
TH	TU	PR	Total	ТН	TS	PR	OR	TW	Total
3			03	70 # (3 Hrs.)	30				100

Rationale:

Our diploma pass outs are normally placed at the supervisory level when they go to industries. Where they are expected to handle labour, material and machinery to get the targeted output. This requires knowledge of managing different resources of the organizations effectively. This course deals with different aspects of management, which helps technician to manage the changed environment in the industry.

Course Outcomes: After studying the course student will be able to:

CO1: Get acquainted with the industrial environment.

CO2: Know the different levels and process of management.

CO3: Describe the organizational structure.

CO4: Manage different industrial resources efficiently.

CO5: Apply various rules and regulations concerned with Business.

Academic Co-ordin

MG 16 501

it No	Contents						
1	Overview Of Business:						
	1.1: Definition of Business.						
	1.2: Types of Business: Service, Manufacturing, and Trade						
	1.3: Globalization: Importance, Advantages and Disadvantages.						
	1.4: Intellectual Property rights: Objectives. Meaning of Patent, Copy right						
2	Management Process:						
	2.1 What is Management? Various definitions, Concept of management.						
	2.2 Levels of management. Difference between Administration and						
	Management. Concept of Scientific management.						
	2.3: Fourteen principles of Management.						
	2.4: Basic Functions of Management: Planning, Organizing, Staffing,						
	Directing and Controlling.						
3	Organizational Management:						
	3.1 Organization :- Definition and Steps in forming organization						
	3.2 Types of organization: Line, Line & staff, Functional and Project.						
	3.3 Forms of ownership: Proprietorship, Partnership, Joint stock Company,						
4	Co-operative Society, Government Sector.						
4	Human Resource Management:						
1 N	4.1 Fersonner Management: Definition and Functions.						
	Introduction to human resource planning and recruitment procedure						
	4.3 Personnel: Training & Development						
	• Types of training						
	• Induction.						
	• Skill Enhancement.						
5	Industrial Safety and legislation:						
	5.1 Causes of accident						
	5.2 Safety precautions						
	5.3 Introduction to						
	• Factory Act 1948						
28	• ESI Act						
	Workmen Compensation Act						
	Industrial Dispute Act						
5 a.	Goods and Services Tax						
5	Financial Management:						
	6.1. Objectives & Functions.						
	• Types and Sources of Conital						
	• Types and sources of Capital.						
	• Types of Budgets						
	 Types of Dudgets Production Budget (including Variance Parart) 						
	I shor Budget						
	 Labor Durger Introduction to Profit & Loss Account and Palance Sheet 						
	Flements of costing						
8 g	Approved Copy						
trial O	reganization and Management Academic Coordinator MG 16 501						

Governme	nt Polytechnic Mumbai Mechanical Engineering Departme	nt
7	Materials Management:	
	7.1 Inventory Management: Definition of inventory and inventory control	
	Objectives of inventory control	
	7.2 ABC Analysis, graphical representation	
	7.3 Economic Order Quantity (E.O.Q.)	
	 Graphical Representation and Calculation of E.O.Q. 	
	7.4 Purchasing:	
	• Objectives of Purchasing.	
	• Functions of Purchase department.	
	• Steps in Purchasing.	
8	Project Management:	
	8.1 Project Management: Definition and meaning of project.	
	8.2 Introduction to C.P.M.& P.E.R.T., Preparationof network, calculation of	
	project duration and floats.	
	8.3 Concept of Break Even Analysis.	
21	8.4 Introduction to KAIZEN, 5 "S".	

Specification Table with hours and marks (Theory)

Unit	Topic title	Teaching	D: / 11			
INO.		hours	Distribu	tion of The	ory Marks	T (1
		× .	K	U	A	Total
		2	Level	Level	Level	Marks
1	Overview Of Business	4	4			04
2	Management Process	6	2		4	06
3	Organizational Management	8	2	4	4	10
4	Human Resource Management	5	2	4	4	10
5	Industrial Safety and Legislation	5	2	4	4	10
6	Financial Management	7	2	2	6	10
7	Materials Management	6	2	2	6	10
8	Project Management	7.	2	2	6	10
	Total	48	18	18	34	70

Approved Copy .1 Academic Co-ordinator G. P. Musripei

MG 16 501

Mechanical Engineering Department

Course Outcomes (C.O.) Vs Program Outcomes (P.O.) matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C01	2	2	3	3	1	1	2	2	1	2
CO2	3	3	2	2	1	1	2	2	1	3
CO3	1	2	2	3	2	1	1	2	1	3
CO4	3	3	3	3	2	2	2	3	2	3
CO5	3	3	3	3	2	2	3	3	3	3

C.O. Vs P.S.O. matrix

Course	Course Outcomes (CO's)	PSO1	PSO2
Outcome			
No.			
CO1	Get acquainted with the industrial environment.	2	-
CO2	Know the different levels and process of management.	2	1
CO3	Describe the organizational structure.	2	2
CO4	Manage different industrial resources efficiently.	2	2
CO5	Apply various rules and regulations concerned with	-	2
-	Business.		

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) *If there is no correlation, put "-"* CO: Course Outcomes, PSO: Programme Specific Outcomes, PO: Programme Outcomes

TOPICS AND COURSE OUTCOMES

Topic Title	COs		
Overview Of Business	CO1		
Management Process	CO2		
Organizational Management	CO3 CO4		
Human Resource Management			
Industrial Safety and Legislation	CO5		
Financial Management	CO4		
Materials Management	CO4		
Project Management	C01,C02,C03,C04,C05		
	Topic TitleOverview Of BusinessManagement ProcessOrganizational ManagementHuman Resource ManagementIndustrial Safety and LegislationFinancial ManagementMaterials ManagementProject Management		

Academic Co-ordinator

MG 16 501