SYLLABUS

DIPLOMA
IN
ELECTRONICS (ROBOTICS) ENGINEERING / MECHATRONICS
FULL TIME (1047/1049) & SANDWICH (2047)

2015-16

M - SCHEME

DIRECTORATE OF TECHNICAL EDUCATION
GOVERNMENT OF TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING,
TAMILNADU DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
M SCHEME
(Implementation Year - From the Academic year 2015 - 2016 onwards)

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Director Directorate of Technical Education
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Chennai-600 012

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4	ThiruK.K.Kalatharan Lecturer/Mechatronics. Government Polytechnic College, Chennai-12		

DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY

(SEMESTER SYSTEM)

(Implemented from 2015- 2016)

M – SCHEME

R E G U L A T I O N S*

* *Applicable to the Diploma Courses other than Diploma in Hotel Management & Catering Technology and the Diploma Courses offered through MGR Film Institute, Chennai.*

1. Description of the Course:

a. Full Time (3 years)

The Course for the full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters* and the First Year is common to all Engineering Branches.

b. Sandwich (3½ years)

The Course for the Diploma in Engineering (sandwich) shall extend over a period of three and half academic years, consisting of 7 semesters* and the First Year is common to all Engineering Branches. The subjects of three years full time diploma course being regrouped for academic convenience.

During 4^{th} and/or during 7^{th} semester the students undergo industrial training for six months/ one year. Industrial training examination will be conducted after completion of every 6 months of industrial training

c. Part Time (4 years)

The course for the diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters*, the subjects of 3 year full time diploma courses being regrouped for academic convenience.

* Each Semester will have 15 weeks duration of study with 35 hrs. /Week for Regular Diploma Programme and 18hrs/ week (21 hrs. / Week I year) for Part-Time Diploma Programmes.

The Curriculum for all the 6 Semesters of Diploma courses (Engineering & Special Diploma Courses viz. Textile Technology, Leather Technology, Printing Technology, Chemical Technology etc.) have been revised and revised curriculum is applicable for the candidates admitted from 2015 – 2016 academic year onwards.

2. Condition for Admission:

Condition for admission to the diploma courses shall be required to have passed in

The S.S.L.C Examination of the Board of Secondary Education, TamilNadu.

(Or)

The Anglo Indian High School Examination with eligibility for Higher Secondary Course in TamilNadu.

(Or)

The Matriculation Examination of Tamil Nadu.

(Or)

Any other Examination recognized as equivalent to the above by the Board of Secondary Education, TamilNadu.

Note: In addition, at the time of admission the candidate will have to satisfy certain minimum requirements, which may be prescribed from time to time.

3. Admission to Second year (Lateral Entry):

A pass in HSC (Academic) or (Vocational) courses mentioned in the Higher Secondary Schools in TamilNadu affiliated to the TamilNadu Higher Secondary Board with eligibility for university Courses of study or equivalent examination, & Should have studied the following subjects.

Sl. No	Courses	H.Sc Academic	H.Sc Vocational	
		Subjects Studied	Subjects Studied	
			Related subjects	Vocational subjects
1.	All the Regular and Sandwich Diploma Courses	Maths, Physics & Chemistry	Maths / Physics / Chemistry	Related Vocational Subjects Theory & Practical
2.	Diploma course in Modern Office Practice	English & Accountancy English & Elements of Economics English & Elements of Commerce	English & Accountancy, English & Elements of Economics, English & Management Principles & Techniques, English & Typewriting	Accountancy & Auditing, Banking, Business Management, Co-operative Management, International Trade, Marketing & Salesmanship, Insurance & Material Management, Office Secretaryship.

- For the diploma Courses related with Engineering/Technology, the related / equivalent subjects prescribed along with Practical may also be taken for arriving the eligibility.

- Branch will be allotted according to merit through counseling by the respective Principal as per communal reservation.

- For admission to the Textile Technology, Leather Technology, Printing Technology, Chemical Technology and Modern Office Practice Diploma courses the candidates studied the related subjects will be given first preference.

- *Candidates who have studied Commerce Subjects are not eligible for Engineering Diploma Courses.*

4. Age Limit: No Age limit.

5. Medium of Instruction: English

6. Eligibility for the Award of Diploma:

No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in any institution affiliated to the State Board of Technical Education and Training, TamilNadu, when joined in First Year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

The minimum and maximum period for completion of Diploma Courses are as given below:

Diploma Course	Minimum Period	Maximum Period
Full Time	3 Years	6 Years
Full Time(Lateral Entry)	2 Years	5 Years
Sandwich	3½ Years	6½ Years
Part Time	4 Years	7 Years

7. Subjects of Study and Curriculum outline:

The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical. The curriculum outline is given in Annexure **- I**

8. Examinations:

Board Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The Internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment and 75 marks are allotted for Board Examination.

9. Continuous Internal Assessment:

A . For Theory Subjects:

The Internal Assessment marks for a total of 25 marks, which are to be distributed as follows:

i. Subject Attendance **5 Marks**

(Award of marks for subject attendance to each subject theory/practical will as per the range given below)

80% - 83%	1 Mark
84% - 87%	2 Marks
88% - 91%	3 Marks
92% - 95%	4 Marks
96% - 100%	5 Marks

ii) Test # **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Out of which the best one will be taken and the marks to be reduced to: 05 marks

The Test – III is to be the Model test covering all the five units and the marks so obtained will be reduced to : 05 marks

Total **10 marks**

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit – I & II	End of 6th week	50	2 Hrs
Test II	Unit – III & IV	End of 12th week	50	2 Hrs
Test III	**Model Examination** - **Compulsory** Covering all the 5 Units. (Board Examination-question paper-pattern).	End of 15th week	75	3 Hrs

 # - From the Academic year 2015-2016 onwards.

Question Paper Pattern for the Periodical Test :(Test - I & Test- II)

With no choice:

PART A type questions:	4 Questions X 2 mark	… … 8 marks
PART B type questions:	4 Questions X 3 marks	… … 12 marks
PART C type questions:	3 Questions X 10 marks	… … 30 marks

	Total	50 marks
		----------

iii) Assignment **10 Marks**

For each subject Three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 10 marks

All Test Papers and assignment notebooks after getting the signature with date from the students must be kept in the safe custody in the Department for verification and audit. It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

B. For Practical Subjects:

The internal assessment mark for a total of 25 marks which are to be distributed as follows:-

a)	Attendance (Award of marks as same as Theory subjects)	:	**5 Marks**
b)	Procedure/ observation and tabulation/ Other Practical related Work	:	**10 Marks**
c)	Record writing	:	**10 Marks**

	TOTAL	:	**25 Marks**

- *All the Experiments/exercises indicated in the syllabus should be completed and the same to be given for final board examinations.*
- The Record for every completed exercise should be submitted in the subsequent Practical classes and marks should be awarded for 20 for each exercise as per the above allocation.
- At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)
- The students have to submit the duly signed bonafide record note book/file during the Practical Board Examinations.

- *All the marks awarded for assignment, Test and attendance should be entered in the Personal Log Book of the staff, who is handling the subject. This is applicable to both Theory and Practical subjects.*

10. Life and Employability Skill Practical:

The Life and Employability Skill Practical with more emphasis is being introduced in IV Semester for Circuit Branches and in V Semester for other branches of Engineering.
Much Stress is given to increase the employability of the students:

Internal assessment Mark **….. 25 Marks**

11. Project Work:

The students of all the Diploma Programmes **(except Diploma in Modern Office Practice)** have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamilnadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester.**

a) Internal assessment mark for Project Work & Viva Voce:

Project Review I	…	**10 marks**
Project Review II	…	**10 marks**
Attendance	…	**05 marks** (award of marks same as theory subjects pattern)
Total	…	**25 marks**

Proper record to be maintained for the two Project Reviews, and It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Mark for Project Work & Viva Voce in Board Examination:

Viva Voce	…	**30 marks**
Marks for Report Preparation, Demo	…	**35 marks**
Total		**65 marks**

c) Written Test Mark (from 2 topics for 30 minutes duration): $

i) Environment Management	2 questions X 2 ½ marks	= **5 marks**
iI) Disaster Management	2 questions X 2 ½ marks	= **5 marks**
		10marks

$ **-** Selection of Questions should be from Question Bank, by the External Examiner.

No choice need be given to the candidates.

Project Work & Viva Voce in Board Examination	--	**65 Marks**
Written Test Mark (from 2 topics for 30 minutes duration)	--	**10 Marks**
TOTAL	--	**75 Marks**

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual during the Project Work & Viva Voce Board examination.

12. Scheme of Examinations:

The Scheme of examinations for subjects is given in **Annexure - II.**

13. Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the State Board of Technical Education & Training, Tamil Nadu and pass all the subjects prescribed in the curriculum.

2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than *40% in theory subjects* and *50% in practical subject* out of the total prescribed maximum marks including both the internal assessment and the Board Examination marks put together, subject to the condition that he/she secures at least a minimum of *30 marks out of 75 marks in the Board's Theory examinations and a minimum of 35 marks out of 75 marks in the Board Practical Examinations.*

14. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2018 onwards (Joined in first year in 2015-2016) will be done as specified below.

First Class with Superlative Distinction:
A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 3/ 3½/ 4 years (Full Time/Sandwich/Part Time) without any break in study.

First Class with Distinction:
A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate of marks in all the

semesters put together and passes all the semesters except the I and II semesters in the first appearance itself and passes all the subjects within the stipulated period of study 3/ 3½/ 4 years (Full Time/Sandwich/Part Time) without any break in study.

First Class:

A candidate will be declared to have passed in **First Class** if he/she secures not less than 60% of the aggregate marks in all semesters put together and passes all the subjects within the stipulated period of study 3/ 3½ / 4 years (Full Time/Sandwich/Part Time) without any break in study.

Second Class:

All other successful candidates will be declared to have passed in **Second Class.**

The above mentioned classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2018 /April 2019 onwards (both joined in First Year in 2015-2016)

15. Duration of a period in the Class Time Table:

The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and Lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 periods of instruction (Theory & Practical).

16. Seminar:

For seminar the total seminar 15 hours(15 weeks x 1hour) should be distributed equally to total theory subject per semester(i.e 15 hours divided by 3/4 subject). A topic from subject or current scenario is given to students. During the seminar hour students have to present the paper and submit seminar material to the respective staff member, who is handling the subject. It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

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M SCHEME
(Implementation Year - From the Academic year 2015 - 2016 onwards)
CURRICULUM OUTLINE
DIPLOMA IN
MECHATRONICS ENGINEERING & ELECTRONICS (ROBOTICS) ENGINEERING (FT)

THIRD SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
34031	Electronic Devices and Circuits #	6	-	-	6
34232	Electrical Circuits and Machines $	6	-	-	6
34733	Manufacturing Technology	5	-	-	5
34034	Electronic Devices and Circuits Practical #	-	-	4	4
34735	Electrical Circuits and Machines Practical	-	-	4	4
34736	Manufacturing Technology Practical	-	-	5	5
30001	Computer Applications Practical @	-	-	4	4
Seminar		1	-	-	1
TOTAL		18	-	17	35

 # Common with III Semester ECE, $ Common with III Semester ICE, @ Common with all branches

FOURTH SEMESTER

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
34241	Analog and Digital Electronics #	5	-	-	5
34742	Mechanics of Materials	5	-	-	5
34743	Hydraulic & Pneumatic Systems	5	-	-	5
34744	Measuring Instruments and Sensors	5	-	-	5
34245	Analog and Digital Electronics Practical#	-	-	5	5
34746	Hydraulic, Pneumatic and PLC Practical	-	-	5	5
30002	Life and Employability Skill Practical $	-	-	4	4
Seminar		1	-	-	1
	TOTAL	21	-	14	35

 # Common with IV Semester ICE, $ Common with all branches

FIFTH SEMESTER

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
34751	Industrial Instrumentation And Automation	5	-	-	5
34752	Microcontroller & PIC	5	-	-	5
34753	Auto Electronics	5	-	-	5
34754	CAD/CAM	5	-	-	5
34755	Microcontroller Practical	-	-	4	4
34756	Programming in C Practical	-	-	5	5
34757	CNC Practical	-	-	5	5
Seminar		1	-	-	1
TOTAL		21	-	14	35

SIXTH SEMESTER

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
32061	Industrial Engineering and Management #	6	-	-	6
34762	Process control	5	-	-	5
34763	Robotics	5	-	-	5
34764	Process Control Practical	-	-	4	4
34765	Robotics Practical	-	-	5	5
34766	CAD Practical	-	-	5	5
34767	Project Work	-	-	4	4
Seminar		1	-	-	1
TOTAL		17	-	18	35

 # Common with VI Sem Mechanical

SCHEME OF THE EXAMINATION

THIRD SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam. Marks	Total Mark		
34031	Electronic Devices and Circuits	25	75	100	40	3
34232	Electric Circuits and Machines	25	75	100	40	3
34733	Manufacturing Technology	25	75	100	40	3
34034	Electronic Devices & Circuits Practical	25	75	100	50	3
34735	Electric Circuits and Machines Practical	25	75	100	50	3
34736	Manufacturing Technology practical	25	75	100	50	3
30001	Computer Applications Practical	25	75	100	50	3
TOTAL		175	525	700		

FOURTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam Marks	Total Mark		
34241	Analog and Digital Electronics	25	75	100	40	3
34742	Mechanics of Materials	25	75	100	40	3
34743	Hydraulic & Pneumatic Systems	25	75	100	40	3
34744	Measuring Instruments and Sensors	25	75	100	40	3
34245	Analog and Digital Electronics Practical	25	75	100	50	3
34746	Hydraulic, Pneumatic and PLC Practical	25	75	100	50	3
30002	Life and Employability Skill Practical	25	75	100	50	3
TOTAL		175	525	700		

SCHEME OF THE EXAMINATION

FIFTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam. Marks	Total Mark		
34751	Industrial Instrumentation Automation	25	75	100	40	3
34752	Microcontroller & PIC	25	75	100	40	3
34753	Auto Electronics	25	75	100	40	3
34754	CAD/CAM	25	75	100	40	3
34755	Microcontroller Practical	25	75	100	50	3
34756	Programming in C Practical	25	75	100	50	3
34757	CNC Practical	25	75	100	50	3
TOTAL		175	525	700		

SIXTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam Marks	Total Mark		
32061	Industrial Engineering and Management	25	75	100	40	3
34762	Process control	25	75	100	40	3
34763	Robotics	25	75	100	40	3
34764	Process Control Practical	25	75	100	50	3
34765	Robotics Practical	25	75	100	50	3
34766	CAD Practical	25	75	100	50	3
34767	Project Work	25	75	100	50	3
TOTAL		175	525	700		

DIPLOMA IN ELECTRONICS (ROBOTICS) ENGINEERING / MECHATRONICS
(SANDWICH)

CODE NO : 2047

M - SCHEME

2015- 2016

DIRECTORATE OF TECHNICAL EDUCATION
GOVERNMENT OF TAMILNADU

M SCHEME
(Implementation Year - From the Academic year 2015 - 2016 onwards)
CURRICULUM OUTLINE
2047: DIPLOMA IN MECHATRONICSENGINEERING (SANDWICH)

THIRD SEMESTER

SUB CODE	SUBJECT	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
34031	Electronic Devices and Circuits #	5	-	-	5
34232	Electrical Circuits and Machines $	4	-	-	4
34733	Manufacturing Technology	4	-	-	4
34744	Measuring Instruments and Sensors	4	-	-	4
34034	Electronic Devices and Circuits Practical #	-	-	4	4
34735	Electrical Circuits and Machines Practical	-	-	5	5
34736	Manufacturing Technology Practical	-	-	4	4
30001	Computer Applications Practical @	-	-	4	4
	Seminar	1	-	-	1
	TOTAL	18	-	17	35

Common with III Semester ECE , $ Common with III Semester ICE, @ Common with all branches

FOURTH SEMESTER

S.No	SUBJECT	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
34756	Programming in C practical	-	-	3	3
34791	Industrial Training-I	-	-	-	-
30002	Life and Employability Skill Practical#	-	-	3	3
		-	-	-	-

FIFTH SEMESTER

S.NO.	UBJECTS	HOURS PER WEEK			
		Theory Hours	Tutorial/ Drawing	Practical Hours	Total Hours
34241	Analog and Digital Electronics $	5	-	-	5
34742	Mechanics of Materials	4	-	-	4
34743	Hydraulic and Pneumatic systems	4	-	-	4
34752	Microcontroller and PIC	5	-	-	5
34754	CAD/CAM	4	-	-	4
34755	Microcontroller Practical	-	-	4	4
34766	CAD Practical	-	-	4	4
34245	Analog and Digital Electronics Practical	-	-	4	4
	Seminar	1	-	-	1
	TOTAL	23	-	12	35

$ Common with IV Semester ICE

SIXTH SEMESTER

S.NO.	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial/ Drawing	Practical Hours	Total Hours
34751	Industrial Instrumentation and Automation	4	-	-	4
34753	Auto Electronics	4	-	-	4
34762	Process Control	4	-	-	4
34763	Robotics	4	-	-	4
32061	Industrial Engineering and Management	4	-	-	4
34757	CNC Practical	-	-	4	4
34764	Process Control Practical	-	-	3	3
34765	Robotics practical	-	-	4	4
34746	Hydraulics, Pneumatics and PLC Practical	-	-	3	3
	Seminar	1	-	-	1
	TOTAL	21	-	14	35

SEVENTH SEMESTER

SUB CODE	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial/ Drawing	Practical Hours	Total Hours
34767	Project Work	-	-	3	3
34792	Industrial Training-II	-	-	-	-

SCHEME OF THE EXAMINATION

THIRD SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam. Marks	Total Mark		
34031	Electronic Devices and Circuits #	25	75	100	40	3
34232	Electrical Circuits and Machines $	25	75	100	40	3
34733	Manufacturing Technology	25	75	100	40	3
34744	Measuring Instruments and Sensors	25	75	100	40	3
34034	Electronic Devices and Circuits Practical #	25	75	100	50	3
34735	Electrical Circuits and Machines Practical	25	75	100	50	3
34736	Manufacturing Technology Practical	25	75	100	50	3
30001	Computer Applications Practical @	25	75	100	50	3
TOTAL		200	600	800		

FORTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam. Marks	Total Mark		
34756	Programming in C practical	25	75	100	50	3
34791	Industrial Training-I	25	75	100	50	3
30002	Life and Employability Skill Practical#	25	75	100	50	3
TOTAL		75	225	300		

FIFTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam. Marks	Total Mark		
34241	Analog and Digital Electronics $	25	75	100	40	3
34742	Mechanics of Materials	25	75	100	40	3
34743	Hydraulic and Pneumatic systems	25	75	100	40	3
34752	Microcontroller and PIC	25	75	100	40	3
34754	CAD/CAM	25	75	100	40	3
34755	Microcontroller Practical	25	75	100	50	3
34766	CAD Practical	25	75	100	50	3
34245	Analog and Digital Electronics Practical	25	75	100	50	3
TOTAL		200	600	800		

SIXTH SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam. Marks	Total Mark		
34751	Industrial Instrumentation and Automation	25	75	100	40	3
34753	Auto Electronics	25	75	100	40	3
34762	Process Control	25	75	100	40	3
34763	Robotics	25	75	100	40	3
32061	Industrial Engineering and Management	25	75	100	40	3
34757	CNC Practical	25	75	100	50	3
34764	Process Control Practical	25	75	100	50	3
34765	Robotics practical	25	75	100	50	3
34746	Hydraulics, Pneumatics and PLC Practical	25	75	100	50	3
TOTAL		225	675	900		

SEVEN SEMESTER

Subject Code	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment Marks	Board Exam. Marks	Total Mark		
34767	Project Work	25	75	100	50	3
34792	Industrial Training-II	25	75	100	50	3
TOTAL		50	150	200		

Board Examination - Question paper pattern

Common for all theory subjects unless it is specified

PART A ***- (1 to 8) 5 Questions are to be answered out of 8 questions for 2 marks each.*****(Question No. 8 will be the compulsory question and *can be asked from any one of the units)(From each unit maximum of two 2 marks questions alone can be asked)***

PART B ***- (9 to 16)5 Questions are to be answered out of 8 questions for 3 marks each.*** **(Question No. 16 will be the compulsory question and *can be asked from any one of the units) (From each unit maximum of two 3 marks questions alone can be asked)***

PART C ***- (17 to 21) Five Questions will be in the Either OR Pattern. Students have to answer these five questions. Each question carries 10 marks. (Based on the discretion of the question setter, he/she can ask two five mark questions (with sub division A & sub division B) instead of one ten marks question if required)***

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

III SEMESTER

2015-2016 onwards

ELECTRONIC DEVICES AND CIRCUITS

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M-SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code : 34031

Semester : III Semester

Subject title : ELECTRONIC DEVICES & CIRCUITS

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 15

SUBJECT	INSTRUCTIONS		EXAMINATION			
ELECTRONIC DEVICES & CIRCUITS	Hours / week	Hours / semester	Marks			Duration
	6	90	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS

Sl.No.	TOPICS	TIME (Hrs)
1	Semiconductor and Diodes	16
2	Bipolar Junction Transistor	15
3	Transistor oscillators and FET and UJT	17
4	SCR,DIAC,TRIAC and MOSFET	16
5	Opto Electronic Devices and Wave shaping Circuits	16
	Revision, Tests and Model Exam (3+4+3 Hrs)	10
Total		90

RATIONALE:

Every Electronics Engineer should have sound knowledge about the components used in Electronics Industry. This is vital in R&D Department for chip level troubleshooting. To meet the industrial needs, diploma holders must be taught about the most fundamental subject, Electronic devices and Circuits. By studying this subject, they will be skilled in handling all types of electronic devices and able to apply the skill in electronics system.

OBJECTIVES:

- On completion of the following units of syllabus contents, the students must be able to: Study the working principle of PN junction diode and transistor
- Understand the working principle of different types of rectifiers Understand the different transistor configurations Differentiate various types of amplifiers
- Study the performance of special devices like UJT, FET Study the performance of different transistor oscillators Study the performance of SCR, DIAC, and TRIAC
- Study the performance and types of MOSFET
- Study the different modes of operations of MOSFET
- Know the construction and working principle of optoelectronic devices Study the performance of solar cell with principle and applications
- Explain the concept of wave shaping circuits
- Study the working principle of clippers and clampers

DETAILED SYLLABUS

CONTENTS

34031 – ELECTRONIC DEVICES AND CIRCUITS

Unit	Name of the topic	Hrs
1	**Semiconductor and Diodes:** **Semiconductor-**Definition, classification, intrinsic and extrinsic N type & p type – drift current &diffusion current diodes – PN junction diode – forward and Reverse bias characteristics – specification – zener diode construction & working Principle-characteristics - zener break down-avalanche break down- zener Diode as a voltage regulator –applications- specifications **Rectifier** – introduction-classification of rectifiers-half wave rectifier-full wave Rectifier(center tapped, bridge)-(no mathematical equations)-comparison-Applications-filters-C, LC and PI filters	10 6
2	**Bipolar junction Transistor:** **Transistor –** NPN and PNP transistor – operation-transistor as an amplifier-transistor as a switch – transistor biasing – fixed bias, collector base bias, self bias – CB,CE,CC configurations – characteristics - comparison between three configurations in terms of input impedance, output impedance, current gain, voltage gain – classification of amplifiers- RC coupled amplifier – emitter follower and its application – negative feedback Concept, effect of negative feedback – types of negative feedback connections	10 5
3	**Transistor Oscillators and FET and UJT:** **Transistor oscillator** – Classifications – Condition for oscillations (Barkhausen criterion) – General form of LC oscillator – Hartley Oscillator – Colpitts Oscillator – RC Phase shift oscillator- Crystal oscillator. **Field Effect Transistor** – construction – working principle of FET – difference Between FET and BJT – classification of FET – characteristics of FET – Applications – FET amplifier (common source amplifier). **Uni Junction Transistor** – construction – equivalent circuit – operation – Characteristics – UJT as a relaxation oscillator	11 6
4	**SCR, DIAC, TRIAC & MOSFET:** SCR – introduction – working – VI-characteristics -comparison between SCR and transistor – SCR as a switch, controlled rectifier. TRIAC working principle Characteristics – DIAC – characteristics – DIAC as bi-directional switch. MOSFET – types & characteristics of N channel MOSFET and P channel MOSFET- Characteristics of enhancement and depletion mode MOSFET – MOSFET as a switch. Applications of SCR,TRIAC, DIAC and MOSFET.	9 7
5	**Opto Electronics Devices and wave shaping circuits:** Classification of opto electronic devices – symbols, Characteristics, working of	16

	LDR, LED, 7 segment LED and LCD– opto coupler - Photo transistor. Clipper, Clamper Circuits and waveforms only – Solar Cell - Principles -Applications. Astable, Monostable and Bi-stable Multivibrators using Transistors -Schmitt Trigger using Transistors.	
	Revision , Test and Model exam	10

Text Books:

1. Electronics Devices & Circuits by Salivahanan S, N.Suresh Kumar, A.Vallavaraj
   Tata McGraw Publication 3rd Edition 2016
2. Electronics Devices and circuit theory by Boyestad&Nashelsky, PHI , New Delhi 2009

Reference Books:

1. Electronic Principles by Malvino,-Tata McGraw Hill Publication 2010.
2. Electronic Devices & Circuits by Allen Mottershed*An Introduction*, PHI
3. Electronics Devices & Circuits by Jacob Millman and Halkias3rd Edition 2010, Tata McGraw – Hill publication
4. Optical Fiber Communication by GerdKeise 5th Edition, Tata McGraw – Hill Publication

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

III SEMESTER

2015-2016 onwards

ELECTRICAL CIRCUITS AND MACHINES

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME
(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Course Code: 1047

Semester : III

Subject Code : 34232

Subject : ELECTRICAL CIRCUITS AND MACHINES

Teaching and Scheme of Examinations:

No. of Weeks per Semester: 15

Subject Code & Name	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration in Hours
Electrical Circuits and Machines	6	90	Continuous Assessment	End Semester Examination	Total	3
			25	75	100	

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	TOPICS	TIME (Hrs)
1	DC circuits and DC Networks Theorems	16
2	AC circuits	16
3	Resonance and Three phase AC circuits	16
4	DC Machines and AC Machines	16
5	Transformers	16
	Test & Revision	10
	Total	90

RATIONALE:

The fundamental knowledge about Electrical circuits both AC and DC is essential for all diploma holders. The working principle of DC AND AC machines, transformer is a prerequisite for technicians in their workplace. This subject helps in this way.

OBJECTIVES:

- Define voltage, current, resistance, resistivity, power, energy and their units.
- State and explain ohm's law and Kirchoff's law and solve simple problems
- Derive equivalent resistance of series and parallel circuits
- Solve problems in mesh current and nodal voltage method
- State and explain super position theorem, Thevinin's theorem, Norton's theorem and maximum power transfer theorem and solve problems in theorems
- Explain 3ϕ power measurement by two watt meter method
- Explain constructional details of dc machines
- Explain the construction, working and starting methods of 1ϕ &3ϕ induction motor
- Explain the principle and working of different types of induction motor
- Explain the principle and working of transformer

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPIC	HOURS
I	**DC Circuits and DC Network Theorems** Concept of electrical quantities – Voltage – current – resistance – power – energy – ohm's law – Resistances in series – Resistances in parallel – series parallel circuits – Kirchhoff's laws Super position, Thevenin's, Norton's and maximum power transfer theorems – Statement and explanations – Simple problems.	16
II	**AC Circuits** AC fundamentals – AC waveform – sinusoidal and non-sinusoidal – period – frequency – cycle – amplitude – phase – peak value – average value – RMS value (effective value) – form factor – crest factor AC Through pure resistor, inductor and Capacitor – Concept of impedance – vector diagram. Capacitors in series and parallel – energy stored in a capacitor– derivation – simple problems. Power in AC circuits – power factor– RL, RC and RLC series and parallel circuits – simple problems. Introduction of Harmonics - Effects of Harmonics	16
III	**Resonance and 3 ϕ AC circuits** Resonance – condition for resonance – series and parallel resonance – resonance curve – effect of resistance on resonance curve – selectivity – Q factor and bandwidth – applications of resonance – simple problems in resonance. Concept of 3ϕ supply – line and phase voltage and current in star and delta connected circuits – three phase power – Measurement of three phase power by two watt meter method – simple problems – advantages of three phase over single phase system.	16

UNIT	NAME OF THE TOPIC	HOURS
IV	**D.C Machines and A.C Machines** DC machines – Types – constructional details of DC machines – DC generators – principle – types – emf equation – characteristics of shunt, series and compound generators DC motor – types – motor action – back emf – torque speed characteristics – starting of motors using 3 and 4 point starters – speed control of DC motor-applications. AC machines – 3ϕ alternator – construction and working – relation between speed and frequency. 3ϕ Induction motor – construction – types – principle of operation – methods of starting of 3ϕ induction motor – slip. Single phase induction motor – principle of operation – capacitor start - motors – Applications – principle of operation -Stepper motor .	**16**
V	**Transformers** Transformer – Ideal transformer – principle of working – constructional details – emf equation – turns ratio – core loss – copper loss – efficiency – regulation – SC and OC tests – simple problems. Transformer on No load – Transformer on load – condition for maximum efficiency – All-day efficiency(simple problems). Auto transformer – construction and working – applications.	**16**
	Revision and Test	**10**

Text books:

1. Theraja. B.L., A text book of Electrical Technology, Vol. I & II", S.Chand & Co.
2. Nagoor kani , Circuit Theory ,RBA Publications

Reference books:

1. Arumugam & Prem kumar, Circuit Theory, Khanna Publishers
2. Louis M.M. ,Elements of Electrical Engineering , Khanna Publishers
3. Gupta M.L. ,S.K.Kataria & Sons, Elementary of Electrical Engineering ,

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN
MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

III SEMESTER

2015-2016 onwards

MANUFACTURING TECHNOLOGY

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code : 34733

Semester : III Semester

Subject Title : MANUFACTURING TECHNOLOGY

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
MANUFACTURING TECHNOLOGY	Hours / week	Hours / semester	Marks			Duration
	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	TOPICS	TIME (Hrs)
1	Lathe,Planer,Shaper	**14**
2	Drilling machines, Milling machines	**14**
3	Grinding machine, Broaching	**14**
4	Unconventional Machining Processes	**14**
5	Fundamentals of measurement	**14**
6	Test & Revision	**5**
	Total	**75**

RATIONALE:

The Working principle of various machines like Planer, Shaper, Lathe, Drilling machine, Milling Machine is necessary for supervisors and Head's of Manufacturing industries. Usage of machines & Maintenance of Machines are important for plant Engineers.

Knowledge of Unconventional machining processes & measurement methods are necessary for a Mechanical Engineer.

OBJECTIVES:

On completion of the following syllabus contents, the students must be able to

- Explain the working of machine tools Lathe, planer, shaper
- Compare various work holding devices
- Explain the working of machine tools drilling machine, Milling machine
- Distinguish various types of milling cutter
- Classify different types of grinders and grinding wheels
- Explain the broaching operation and their application
- Explain the working of various unconventional machines
- Explain the various types of Measuring instruments

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	**Lathe:** Types, specification, sketch, principle parts-headstock, tailstock, carriage, and tool post. Operations performed on Lathe: turning, thread cutting, drilling, boring, reaming, tapping, knurling, forming, thread cutting, taper turning. **Planer:** Types of planers-description of double housing planer – specifications-principles of operation-drives-quick return mechanism-feed mechanism-types, work holding devices and special fixtures-types of tools-various operation. **Shaper:** Types of shaper-specifications-standard-plain-universal-principles of operations-drives-quick return mechanism –crank and slotted link-feed mechanism-work holding devices-tools and fixtures.	14

II	**Drilling machines:** Drills-flatdrills-twistdrills-nomenclature-types of drilling machines-bench type-floor type-radial type-gang drill –multi spindle type-principle of operation in drilling-speeds and feeds for various materials-drilling holes- methods of holding drill bit-drill chucks-socket and sleeve-drilling-reaming-counter sinking-counter boring-spot facing-tapping-deep hole drill-drill jigs. **Milling machines:** Types-column and knee type-plain-universal milling machine-vertical milling machine-specification of milling machines-principles of operation-work and tool holding devices-arbor-stub arbor-spring collets-adaptors-milling cutters-plain milling cutter-slab milling cutter-slitting saw-side milling cutter-angle milling cutter-T-slot milling cutter woodruff milling cutter-fly cutter-nomenclature of milling cutter-milling process-conventional milling-climb milling-milling operations-straddle milling-gang milling-vertical milling attachment-types of milling fixtures	**14**
III	**Grinding machines:** Types and classification-specifications-rough grinders-floor mounted hand grinders-portable grinders-belt grinders-precision grinders-cylindrical, surface, centre less grinders-internal grinders-planetary grinders-principles of operations-grinding wheels-abrasives-natural and artificial-dressing and truing of wheels-balancing of grinding wheels-diamond wheels-types of bonds-grit, grade and structure of wheels-wheels shapes and sizes-standard marking systems of grinding wheels-selection of grinding wheel-mounting of grinding wheels. **Broaching:** Types of broaching machine-horizontal vertical and continuous broaching-principles of operation-types of broaches-classification-broach tool nomenclature-broaching operations-simple examples.	**14**
IV	**Unconventional Machining Processes** Unconventional machining process-need – classification-Abrasive jet machining (AJM) working principle -applications – water jet machining (WJM) – working principle –applications- Abrasive water jet machining (AWJM) – working principle –applications-Electric discharge machining (EDM) - wire cut EDM- working principle -applications –Chemical machining and Electro chemical machining – working principle -applications -Laser beam machining and drilling- working principle -applications Plasma arc machining- working principle -applications -Electron beam machining –working principle -applications	**14**
V	**Fundamentals of Measurement :** Introduction –Metrology – Inspection – Definition of terms-	**14**

	Accuracy – Precision – Tolerance – Surface finish – Quality – Reliability – Interchangeability – optical fundamentals – optical instruments – principles of operation- interference band - Measurement of Length – Classification of measuring instruments – Radius measurement – Measurement of Angles – Sine bar and slip gauges, Sine bar and spirit level , Angle gauges- Measurement of Tapers –vernier bevel protractor, Tool room microscope, Autocollimator, External taper – Ring gauge measurement by balls and slip gauges –ring gauge measurement by unequal balls – Screw threads Inspection –Elements of a thread-gauging of screw threads – thread gauges – Measurement of individual elements of a screw thread – Measurement of External threads	

Text Books

1. HajraChoudhry “work shop technology” Vol.II Media Promoters and Publishers Pvt Ltd.,
2. Jain R.K “Production Technology” Khanna Publishers

Reference Books

3. M I khan ,ErajulHaque “Manufacturing Science” PHI Learning Pvt Ltd.
4. Vijay K Jain –“Advanced machining processes” Allied publishers pvt Ltd., New delhi 2007
5. Pandey p.c and shan H.S “Modern machining processes” Tata Mcgraw hill, New delhi 2007

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

III SEMESTER

2015-2016 onwards

ELECRONIC DEVICES AND CIRCUITS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code : 34034

Semester : III Semester

Subject Title : ELECTRONIC DEVICES AND CIRCUITS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

<table>
<tr><th>SUBJECT</th><th colspan="2">INSTRUCTIONS</th><th colspan="4">EXAMINATION</th></tr>
<tr><td rowspan="3">ELECTRONIC DEVICES AND CIRCUITS PRACTICAL</td><td>Hours / week</td><td>Hours / semester</td><td colspan="3">Marks</td><td>Duration</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">60</td><td>Internal Assessment</td><td>Board Examination</td><td>Total</td><td rowspan="2">3 Hrs</td></tr>
<tr><td>25</td><td>75</td><td>100</td></tr>
</table>

ELECTRONIC DEVICES AND CIRCUITS PRACTICAL

Note:

1. Each student must possess his own multimeter and a quality soldering iron

2. At least 10 experiments should be constructed using breadboard/soldering

3. Different value of components should be given for each batch of students

34034 - ELECTRONIC DEVICES AND CIRCUITS PRACTICAL

Note:

1. At least 5 experiments should be constructed using breadboard/soldering

STUDY EXPERIMENT (Not for Examination)

Identify and check the working condition of passive & active components and switches.

List of experiments to be conducted

1. Construct and plot the VI characteristics of PN junction diode and find the cut-in voltage.
2. Construct and plot the VI characteristics of Zener diode and find the break down voltage.
3. Construct and plot the regulation characteristics (by varying either load or line voltage) of Half wave rectifier with and without filters.
4. Construct and plot the regulation characteristics (by varying either load or line voltage) of Full wave rectifier with and without filters.
5. Construct and plot the regulation characteristics (by varying either load or line voltage) of Bridge rectifier with filters.
6. Construct and draw the Input and output characteristics of CE Transistor configuration and find its input & output resistance.
7. Construct and draw the frequency response of RC coupled amplifier and determine the 3-db bandwidth.
8. Construct and plot the drain characteristics of JFET and find its pinch off voltage.
9. Construct and plot UJT characteristics and find its Ip and Vv.
10. Construct and draw SCR characteristics and find its break over voltage.
11. Construct and plot the DIAC and TRIAC characteristics.
12. Construct and draw the waveforms of positive clipper and clamper.
13. Construct and draw the characteristics of LDR and a photo transistor.
14. Simulate the half wave, full wave and bridge rectifier using the simulation tool like PSPICE/multisim/orcad/tina
15. Simulate the astable and mono stable multi vibrator using the simulation tool like PSPICE/multisim/orcad/tina

EQUIPMENT REQUIREMENTS

S.NO	Name of the Equipments	Range	Quantity
1	DC Regulated power	*0-30v* 1A	10
2	High Voltage Power Supply	0-*250V, 1*A	2
3	Signal Generator	1*MHz*	4
4	Dual trace CRO	*20 MHz /* 30MHz	5
5	Digital Multi meter	---	10
6	DC Voltmeter (Analog/Digital)	Different Ranges	15
7	DC Ammeter (Analog/Digital)	Different Ranges	15

QUESTION PAPER PATTERN

CIRCUIT DIAGRAM	20 MARKS
CONNECTION	25 MARKS
EXECUTION & HANDLING OF EQUIPMENT	15 MARKS
OUTPUT / RESULT	10 MARKS
VIVA – VOCE	5 MARKS
TOTAL	75MARKS

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

III SEMESTER

2015-2016 onwards

ELECTRICAL CIRCUITS AND MACHINES PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M – SCHEME
(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code :34735

Semester : III Semester

Subject Title : ELECTRICAL CIRCUITS AND MACHINES PRACTICAL

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

<table>
<tr><th>SUBJECT</th><th colspan="2">INSTRUCTIONS</th><th colspan="4">EXAMINATION</th></tr>
<tr><td rowspan="3">ELECTRICAL CIRCUITS AND MACHINES PRACTICAL</td><td>Hours / week</td><td>Hours / semester</td><td colspan="3">Marks</td><td>Duration</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">60</td><td>Internal Assessment</td><td>Board Examination</td><td>Total</td><td rowspan="2">3 Hrs</td></tr>
<tr><td>25</td><td>75</td><td>100</td></tr>
</table>

OBJECTIVES:

- Verify the Thevinin's Theorem
- Verify Ohms law and super position theorem
- Verify maximum power transfer theorem
- Demonstrate the frequency response plot for series and parallel resonance
- Conduct load test on single phase transformer
- Conduct Load test and No Load test on DC generator

LIST OF EXPERIMENTS

1. Verify Ohm's law
2. Verify Kirchhoff's current Law
3. Verify Kirchhoff's Voltage Law
4. Test and Verify Maximum Power Transfer theorem
5. Test and verify Super position theorem
6. Test and verify Thevenin's Theorem
7. Determine the frequency response of series resonance
8. Determine the frequency response of parallel resonance
9. Measurement of power and power factor of single phase load and plot the graph.
10. Speed control of DC motor using DIAC and TRIAC
11. Speed control of AC motor using DIAC and TRIAC
12. Predetermine the efficiency and regulation by open circuit and short circuit test on single phase transformer
13. Conduct Load test on DC Generator
14. Conduct Load test on Single phase transformer
15. Determination of open circuit characteristics of DC Generators.

QUESTION PAPER PATTERN

Allocation	Marks
Circuit diagram	20
Connections & procedure	20
Tabulation & Graph	20
Result	10
Viva Voce	5
TOTAL	75

Equipment Requirements

S.NO	Name of the Equipments	Range	Required Nos.
1.	Dual power supply	0-15V	5
2.	Single phase Transformer	0-250V	2
3.	Signal Generator	1MHz	2
4.	Dual trace CRO	20 MHz	2
5.	Transformer	12-0-12V	5
6.	DC Generator		1
7.	Digital Multi meter	-	10
8.	DC Motor	-	1
9.	AC Motor		1
10.	Ohm's law kit		2
11.	Kirchoff's law kit		2
12.	Super position theorem kit		2
13.	Maximum power transfer theorem kit		2
14.	Series, parallel resonance kit		2
15.	Ammeter	Different ranges	
16.	Voltmeter	Different ranges	

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

III SEMESTER

2015-2016 onwards

MANUFACTURING TECHNOLOGY PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code :34736

Semester : III Semester

Subject Title : MANUFACTURING TECHNOLOGY PRACTICAL

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
MANUFACTURING TECHNOLOGY PRACTICAL	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES:

- Identify the parts of a Lathe and Shaper.
- Identify the Parts of a Milling machine.
- Machine a component using Lathe
- Machine a component using Shaper
- Grind a job to the given specification
- Use a dividing head and indexing plate
- Maintenance of Machines

MANUFACTURING TECHNOLOGY PRACTICAL

Exercises in Lathe:

1. Plain turning
2. Step turning
3. Step and Taper turning
4. Knurling and thread cutting
5. Boring (Straight and taper)

Exercises in milling machine

1. Plain milling
2. Spur gear milling
3. Pocket milling

Exercises in cylindrical grinding:

1. Shaft grinding
2. Plug gauge grinding

Exercises in Surface Grinding:

1. Square surface grinding

Exercises in Tool and Cutter Grinding:

1. Single point cutting tool grinding

Exercises in Shaper:

1. Shaping round to square
2. Shaping a ‘V’ block

EQUIPMENT REQUIREMENTS

LATHE	15 NOS
MILLING MACHINE	3 NOS
CYLINDRICAL GRINDING MACHINE	1 NO
SURFACE GRINDING MACHINE	1 NO
TOOL AND CUTTER GRINDING MACHINE	1 NO
SHAPER	2 NOS

QUESTION PAPER PATTERN

LATHE/MILLING	45 MARKS
DRILLING/SHAPING/GRINDING	25 MARKS
VIVA VOCE	5 MARKS
TOTAL	75 MARKS

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

III SEMESTER

2015-2016 onwards

COMPUTER APPLICATIONS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU.

M- SCHEME

(Implemented from the academic year 2016-2017 onwards)

Course Name : For All Branches

Subject Code : 30001

Semester : III

Subject title : COMPUTER APPLICATIONS PRACTICAL

TEACHING & SCHEME OF EXAMINATION:

No. of weeks per Semester: 15 Weeks

Course	Instruction		Examination			
			Max.			Duration
	Hours/ week	Hours/ Semester	Internal Assessment	Board Examination	Total	
COMPUTER APPLICATIONS PRACTICAL	4Hrs	60 Hrs	25	75	100	3Hrs

RATIONALE:

The application of Computer knowledge is essential the students of all disciplines of Engineering in addition to their respective branch of study. The Computer Application Practical course facilitates the necessary knowledge and skills regarding creating, working and maintaining the documents and presentation of documents with audio visual effects ina computer and produces necessary skills in E- Learning and Chatting tools..

OBJECTIVES:

On completion of the following exercises, the students will be able to

- Use the GUI operating systems
- Familiarize and customize the desktop
- Use the different facilities available in the word processor
- Prepare Power Point presentation with different formats
- Expose E-learning tools and chatting tools
- Analyze the datasheet
- Create and manipulate the database
- Create different types of charts
- Prepare PowerPoint presentation
- Understand Internet concepts and usage of e-mail

GUIDELINES:

- All the experiments given in the list of experiments should be completed and all the experiments should include for the end semester practical examination.
- The computer systems should be 1:1ratioforpracticalclasses

SYLLABUS
LAB EXERCISES
SECTION – A

GRAPHICAL OPEARTING SYSTEM

Introduction to GUI OS; Features and various versions of GUI OS & its use; Working with GUI OS; My Computer & Recycle bin ; Desktop, Icons and Explorer; Screen description & working styles of GUI OS; Dialog Boxes & Toolbars; Working with Files & Folders; simple operations like copy, delete, moving of files and folders from one drive to another, Shortcuts &Autostart; Accessories and Windows Settings using Control Panel- setting common devices using control panel, modem, printers, audio, network, fonts, creating users, internet settings, Start button & Program lists; Installing and Uninstalling new Hard ware & Software program on your computer - Copying in CD/DVD settings – Recording Audio files.

Exercises

1. a. Installing screen saver and change the monitor resolution by 1280X960
   b. Setting wall papers
   c. Creating, moving, deleting and renaming a folder
   d. Copy, paste and cut a folder/file
   e. Displaying the properties for a file or folder
2. a. Restoring files and folders from Recycle bin
   b. Creating short cuts for folder/file
   c. Finding a file or folder by name
   d. Selecting and moving two or more files/folders using mouse
   e. Sorting folders/files.

WORD PROCESSING

Introduction to Word Processing – Examples- Creation of new documents, opening document, insert a document into another document. Page setup, margins, gutters, font properties, Alignment, page breaks, header footer deleting, moving, replace, editing text in document. Saving a document, spell checker.

Printing a document. Creating a table, entering and editing, Text in tables. Changing format of table, height width of row or column. Editing, deleting Rows, columns in table. Borders, shading, Templates, wizards, drawing objects, mail merge.

Exercises

3. Create the following table and perform the operations given below

DAYS	1	2	3	4	5	6	7	8
MON	←TEST→		**A**: JPP			CA	RDBMS	TUT
			B:RDBMS					
TUE	CA	OOP	CN	RDBMS	**A**: RDBMS			
					B: JPP			
WED	CN	RDBMS	OOP	RDBMS	COMMUNICATIO N		CN	CA
THU	OOP	**A**: JPP			CA	RDBMS	CN	OOP
		B: RDBMS						
FRI	COMMUNICATI ON		**A**: RDBMS		OOP	CN	RDBMS	CA
			B: JPP					
SAT	OOPS	RDBMS	CN	CA	---------			

4. Create a standard covering letter and use mail merge to generate the customized letters for applying to a job in various organizations. Also, create a database and generate labels for the applying organizations.
5. Create a news letter of three pages with two columns text. The first page contains some formatting bullets and numbers. Set the document background colour and add 'confidential' as the watermark. Give the document a title which should be displayed in the header. The header/ footer of the first page should be different from other two pages. Also, add author name and date/ time in the header. The footer should have the page number.

SPREADSHEET

Introduction to Analysis Package – Examples - Concepts of Workbook & Worksheets; Using Wizards; Various Data Types; Using different features with Data, Cell and Texts; Inserting, Removing & Resizing of Columns & Rows; Working with Data & Ranges; Different Views of Worksheets; Column Freezing, Labels, Hiding, Splitting etc.; Using different features with Data and Text; Use of Formulas, Calculations & Functions; Cell Formatting including Borders & Shading; Working with Different Chart Types; Printing of Workbook & Worksheets with various options.

Exercises

6. Create a result sheet containing Candidate's Register No., Name, Marks for six subjects. Calculate the total and result. The result must be calculated as below and failed candidates should be turned to red.

   Result is Distinction if Total >= 70 %

   First Class if Total > = 60 % and < 70 %

   Second Class if Total >= 50 % and < 60 %

   Pass if Total >= 35 % and < 50 %

Fail otherwise

Create a separate table based on class by using auto filter feature.

7. Create a table of records with columns as Name and Donation Amount. Donation amount should be formatted with two decimal places. There should be at least twenty records in the table. Create a conditional format to highlight the highest donation with blue color and lowest donation with red colour. The table should have a heading.

8. Create line and bar chart to highlight the sales of the company for three different periods for the following data.

SALES BAR CHART

Period	Product1	Product2	Product3	Total
JAN	35	40	50	125
FEB	46	56	40	142
MAR	70	50	40	160

SECTION – B

DATABASE

Introduction – Menus – Tool bar – Create – Edit – Save – Data types – Insert – Delete – Update – View – Sorting and filtering – Queries – Report – Page setup – Print.

Exercises

9. Create Database to maintain at least 10 addresses of your class mates with the following constraints

- Roll no. should be the primary key.
- Name should be not null

10. create a students table with the following fields: Sr.No, Reg. No, Name, Marks in 5 subjects. Calculate total and percentage of 10 students. Perform the following queries.

- To find the details of distinction student
- To find the details of first class students
- To find the details of second class students

11. Design a report for the above exercise to print the consolidated result sheet and mark card for the student.

PRESENTATION

Introduction - Opening new presentation, Parts of PowerPoint window – Opening -Saving and closing presentations - Features of PowerPoint, Background design, Word art, Clip art, Drawings,3D settings - Animations, Sound, Views, types of views - Inserting and deleting slides, arranging slides, slides show, rehearsal, setup show, custom show - Creating custom presentations, action setting, auto content wizard, working with auto content wizard

Exercises

12. Make a marketing presentation of any consumer product with at least 10 slides. Use different customized animation effects on pictures and clip art on any four of the ten slides.
13. Create a Presentation about our institution or any subject with different slide transition with sound effect.

INTERNET

Introduction – Getting acquainted with Internet Connection - Browsers – Website URL - Open a website – Net Browsing - Email: Creating E-mail id – Sending , receiving and deleting E-mail - Email with Attachments – CC and BCC - Chatting – Creating Group mail - Google docs – Search Engines – Searching topics .

Most Popular Social Networking Sites : History – Features – Services – Usage of Face book , Twitter and Linkdln.

Transferring data through wifi / bluetooth among different devices.

Introduction to cybercrime – Software Piracy – Viruses – Antivirus Software

Exercises

14. Create an e-mail id and perform the following
    - Write an e-mail inviting your friends to your Birthday Party.
    - Make your own signature and add it to the e-mail message.
    - Add a word attachment of the venue route
    - Send the e-mail to at least 5 of your friends.

15. Create a presentation on Google docs. Ask your friend to review it and comment onit. Use "Discussion" option for your discussions on the presentation.

Hardware and Software Requirements

Hardware Requirements:

- Computers – 36Nos
    - Intel Core i3 Processor
    - 500 GB Hard Disk, 2 MB RAM
    - 14" Monitor
- Projector – 1 Nos
- Laser Printer – 1 No
- Internet Connection – Minimum of 512 KB

Software Requirement

- Any GUI Operating System
- Open Source Software / MS- Office

1. SemesterEndExamination–75 Marks

Content	Max.Marks
Writing Procedure – One Question from Section A	15
Demonstration	15
Results with Printout	5
Writing Procedure – One Question from Section B	15
Demonstration	15
Results with Printout	5
Viva voce	5
Total	**75MARK**

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

IV SEMESTER

2015-2016 onwards

ANALOG AND DIGITAL ELECTRONICS

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Course Code : 1047

Semester : IV

Subject Code : 34241

Subject : **ANALOG AND DIGITAL ELECTRONICS**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15

<table>
<tr><th rowspan="2">Subject Code & Name</th><th colspan="2">Instruction</th><th colspan="4">Examination</th></tr>
<tr><th>Hours/ Week</th><th>Hours/ Semester</th><th colspan="3">Marks</th><th>Duration in Hours</th></tr>
<tr><td rowspan="2">Analog and Digital Electronics</td><td rowspan="2">5</td><td rowspan="2">75</td><td>Continuous Assessment</td><td>End Semester Examination</td><td>Total</td><td rowspan="2">3</td></tr>
<tr><td>25</td><td>75</td><td>100</td></tr>
</table>

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	TOPICS	TIME (Hrs)
1	Linear Ics: Op. amp. Timer and their applications	13
2	Boolean Algebra	13
3	Combinational Logic	13
4	Sequential Logic	13
5	D/A, A/D and Memory	13
6	Revision and test	10
	Total	75

RATIONALE:

Digital electronics replaces the analog circuits in many fields. Using digital circuits is easier . Diploma holders must have knowledge about the fundamental laws used in digital electronics and the working principle of digital circuits. Operational amplifiers find application in timer circuits . This subject deals with both analog and digital electronic circuits.

OBJECTIVES:

- Explain the characteristics and applications of operational amp.
- Learn the concepts of Astable and Monostable Multivibrator using 555.
- Recognize the different number systems such as binary, BCD, Octal, Hexadecimal
- Familiarize the Truth Table and symbol of Logic gates
- Learn the operation of Adders and subtractor
- Distinguish between Combinational Logic and Sequential Logic
- Familiarize the reduction technique using Karnaugh map(2 variable to 4 variable)
- Familiarize the concept of multiplexer, Demultiplexer , encoder and decoder
- Explain various Flip flops , registers and counters
- Study the different types of A/D and D/A converters

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPIC	HOURS
I	**Linear ICs: Op-amps, Timers and their applications** Operational amplifier – Ideal Op.Amp – Block diagram and characteristics –Op-amp parameters – CMRR – Slew rate – Virtual ground – Applications of op-amp – Inverting amplifier – Summing amplifier – Non inverting amplifier – Voltage follower – Comparator – Zero crossing detector – Integrator – Differentiator – Op- Amp Specifications. 555 Timer – Functional Block diagram – Astable, Monostable and Schmitt Trigger – Sequence timer,555 timer can be used as PWM.	13
II	**Boolean Algebra** Number systems – Decimal – Binary – Octal – Hexadecimal – BCD – Conversion from one number system to other – Boolean Algebra – Basic laws and Demorgan's Theorems – Logic gates – OR – AND – NOT – NOR – NAND – EX-OR Symbols, Truth table and Boolean expression – Realization of gates using universal gates NAND, and NOR – Problems using 2, 3, and 4 variables – Boolean expression for outputs – Simplification of Boolean expression using Karnaugh map (up to 4 variable)- Constructing logic circuits for the Boolean expressions.	13
III	**Combinational Logic** Arithmetic circuits – Binary addition – Binary Subtraction – 1's complement and 2's complement – Signed binary numbers – Half adder – Full adder – Half subtractor – Full subtractor – Parity Generator and checker – Digital comparator – Arithmetic Logic Unit – Decoder – 3 to 8 decoder – BCD to seven segment decoder – Encoder – Multiplexer – Demultiplexer – Digital Logic families – TTL – CMOS – LS series – Fan in – Fan out – Propagation delay – Noise immunity for the above families.	13

UNIT	NAME OF THE TOPIC	HOURS
IV	**Sequential Logic** Flip-flops – RS – D – T – JK – Master Slave Flip Flops – Edge triggered FF – Asynchronous Binary Counter – Decade counter – Mod n counter – Up Down Counter – Preset table counter – Ring counter – Johnson counter – Synchronous counter – State diagram – Shift register – 4 bit shift register – Serial in Serial out – Serial in Parallel out – Parallel in serial out.	13
V	**D/A, A/D and Memory** D/A Converter – Basic concepts – Weighted Resistor D/A converter – R-2R Ladder D/A converter – Specification of DAC IC. Sampling and quantization – Analog to digital conversion using Ramp method – Successive approximation method – Dual slope method, simultaneous method voltage to frequency converter – Frequency to voltage converter specification of A/D converter. Memory – Static Memory – Dynamic Memory – Static Memory organization in terms of address lines, control lines and data lines –– SDRAM – DDR RAM	13

Text Books:

1. R.P. Jain, Modern Digital Electronics.
2. Godse, digital electronics- 3rd edition

Reference Books:

Albert Paul Malvino and Donald P. Leach ,Digital Principles and Applications-TMH. .

1. Roger L. Tokenism Macmillan, Digital Electronics-McGraw – Hill
2. William H.Goth Mann, Digital Electronics–An introduction to theory and practice – PHI.
3. Satnam P.Mathur and others ,Electronic devices, Applications and Integrated Circuits – Umesh Publications

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

IV SEMESTER

2015-2016 onwards

MECHANICS OF MATERIALS

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name: DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code: 34742

Semester : IV Semester

Subject Title : MECHANICS OF MATERIALS

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
MECHANICS OF MATERIALS	Hours / week	Hours / semester	Marks			Duration
	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	TOPICS	TIME (Hrs)
1	Deformation of metals	14
2	Geometrical properties of sections, thin cylinders and thin spherical shells	14
3	Lateral deformation, Theory of simple bending	14
4	Torsion and Springs	14
5	Friction, Gear drives and Belt drives	14
6	Test & Revision	5
	Total	75

RATIONALE:

Mechanical Engineers must have knowledge about mechanical properties of material, deformation of material subjected to axial load and shear. This will provide adequate knowledge to work as a design engineer.

OBJECTIVES:

- Define various mechanical properties of materials.
- Calculate the deformation of materials, which are subjected to axial Load and shear
- Determine the moment of inertias of various section used in the industry.
- Estimate the stresses used in thin cylinder under internal pressure.
- Draw the graphical representation of shear force and bending moment of the Beam subjected to different Load.
- Construct SFD and BMD.
- Calculate the power transmitted by the solid & hollow shafts.
- Distinguish different types of spring and their applications.
- Define Types of Friction.

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	**DEFORMATION OF METALS** **Mechanical properties of materials:** Engineering materials – Ferrous and non ferrous materials **-**Definition of mechanical properties such as strength –elasticity, plasticity, ductility, malleability, stiffness, toughness, brittleness, hardness, wear resistance, machinability, castability and weldability—Alloying elements-effect of alloying element - Fatigue, fatigue strength, creep –temperature creep – cyclic loading and repeated loading – endurance limit **Simple stresses and strains:** Definition – Load, stress and strain – Classification of force systems – tensile, compressive and shear force systems –Behavior of mild steel in tension up to rupture – Stress – Strain diagram – limit of proportionality – elastic limit – yield stress – breaking stress – Ultimate stress – percentage of elongation and percentage reduction in area – Hooke's law – Definition – Young's modulus - working stress, factor of safety, load factor, shear stress and shear strain - modulus of rigidity. Linear strain – Deformation due to tension and compressive force – Simple problems in tension, compression and shear force. Definition – Lateral strain – Poisson's ratio – volumetric strain – bulk modulus –volumetric strain of rectangular and circular bars – problems connecting linear, lateral and volumetric deformation – Elastic constants and their relationship -Problems on elastic constants Definition – Composite bar – Problem in composite bars subjected to tension and compression	**14**
II	**GEOMETRICAL PROPERTIES OF SECTIONS AND THIN CYLINDERS AND THIN SPERICAL SHELLS** **Properties of sections:** Definition – center of gravity and centroid - position of centroids of plane geometrical figures such as rectangle, triangle, circle and trapezium-problems to determine the centroid of angle, channel, T and I sections only - Definition-centroidal axis-Axis of symmetry. Moment of Inertia –Statement of parallel axis theorem and perpendicular axis theorem. Moment of Inertia of lamina of rectangle, circle, triangle, I and channel sections-Definition-Polar moment of Inertia-radius of gyration – Problems computing moment of inertia and radius of gyration for angle, T, Channel and I sections.	**14**

UNIT	NAME OF THE TOPICS	HOURS
	Thin Shells: Definition – Thin and thick cylindrical shell – Failure of thin cylindrical shell subjected to internal pressure – Derivation of Hoop and longitudinal stress causes in a thin cylindrical shell subjected to internal pressure – simple problems – change in dimensions of a thin cylindrical shell subjected to internal pressure – problems – Derivation of tensile stress induced in a thin spherical shell subjected to internal pressure – simple problems – change in diameter and volume of a thin spherical shell due to internal pressure – problems.	
III	**LATERAL DEFORMATION** **(SF AND BM DIAGRAMS ,THEORY OF SIMPLE BENDING)** Classification of beams – Definition – shear force and Bending moment – sign conventions for shear force and bending moment – types of loadings –Relationship between load, force and bending moment at a section – shear force diagram and bending moment diagram of cantilever and simply supported beam subjected to point load and uniformly distributed load (udl) – Determination of Maximum bending moment in cantilever beam and simply supported beam when they are subjected to point load and uniformly distributed load. **THEORY OF SIMPLE BENDING** Theory of simple bending – Assumptions – Neutral axis – bending stress distribution – moment of resistance – bending equation – M/I=f/y=E/R – Definition – section modulus - rectangular and circular sections – strength of beam – simple problems involving flexural formula for cantilever and simple supported beam.	**14**
IV	**TORSION AND SPRINGS** Theory of torsion – Assumptions – torsion equation – strength of solid and hollow shafts – power transmitted – Definition – Polar modulus – Torsional rigidity – strength and stiffness of shafts – comparison of hollow and solid shafts in weight and strength considerations – Advantages of hollow shafts over solid shafts – Problems. Types of springs – Laminated and coiled springs and applications – Types of coiled springs – Difference between open and closely coiled helical springs –closely coiled helical spring subjected to an axial load – problems to determine shear stress, deflection, stiffness and resilience of closed coiled helical springs.	**14**

UNIT	NAME OF THE TOPICS	HOURS
V	**FRICTION, GEAR DRIVES AND BELT DRIVES** Definition – force of friction – limiting friction- static – dynamic friction – angle of friction – co-efficient of friction – cone of friction – laws of static and dynamic friction GEAR DRIVES: Introduction – classification of gears – Nomenclature of a gear – Explanation and application of Spur, Helical and Bevel gears, Worm and Worm wheel, rack and pinion – Velocity ration of a gear drive – merits and demerits of gear drive – Problems on simple gear train and power transmitted by gear BELT DRIVES: Belt Drive – types – open belt drive – Cross Belt drive – Flat belt drive – V Belt drive –Problems on Power transmitted.	**14**

Text Books:

1) Strength of Materials ,R. S. Khurmi, , S.Chand & Co., Ram Nagar, New Delhi – 2002
2) Strength of Materials, S. Ramamrutham, 15 th Edn 2004, DhanpatRai Pub. Co., New Delhi.

Reference Books:

1) Strength of Materials ,R.K. Bansal,, Laxmi Publications Pvt. Ltd., New Delhi, 3rd Edition, 2010.
2) Strength of materials, S.S.Rattan, Tata Mcgraw hill, New Delhi,2008, ISBN 9780070668959,
3) Strength of Materials, B K Sarkar, I Edition, 2003 Tata Mcgraw hill, New Delhi.
4) Engineering mechanics, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 2nd Edition, 2007

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

IV SEMESTER

2015-2016 onwards

HYDRAULICS AND PNEUMATICS SYSTEMS

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code: 34743

Semester : IV

Subject Title : **HYDRAULICS AND PNEUMATICS SYSTEMS**

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
HYDRAULICS AND PNEUMATICS SYSTEMS	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	TOPICS	TIME (Hrs)
1	Fluid Power and Pumps	14
2	Linear Actuators, Rotary Actuators	14
3	Directional Control Valve, Pressure Control Valve and Flow Control Valve	14
4	Hydraulic Components, Instrumentation and measurement, Conduits and Fittings, Hydraulic Circuits	14
5	Pneumatics System, Electronic Control for Fluid Power	14
6	Test & Revision	5
	Total	75

RATIONALE:

Hydraulics and pneumatics systems plays a vital role in the Automation world. Adequate Knowledge in hydraulic and pneumatic components, principle of working, usage of components & maintenance of components is necessary in the field of automation.

OBJECTIVES:

To Understand & Explain various types of piston pumps.

To Understand & Explain various types gear pumps.

To Familiarize Understand & Explain various linear actuators.

To Understand& Explain various rotary actuators.

To Understand & Explain various directional control valves.

To Understand & Explain various pressure control valves.

To Understand & Explain Various Hydraulic components.

To Understand & Explain Various Directional Control valves.

To Understand & Explain Various Pneumatic system.

Interpolate the hydraulic and pneumatic systems

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	**Fluid Power, Pumps.** Fluid Power –Definition –Pascal's Law- Basic Properties Of Hydraulic Fluids- Mass , Weight, Density, Specific Weight, Specific Gravity, Viscosity, Bulk Modulus. Hydraulic Pumps-Classification -Pump Types- **Piston Pumps** –Axial Piston Pump-Radial Piston Pumps- Graphical Symbols – Working Principles only. **Gear Pumps**-External Gear Pump- Internal Gear Pumps. Graphical Symbols – Working Principles only. V**ane Pump**-Unbalanced Vane Pump – Balanced Vane Pump- Graphical Symbols – Working Principles only.	**14**
II	**Linear actuators, Rotary actuators.** **Linear Actuators**- Hydraulic Cylinders - Cylinder Types-Single Acting cylinder -Gravity Return cylinder–Spring Return cylinder - Telescopic Cylinder – Hydraulic Ram –Tandem Cylinder , Symbols and working principles only- **Rotary actuators**-motor types –gear motor-balanced vane motor-piston motor –two vane rotor actuator-rack AND pinion rotary actuator-motor torque – speed – power –efficiency –symbols –applications – specifications.	**14**
III	**Directional control valve, pressure control valve and Flow control valve** **Directional Control Valves**:-Check Valve-Shuttle Valves-Two Way Directional Control Valves -Three Way Directional Control Valves -Four Way Directional Control Valves – Directional Control Valves Actuation types-Symbols- Working Principles- **Pressure Control Valve:** Pilot Operated, Pressure Relief Valve –Pressure Reducing Valve –Sequence Valve – Symbols- Working Principles **Flow Control Valve** –Type –Needle Valve –Pressure Compensated Flow Control Valve-Cushioned Cylinders –Flow Dividers –Balanced Spool Flow Divider- Rotary Flow Divider .	**14**
IV	**Hydraulic components, Instrumentation and Measurement, Conduits and Fittings, Hydraulic circuits:** **Hydraulic Components** –Accumulators – types –Diaphragm - Spring Loaded -Weight Loaded -Pressure Intensifiers – Hydraulic Reservoirs-Heat Exchanger types- Air cooled –Water cooled - Filters .	**14**

UNIT	NAME OF THE TOPICS	HOURS
	Instrumentation and Measurement: Pressure Gauges-Flow meters- Temperature Gauges- **Conduits and Fittings**-Pipe - Tubing –Hose - Seals and Bearings – Hydraulic Fluids. **Hydraulic Circuits:-**Counter Balance Circuit –Sequence Circuit-Speed Control Circuit-Meter in Circuit –Meter Out Circuit-Intermittent Feed Control-Speed Control For Continous Processing – **Booster and Intensifier Circuits**-Force Multiplication –Pressure Intensification.	
V	**Pneumatics system, Electronic control for Fluid power** **Pneumatics** - Basic principles of pneumatics-difference between hydraulics and pneumatics-compressor types-two stage piston compressor –rotary vane compressor-rotary screw compressor – vacuum pumps- double acting pneumatic cylinder–gear motor-pressure regulator –filters-lubricators-FRL unit-water removal – air preparation and distribution – **Electronic control of fluid power** - solenoid valves-servo valves pump controls.	**14**

Text Books:

1. Industrial Hydraulics –Third Edition John J.PippengerTyler,G.Hicks.Mc.Graw-Hill Book Companys.
2. Introduction To Fluid Power--James L. Johnson.-Delmar Thomson Learning Inc.

References :

1. Fluid Power Technology-Robert P. Kokernale-Library Of Congress Cataloging-Publication Data.
2. Basic Fluid Power - Dudleyt, A Pease and John J Pippenger - Prentice Hall 1987.
3. Fluid Power With Applications - Antony Espossito, Prentice Hall 1980.
4. Hydraulics And Pneumatics - (HB) Adrewparr –Jaico Publishing House.
5. Pneumatic And Hydraulic Systems - Bolton W. Butterworth-Heinemann-1987

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

IV SEMESTER

2015-2016 onwards

MEASURING INSTRUMENTS AND SENSORS

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name: DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code: 34744

Semester : IV

Subject Title : MEASURING INSTRUMENTS AND SENSORS

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
MEASURING INSTRUMENTS AND SENSORS	Hours / week	Hours / semester	Marks			Duration
	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS:

Sl.No.	TOPICS	TIME (Hrs)
1	Analog Instruments	14
2	CRO and Bridges	14
3	Digital Instruments, Displays & Recorders	14
4	Basic Sensors	14
5	Advanced Sensors	14
6	Test and Revision	5
	Total	75

RATIONALE:

Basic knowledge about instruments, usage of instruments, debugging faults, maintenance of instruments are most important for an instrumentation Engineer. Types of Transducers, Measurement methods & procedures are essential to work in the field of Automation & process industries.

OBJECTIVES:

On completion of the following units of syllabus contents, the student must be able to

- Define the characteristics of instruments.
- List out the classification of instruments.
- Explain the principle and working of analog instruments.
- Draw and explain the block diagram of CRO.
- Understand the functioning of Digital Storage Oscilloscope.
- Explain the working of various bridges.
- Understand the various types of Digital instruments.
- Explain the principle of operation of various recorders and displays.
- Understand various types of sensors.
- Explain inductive, capacitive, ultrasonic, hall effect, pyro electric sensors for various measurements.
- Study advanced sensors for various measurements.
- Understand recent trends in sensors technologies.

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	**ANALOG INSTRUMENTS:** **Characteristics of Instruments** – True value, Accuracy, Precision, Sensitivity, Reproducibility, Drift, Static Error and Correction, Resolution. **Classification of Instruments** – Primary and Secondary Instruments – Indicating, Recording & Integrating instruments. **Operating forces** – Deflecting, Controlling and Damping force. **Instruments -** Permanent Magnet Moving Coil instrument, Moving Iron Instrument – attraction and repulsion type, Analog Multimeter, Dynamometer Watt meter, Single phase induction type Energy meter.	14
II	**CRO & BRIDGES:** **CRO -** Block diagram of oscilloscope, construction and working of CRT, Horizontal deflection, Vertical deflection, Delay line, Time base generator, Electrostatic focusing and Electrostatic deflection(No derivation), applications of CRO, Digital Storage Oscilloscope. **Bridges –** Construction, working, balance equation (derivation not required) & applications of – measurement of resistance by wheat stone bridge, measurement of capacitance by Schering Bridge, measurement of inductance by Maxwell's bridge.	14
III	**DIGITAL INSTRUMENTS, DISPLAYS AND RECORDERS:** **Digital Instruments** – Digital Vs Analog Instruments – Auto ranging – Auto zeroing – Auto Polarity – Block diagram of Digital Multimeter, Digital frequency counter, Digital Tachometer. **Displays** –Seven Segment Display, Alpha Numeric display, Liquid Vapour display (LVD). **Recorders** – Strip-chart recorder, X-Y recorder, CD recording and reproduction.	14
IV	**BASIC SENSORS:** Sensors and Transducers – definition, difference between sensors and transducers, classification – Active and Passive sensors.	14

	Inductive Sensors: LVDT, RVDT, Proximity Switch	
	Capacitive Sensors: The parallel plate capacitive sensors, Variable permittivity capacitive sensors, advantages and disadvantages, Capacitive sensors for liquid level measurement. **Ultrasonic Sensors:** for Level Measurement and Distance Measurement. **Hall effect Sensors**: Hall effect, Hall effect sensors for Displacement measurement, Fluid level measurement. **Pyro electric Sensors:** Pyro electric Sensors as Thermal Detector	
V	**ADVANCED SENSORS:** **Fiber optic Sensors:** Temperature sensors, Liquid level sensing, Fluid flow sensing, Micro bend sensors, Advantages of fiber optic sensors **Smart Sensors:** Primary sensors, Excitation, Amplification, filter,converters,information coding/processing, data communication, the automation. **Automotive Sensors (On-Board automobile sensors):** - Flow-rate sensors, pressure sensors, oxygen sensors, torque and position sensors. **Recent trends in Sensor Technologies:** - Film sensors- Thick film and Thin film sensors. - MEMS – Advantages and Applications of MEMS, micro machining, MEMS Accelerometer. - Nano sensors.	14

Text books:

1. A Course in Electrical and Electronics Measurements and Instrumentation – A.K.Sawhney, Dhanpat Rai & Co private limited, Eighteenth Edition 2007.

2. Sensors and Transducers - D.Patranabis, PHI Learning Private Limited, New Delhi – 110 001, Second Edition 2010.

Reference Books:

1. Electrical and Electronics Measurement and Instrumentation – R.K. Rajput, S.Chand & co.,
2. Electrical and Electronics Measurement and Instrumentation – Umesh Sinha, Satyaprakasan, Tech. India Pub 1992.
3. Modern Electronics Instrumentation and Measurement Techniques – Albert D. Helfrick.

4. A Treatise on Instrumentation Engineering – Prof. K. Padmanabhan and S.Ananthi, Ik International Publishers, New Delhi, 2010.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

IV SEMESTER

2015-2016 onwards

ANALOG AND DIGITAL ELECTRONICS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Course Code : 1047

Semester : I V

Subject Code : 34245

Subject : ANALOG AND DIGITAL ELECTRONICS PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15

<table>
<tr><th>Subject Code & Name</th><th colspan="2">Instruction</th><th colspan="4">Examination</th></tr>
<tr><td rowspan="3">Analog and Digital Electronics</td><td>Hours/ Week</td><td>Hours/ Semester</td><td colspan="3">Marks</td><td>Duration in Hours</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">75</td><td>Continuous Assessment</td><td>End Semester Examination</td><td>Total</td><td rowspan="2">3</td></tr>
<tr><td>25</td><td>75</td><td>100</td></tr>
</table>

RATIONALE:

As instrumentation signal conditioning circuits are constructed using analog and digital ICs it is mandatory for Instrumentation engineer to get practice with constructing and testing fundamental Digital circuit .Also analog to Digital and Digital to Analog conversion is also learnt in this subject practically.

OBJECTIVES:

- Illustrate the working Operational Amplifier, Differentiator and Integrator.
- Realize about the different types of thee pin IC Regulators
- Familiarize the truth table of logic gates
- Realize the Logic circuit of Boolean Expression.
- Distinguish on the operation of Adder and subtractor
- Verify the truth table of multiplexer, Demultiplexer, decoder and encoder.
- Verify the truth table of D- flip flop, T flip flop & J-K flip flop.
- Learn the operation of shift registers and counters.
- Study the operation of A/D and D/A converters

LIST OF EXPERIMENTS:

1. Construct and test Inverting Amplifier and Non inverting amplifier with dc signal using op-amp.
2. Construct and test Integrator and Differentiator using operational Amplifier
3. Construct and test Astable multivibrator using IC 555
4. Experimentally obtain the output of IC voltage regular power supplies using IC 7805 and 7912.
5. Experimentally verify the Truth table of OR, AND, NOT, NOR NAND and XOR gate using 7432,7408,7404,7402and7486.
6. Experimentally verify the universal property of NAND and NOR gates.
7. Construct and test Half adder, full adder using discrete ICs.
8. Construct and test Half subtractor, full subtractor using discrete ICs.
9. Experimentally verify the truth table of D, T, JK, Flip_Flop.
10. Construct and test 4 bit ripple counter using Flip Flop with feedback.
11. Construct and verify Digital to Analog converter using R-2R ladder Network.
12. Construct and verify A/D convertor using ADC 0808 IC.

SCHEME OF EVALUATION

No.	Allocation	Marks
1	Circuit diagram &truth table	20
2	Connection & Procedure	20
3	Tabulation & graph	20
3	Result	10
4	Viva Voce	05
Total		75

EQUIPMENTS REQUIRED :

S.No	NAME OF THE EQUIPMENT	QUANTITY REQUIRED
1.	IC TRAINER WITH POWER SUPPLY FACILITY	10
2.	CATHODE RAY OSCILLOSCOPE	2
3.	AUDIO OSCILLATOR	2

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

IV SEMESTER

2015-2016 onwards

HYDRAULIC, PNEUMATIC AND PLC PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code: 34746

Semester : IV Semester

Subject Title: HYDRAULIC, PNEUMATIC AND PLC PRACTICAL

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

<table>
<tr><th>SUBJECT</th><th colspan="2">INSTRUCTIONS</th><th colspan="4">EXAMINATION</th></tr>
<tr><td rowspan="3">HYDRAULIC, PNEUMATIC AND PLC PRACTICAL</td><td>Hours / week</td><td>Hours / semester</td><td colspan="3">Marks</td><td>Duration</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">75</td><td>Internal Assessment</td><td>Board Examination</td><td>Total</td><td rowspan="2">3 Hrs</td></tr>
<tr><td>25</td><td>75</td><td>100</td></tr>
</table>

OBJECTIVES:

- Study basic pneumatic system and it's functioning.
- Study basic hydraulic system and it's functioning.
- Design application oriented pneumatic circuits.
- Design of application oriented hydraulic system.
- Study the operation and use of special purpose values.
- Compare working of directional control valves.
- Trouble shoots in pneumatic and hydraulic circuits.

HYDRAULIC, PNEUMATIC AND PLC PRACTICAL

LIST OF EXPERIMENTS

PNEUMATICS LAB

A. Study of Pneumatic system and its elements- pressure control valve(PCV), Directional control valve (DCV) and Flow control Valve(FCV)

1. a. Direct operation of a single Acting cylinder.
   b. Direct operation of Double Acting cylinder.
2. Operations of Single Acting Cylinder controlled from two different positions using shuttle valve.
3. Operation of a Double Acting cylinder with Quick exhaust valve.
4. Speed control of Double Acting cylinder using metering in and metering out circuit.
5. Automatic operation of Double Acting cylinder in multi cycles -Using limit switches and memory valves.
6. Automatic operation of Two Double Acting cylinder in multi cycles -Using limit switches and memory valves in the following sequence
   a. A+B+A-B
   b. A-B+A+B
   c. A+B+B-A
   d. A-B+A-B
7. Operation of a Double Acting cylinder using solenoid operated Directional control valve.

HYDRAULICS LAB

B. Study of hydraulic system and its elements.

1. a. Direct operation of Double Acting cylinder.
   b. Direct operation of Hydraulic Motor.
2. a. Speed control of Double Acting cylinder - Using metering-in and metering-out control.
   b. Speed control Hydraulic Motor - Using metering-in and metering-out control.

3. Automatic operation of Double Acting cylinder in multi cycles -Using pressure sequencing valve
4. Operation of a Double Acting cylinder using solenoid operated Directional control
   valve.
5. Automatic operation of Two Double Acting cylinder in multi cycles -Using solenoid
   valves and proximities in the following sequence
   a. A+B+A-B
   b. A-B+A+B
   c. A+B+B-A
   d. A-B+A-B

PLC LAB

C. Study of PLC system and its elements

1. a. Direct operation of a Pneumatic cylinder using solenoid valve and latch circuit.
   b. Direct operation of a hydraulic cylinder using solenoid valve and latch circuit.
   c. Direct operation of a hydraulic motor using solenoid valve and latch circuit.
2. a. Operation of a pneumatic/hydraulic cylinder using AND logic control.
   b. Operation of a pneumatic/hydraulic cylinder using OR logic control.
3. a. On-delay timer control of pneumatic/hydraulic cylinder
   b. Off-delay timer control of pneumatic/hydraulic cylinder.
4. a. Automatic operation of Two Double Acting pneumatic cylinder in multi cycles Using
   proximities in the following sequence
   a. A+B+A-B
   b. A-B+A+B
   c. A+B+B-A
   d. A-B+A-B

b. Automatic operation of Two Double Acting pneumatic cylinder in multi cycles Using
   proximities in the following sequence
   a. A+B+A-B
   b. A-B+A+B

c. A+B+B-A

d. A-B+A-B

EQUIPMENT REQUIREMENTS

PNEUMATIC

BASIC TRAINER KIT	**2 Nos**
ELECTRO PNEUMATIC TRAINER KIT WITH PLC	**1 No**

HYDRAULIC

BASIC TRAINER KIT	**2 Nos.**
ELECTRO HYDRAULIC TRAINER KIT WITH PLC	**1 No.**

QUESTION PAPER PATTERN

CIRCUIT DIAGRAM	30 Marks
CONNECTION AND EXECUTION	40 Marks
VIVA VOCE	5 Marks
TOTAL	75 Marks

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

IV SEMESTER

2015-2016 onwards

LIFE AND EMPLOYABILITY SKILL PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING – SYLLABUS – M Scheme

(Being implemented from the Academic Year 2016-2017 onwards)

Course Name : **All Branches of Diploma in Engineering and Technology and Special Programmes**

Subject Code : **30002**

Semester : **IV**

Subject Title : **LIFE AND EMPLOYABILITY SKILLS PRACTICAL**

Teaching and Scheme of Examination: **No. of Weeks per Semester: 15 Weeks**

Subject	Instruction		Examination			
			Marks			
	Hours/ Week	Hours/ Semester	Internal assessment	Board Examination	Total	Duration
Life and Employability Skills	4 Hours	60 Hours	25	75	100	3 Hours

Topics and Allocation of Hours:

Sl. No.	Section	No. of Hours
1	**Part – A** Communication	**30**
2	**Part – B** Entrepreneurship, Project Preparation, Productivity, Occupational Safety, Health, Hazard, Quality Tools& Labour Welfare	**20**
3	**Part – C** Environment, Global Warming, Pollution	**10**
TOTAL		**60**

RATIONALE

Against the backdrop of the needs of the Industries, as wells as based on fulfilling the expectations of the Industries, the Diploma Level students have to be trained directly and indirectly in toning up their competency levels. Proficiency in Communication only, equips them with confidence and capacity to cope with the employment. Hence, there is a necessity to focus on these in the curriculum. At the end of the Course, the student is better equipped to express himself in oral and written communication effectively.

SPECIFIC INSTRUCTIONAL OBJECTIVES

1. Emphasize and Enhance Speaking Skills

2. Increase Ability to Express Views & Opinions

3. Develop and Enhance Employability Skills

4. Induce Entrepreneurship and Plan for the Future

5. Expose & Induce Life Skills for Effective Managerial Ability

LIFE AND EMPLOYABILITY SKILLS PRACTICAL

SYLLABUS

Unit	Topics	Activity	Hours
I	**Communication, Listening, Training, Facing Interviews, Behavioural Skills**	-- instant sentence making – say expressions/phrases-- self- introduction/another higher official in company – describe/explain product – frame questions based on patterns – make sentences based on patterns	**30**
II	**Entrepreneurship, Project Preparation, Marketing Analysis, Support & Procurement**	-- prepare an outline of a project to obtain loan from bank in becoming an entrepreneur – prepare a resume	**10**
III	**Productivity – comparison with developed countries, Quality Tools, Circles, Consciousness, Management, House Keeping**	-- search in the website -- prepare a presentation – discuss & interact	**05**
IV	**Occupational Safety, Health Hazard, Accident & Safety, First-Aid,Labour Welfare Legislation, Welfare Acts**	-- search in the website -- prepare a presentation – discuss & interact	**05**
V	**Environment, Global Warming, Pollution**	-- taking down notes / hints – answering questions -- fill in blanks the exact words heard	**10**

LEARNING STRUCTURE **100 Marks**

-- Focus more on Speaking & Listening Skills
-- Attention less on Reading & Writing Skills
-- Apply the skills in fulfilling the Objectives on Focused Topics

a) Listening **25 Marks**

1. Deductive Reasoning Skills (taking down notes/hints) **10**
2. Cognitive Skills (answering questions) **10**
3. Retention Skills (filling in blanks with exact words heard) **05**

b) Speaking Extempore/ Prepared **30 Marks**

1. Personality/Psychological Skills (instant sentence making) **05**
2. Pleasing & Amiable Skills (say in phrases/expressions) **05**
3. Assertive Skills (introducing oneself/others) **05**
4. Expressive Skills (describe/explain things) **05**
5. Fluency/Compatibility Skills (dialogue) **05**
6. Leadership/Team Spirit Skills (group discussion) **05**

c) Writing & Reading **20 Marks**

1. Creative & Reasoning Skills (frame questions on patterns) **05**
2. Creative & Composing Skills (make sentences on patterns) **05**
3. Attitude & Aim Skills (prepare resume) **05**
4. Entrepreneurship Skills (prepare outline of a project) **05**

d) Continuous Assessment (Internal Marks) **25 Marks**

(search,read, write down, speak, listen, interact & discuss)

1. Cognitive Skills (Google search on focused topics)
2. Presentation Skills& Interactive Skills (after listening, discuss)

Note down and present in the Record Note on any 5 topics **10 Marks**
Other activities recorded in the Record note **10 Marks**
Attendance **05 Marks**

INTERNAL MARKS **25 MARKS**

EXTERNAL MARKS AT END EXAMINATION **75 MARKS**

MODEL QUESTION

Time: 3 Hours **Maximum Marks: 75**

A. LISTENING **25 Marks**

1. Listen to the content and take down notes/hints 10
2. Listen to the content and answer the following questions. 10
3. Listen to the content and fill in the blanks the exact words heard. 05

B. SPEAKING **30 Marks**

1. Say in a sentence instantly on hearing the word(5 words, one after another). 05
2. Say any five expressions commonly used in communication. 05
3. Imagine, a consultant has come to your department.
   Introduce him to your subordinates. 05
4. Explain/describe the product you are about to launch in the market. 05
5. Speak with your immediate boss about the progress you have made. 05
6. Discuss within the group on the topic of focus in the syllabus. 05

C. WRITING & READING **20 Marks**

1. Frame new questions from the pattern given by changing sets of words with your own. 05

a.	When	do	you	return?
b.	How	is	his performance?	
c.	Where	has	the manager	gone?
d.	What	is	the progress	today?
e.	Why	are	the machines	not functioning?

2. Make sentences from the pattern given by changing sets of words with your own. 05

a.	The workers	are	on strike		
b.	The labourers	are paid	well	in this factory	
c.	There	is	a rest room	for the workers	
d.	These	are	the new products	launched	by our company
e.	Almost everyone	come	to the company	on motorbikes	

3. Prepare a resume for the post of Department Manager. 05

4. Prepare an outline of a project to obtain a loan. (Provide headings and subheadings) 05

I. Guidelines for setting the question paper:

A. LISTENING :

ONLY TOPICS related to
POLLUTION /
ENVIRONMENT /
GLOBAL WARMING are to be taken.
These topics are common for all the three types of evaluation.

B. SPEAKING :

1. WORDS of common usage
2. Fragments – expression of politeness, courtesy, cordiality
3. Introduce yourself as an engineer with designation or
   Introduce the official visiting your company/department

4. Describe/Explain the product/machine/department
5. Dialogue must be with someone in the place of work.
6. Group of six/eight
   Discuss the focused topic prescribed in syllabus

C. WRITING & READING:

1. Provide five different structures.
   Students are to substitute at least one with some other word/words
2. Provide five different structures.
   Students are to substitute at least one with some other word/words
3. Provide some post related to industries.
4. Outline of the project (skeleton/structure)
   Only the various headings and subheadings
   Content is not needed

II. Guidelines for recording the material on the Focused Topics in the Record note.

Write in the record note, **on any five topics**, from the list of topics given below. **10 Marks**
(5 topics x 10 marks = 50 marks. Thus, the **Average of 5 topics is 10 Marks)**

1. Productivity in Industries – Comparison with developed countries
2. Quality Tools, Quality Circles and Quality Consciousness
3. Effective Management
4. House Keeping in Industries
5. Occupational Safety and Hazard
6. Occupational Accident and First Aid
7. Labour Welfare Legislations
8. Labour Welfare Acts and Rights

9. Entrepreneurship
10. Marketing Analysis, Support and Procurement

LABORATORY REQUIREMENT:

1. An echo-free room
2. Necessary furniture and comfortable chairs
3. A minimum of two Computers with internet access
4.A minimum of two different English dailies
5. A minimum of Three Mikes with and without cords
6. Colour Television (minimum size – 29")
7. DVD/VCD Player with Home Theatre speakers
8. Smart board
9. Projector

Suggested Reading:

1. Production and Operations Management by S.N. Chary, TMH
2. Essentials of Management by Koontz &Weihrich, TMH
3. Modern Production / Operations Management by E.S. Buffa and R.K. Sarin, John Wiley & Sons
4. Production Systems: Planning, Analysis and Control by J.L.Riggs, 3rd ed., Wiley.
5. Productions and Operations Management by A.Muhlemann, J.Oakland and K.Lockyer, Macmillan
6. Operations Research - An Introduction by H.A.Taha, Prentice Hall of India
7. Operations Research by J.K.Sharma, Macmillan
8. Business Correspondence & Report Writing by R.C. Sharma and K.Mohan, TMH
9. How to prepare for Group Discussion & Interview (With Audio Cassette) by Prasad, TMH
10. Spoken English – A self-learning guide to conversation practice (with Cassette)
11. Introduction to Environmental Engineering by Mackenzie, L. Davis and A. David, Cornwell, McgrawHill, 3rd Ed.
12. Environmental Engineering by Peary, Rowe and Tchobanoglous, McgrawHill
13. Total Quality Management – An Introductory Text by Paul James, Prentice Hall
14. Quality Control and Applications by Housen&Ghose
15. Industrial Engineering Management by O.P. Khanna

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

V SEMESTER

2015-2016 onwards

INDUSTRIAL INSTRUMENTATION & AUTOMATION.

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name: DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.
Subject Code: 34751

Semester : V

Subject Title : INDUSTRIAL INSTRUMENTATION & AUTOMATION.

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
INDUSTRIAL INSTRUMENTATION & AUTOMATION.	Hours / week	Hours / semester	Marks			Duration
	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS

Sl.No	TOPICS	TIME (Hrs)
1	Strain and Force Measurements	14
2	Torque and Pressure Measurements	14
3	Tempature and Flow Measurements	14
4	Basic Concepts of PLC	14
5	Programming and Applications of PLC	14
6	Test & Revision	5
	Total	75

RATIONALE:

Sound Knowledge about transducers, Various Transducer types, measurement methodologies are most important for an Electronic & instrumentation Engineers. Familiarization of PLC, Knowledge about Developing ladder diagrams, usage of timer & counter is necessary in the field of automation**.**

OBJECTIVES:

- Understand the Various types of transducers
- Understand the various types of strain Measurement.
- Understand the various types of force measurement.
- Understand the various pressure measuring devices.
- Understand the Various Flow measuring devices.
- Understand Basic concepts of PLC.
- Draw ladder diagram
- Applications of PLC

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	**STRAIN AND FORCE MEASUREMENTS** Strain transducers-Strain measuring techniques- resistance strain gauge-Strain gauge materials – metal resistance strain gauges – bonded and unbounded type – wire type strain gauges – metal foil gauges – semiconductor strain gauge. **FORCE MEASUREMENTS** : Force – work – torque – scales & balances – equal arm beam balance – pendulum scale – proving ring – hydraulic load cell – pneumatic load cell – strain gauge load cell.	14
II	**TORQUE AND PRESSURE MEASUREMENTS** Torsion meter – mechanical, optical & electrical types strain gauge torsion meter –dynamometer – mechanical, hydraulic & electric motor generator dynamometers. Terminology – atmospheric – absolute - gauge-static- total pressures-Manometers-U tube manometer-Single column manometers- ring balance-burden gauge-bellow gauge-low pressure gauge - pirani vacuum gauge	14
III	**TEMPERATURE AND FLOW MEASUREMENTS** **TEMPERATURE MEASUREMENT** Temperature scales-temperature measuring instruments-liquid in glass thermometer-Bi-metallic thermometers-filled system-thermocouples-resistance thermometers- thermistors-total radiation Pyrometer **FLOW MEASUREMENTS** Venturi flow meter-pitot tube current meter- turbine meter-rotor meter	14
IV	**BASIC CONCEPTS OF PLC** Introduction to Programmable Logic controller – Hardwired circuits versus PLC control – Advanatages of PLC control – Relays – Parts pf PLC – Processor – Memory – Input and output modules – Digital and Analog I/O's – Communication with PLC – Logic functions (OR, AND, NAND & EX –OR)- Remote I/O – The operater interface – Message display – operater input and display –Printed reports – Traffic Displays – Time and Date – Computer boards – Talking to other PLC and computers	14

UNIT	NAME OF THE TOPICS	HOURS
V	**PROGRAMMING AND APPLICATIONS OF PLC** Ladder Programming Bit instruction – timer- counter – program control instruction – data handling instruction – math instruction – simple ladder diagrams for star- delta starter – Ladder diagrams for DOL starter – Cylinder sequence Application – Cylinder sequence using counter – Ladder diagram using Latch circuit – Ladder diagram using Timer – Ladder diagram using counter – sequence of the operation and ladder diagram for multicylinder application – sequence of the operation and ladder diagram for clean room air lock.	**14**

Text Books:

1. D.Patranabis, “Principles of industrial instrumentation”, tatamcgraw hill, ii edition

2. Electrical & Electronics – measurements & Instrumentation – Sawheney, Dhanpatrai& sons

Reference Books:

1. Modern Electronic Instrumentation & Measurements Techniques – Albert D. Helfrick and William David Cooper – PHI

2. R.K.Jain, “Mechanical and Industrial Measurements”, Khanna Publishers, 11th Edition

3. Instrumentation – Devices & Systems – C.S.Rangan, G.R.Sarma, VSV.Mani, G.K.Mithal, TMH

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

V SEMESTER

2015-2016 onwards

MICROCONTROLLER & PIC

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code : 34752

Semester : V

Subject Title **: MICROCONTROLLER & PIC**

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
MICROCONTROLLER & PIC	Hours / week	Hours / semester	Marks			Duration
	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS

SL.NO.	TOPICS	TIME (HRS)
1	Architecture of 8051	14
2	Instruction set and Programming	14
3	I/O, Timer, Interrupt and Serial Programming	14
4	Interfacing External Device with 8051	14
5	PIC	14
6	Test & Revision	5
	Total	75

RATIONALE:

Familiarization of Architecture & Functionality of 8051 makes them to work as a complete Engineer. Usage of interfacing helps them to do programming & take-up project works.

OBJECTIVES:

- Explain Architecture of 8051 Microcontroller.
- Explain the functions of various registers.
- Understand interrupt structure of 8051.
- Understand serial data communication concepts.
- Understand the programming techniques.
- Explain various addressing modes.
- Write simple programs using 8051.
- Understand the block diagram and control word formats for peripheral devices.
- Understand how to interface with RS232C.
- Understand how to interface with 8255.
- Understand various application of 8051 Microcontroller
- Understand PIC Microcontroller

UNIT	NAME OF THE TOPICS	HOURS
I	**Architecture Of 8051** Block diagram of Microcontroller – Comparison with Microprocessor and Microcontroller – Pin details of 8051 – ALU – Special function registers – ROM – RAM – RAM Memory Map (including registers and register banks) – Program Counter – PSW register –Stack - I/O Ports – Timer – Interrupt – Serial Port – External memory – Clock – Reset – Clock Cycle – Machine Cycle – Instruction cycle – Instruction fetching and execution – Overview of 8051 family	**14**
II	**Instruction Set and Programming** Assembling and running an 8051 program – Instruction set of 8051 – Data transfer instructions – Different addressing modes – Arithmetic Instructions – Signed number concepts and arithmetic operations – Logic and Compare instructions – Rotate instruction and data serialization – BCD, ASCII – Loop and jump instructions – Call instructions – Time delay routines – Program control – Assembler directives – Sample programs.	**14**
III	**I/O, Timer, Interrupt and Serial Programming** Bit addresses for I/O and RAM – I/O programming – I/O bit manipulation programming – Programming 8051 Timers – Counter programming – Basics of Serial programming – 8051 connection to RS 232 – 8051 Serial Port Programming – 8051 interrupt – Programming Timer Interrupt – Programming external hardware interrupts – Programming the serial communication interrupt – Interrupt priority in 8051	**14**
IV	**Interfacing External Device With 8051** 8051 interfacing to external memory – 8051 interfacing with the 8255 – (Programs are to be written in AssemblY for the following interfacing applications) Relays and opto isolators – Sensors interfacing and signal conditioning – Parallel ADC and Serial ADC interfacing – DAC interfacing - Keyboard interfacing – Seven segment and LCD display interfacing – Stepper Motor interfacing – DC motor interfacing and PWM - RTC Interfacing-Interfacing with I^2C Bus and SPI Bus	**14**

UNIT	NAME OF THE TOPICS	HOURS
V	**PIC** Over view of PIC 18 family-PIC 18 Features-PIC Architecture -WREG Register in the PIC-PIC File Register-File register and access bank in PIC 18- PIC Status Register-Program counter in the PIC-ROM memory map in the PIC18-Where the PIC wakes up when it is powered up-Placing code in Program ROM-Executing a program byte by byte-ROM Width in the PIC18-Harvard architecture in the PIC-RISC architecture in the PIC-Features of RISC, PIC Instructions-MOVWF instructions-COMF instruction-DECF instruction – MOVF instruction-ADDLW instruction and Status Register	**14**

TEXT BOOKS:

1. Mazidi, Mazidi and D.MacKinlay –"8051 Microcontroller and Embedded Systems using Assembly and C "- 2006 Pearson Education Low Price Edition.

2. R.Theagarajan –"Microprocessor and Microcontroller "- Sci Tech Publication, Chennai

3. Kenneth J.Ayala –"8051 Microcontroller"

4. Muhammad Ali Mazidi ,Rolind D.Mckinlay,Danny Causey-PIC Microcontroller and Embedded systems using Assembly and C for PIC 18.

REFERENCE BOOKS:

1. .Myke Predko, -"Programming customizing the 8051 Microcontroller " Tata McGraw Hill

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

V SEMESTER

2015-2016 onwards

AUTO ELECTRONICS

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS & ELECTRONICS (ROBOTICS)

M - SCHEME

(Implemented for the student admitted from the year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS & ELECTRONICS (ROBOTICS)

Subject Code : 34753

Semester : V

Subject Title : AUTO ELECTRONICS

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
AUTO ELECTRONICS	Hours / week	Hours / semester	Marks			Duration
	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS

Sl.No.	TOPICS	TIME (Hrs)
1	Automobile Fundamentals	14
2	Storage Battery, Charging and Lighting System	14
3	Sensors and Engine Management Systems	14
4	Automotive Control Systems and Control Components	14
5	Recent Trends in Automobile Technology	14
6	Test & Revision	5
	Total	75

RATIONALE:

Auto Electronics is introduced with the aim of providing necessary knowledge on automobiles that may help the students getting employed in automobile Industries.

OBJECTIVES:

- Understand the basic concepts and components
- Understand different ignition systems
- Study about the lead acid battery, testing and lighting system
- Study the sensor based electronic engine management and control devices
- Study about advance Future Trends in Automobile Techniques

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
1	**Automobile fundamentals** The engine-components- engine block, cylinder, crank shaft, piston, cam shaft, valves, intake system, ignition, exhaust, cooling system- Lubrication system-fuel feed system ignition system- spark plug- high voltage circuit and distribution- compression ignition system -steering system, Ackerman steering mechanism. Suspension systems. Fuel injection and Ignition system - Fuel injection-types-throttle body versus port injection- Fuel injectors- different types- - High pressure diesel fuel injection- Introduction to Electronic ignition system.	14
2	**Storage Battery, Charging and Lighting System:** Principle of lead acid cells, plates and their characteristics, construction, electrolyte, effect of temperature on electrolyte, specific gravity, capacity and efficiency, methods of charging from D.C. mains, defects and remedies of batteries, care of idle and new batteries. Recycling Process - Recent developments. D.C. Generators, Alternators -their Characteristics. Control, cutout, Electrical, Electro-mechanical and electronic regulators. Procedure for charging., details of head light and side light, LED lighting system, head light dazzling and preventive methods. Static and Dynamic Bending lights.	14
3	**Sensors and Engine Management Systems** Introduction to sensors and transducers-Types-Air flow rate sensor, Engine crankshaft angular position senor, Engine speed sensor, Timing sensor, Throttle angle sensor, Pressure sensor, Temperature sensors, Pressure sensor-Flow sensor, Exhaust gas oxygen sensors, Knock Sensor, Engine torque sensors, Automotive engine control actuators, Exhaust gas recirculation actuator. Electronic Engine Management System, Brake actuation warning system, flash system, oil pressure warning system, engine over heat warning system, air pressure warning system, speed warning system, door lock indicators, neutral gear indicator, horn design, permanent magnet horn, air & music horns. Wind shield wiper. Window washer, electronic instruments, dash board illumination and MIL.	14

UNIT	**NAME OF THE TOPICS**	**HOURS**
4	**Automotive control systems and control components** Engine Control Objectives, Engine control functions, Fuel delivery systems, Electronic fuel Ignition Systems– Emission control, .Automotive Transmission Control Systems - Cruise control system, Antilock braking system(ABS), Tire-slip control, Active suspension, Traction control, Electronic Suspension system, Steering control, Stability control, Integrated engine control. Central locking, Air bags and seat belt tensioners. Voice warning system, Travel information system, GPS. Introduction to micro chip –micro controller – block diagram – architecture –Introduction to AVR family IC – features, block diagram, architecture. Basics of embedded control and software.	14
5	**Recent trends in automobile technology** Electrical and Hybrid Vehicles, Introduction-Electric Vehicle development- system layout- basic system components-Electric battery solar cells- Rapid charging system-Motor drive system-fuel cell Electric vehicle- Hybrid vehicles-Parallel Hybrid Vehicle-CNG Electric hybrid vehicle. Vehicle Intelligence Introduction – Base structure- Vision based autonomous road vehicles- Architecture for vision system-Features-applications –image processing – Intelligent robot vehicles - obstacle detection, collision warning and avoidance system	14

Text Books:

1) Automobile engineering vol- 1, vol – 2, Kirpal singh, Standard publishers distributors New Delhi.
2) Automobile Engineering, G.B.S.Narang, Khanna Publishers, New Delhi.
3) Understanding Automotive Electronics, William B. Ribben, 6th edition Elsevier Science-2003

Reference Books :

1) Vehicle and Engine technology. Vol. I,Heinz Heisler, , ELBS
2) Automobile Engineering,R.B.Gupta, Satya Prakashan, New Delhi
3) Understanding Automotive Electronics,Fourth Edition,William B.Ribbens
4) Sensor and Transducers, Ronald K.Jurgen, SAE-2003
5) Electric and Hybrid-electric vehicles, Ronald K. Jurgen, SAE 2002

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

V SEMESTER

2015-2016 onwards

CAD/CAM

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.
M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code :34754

Semester : V

Subject Title : CAD/CAM

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
CAD/CAM	Hours / week	Hours / semester	Marks			Duration
	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME(HRS)
1	Introduction to CIM and Computer Aided Design & Analysis	14
2	Computer Aided Manufacturing and Rapid Prototyping	14
3	CNC Machine and Components	14
4	Part Programming	14
5	FMS, Integrated Material Handling	14
6	Test & Revision	5
	Total	75

RATIONALE:

As per the latest requirements in the industries, This enables to learn the assistance of computer in the field of design and manufacturing areas. The application of material handling equipment is learnt based on the automation in the industries.

OBJECTIVES:

- Understand the concept and requirement of the integration of the design and manufacturing.
- Acquire knowledge about the computer assistance in the design process and analysis.
- Understand the concepts of manufacturing with computer assistance in the shop floor.
- Learn the principle and working of the CNC machines.
- Understand the principle of latest manufacturing machines like EDM and RPT.
- Learn the method of CNC programming with international codes.
- Acquire the knowledge in the material handling equipment .

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	Hours
I	**INTRODUCTION TO CIM AND COMPUTER AIDED DESIGN & ANALYSIS** **CIM:** Introduction of CIM – concept of CIM - evolution of CIM – CIM wheel – Benefits – integrated CAD/CAM. **CAD:** Computer Aided Design **–** Introduction – CAD definition – Shigley's design process – CAD activities – benefits of CAD. Types of CAD system – Host and terminal based CAD system - PC based CAD system – workstation based CAD system – graphics workstation – CAD software packages. 2D&3D transformations – translation, scaling, rotation and concatenation. Geometric modeling: Techniques: Wire frame modeling – surface modeling – solid modeling: Boundary representation – Constructive Solid Geometry – Comparison. Graphics standard – Definition –Need - GKS – IGES – PHIGS – DXF. Cost involved in design changes – Concept of Design for Excellence (DFX) – Guide lines of Design for Manufacture and assembly (DFMA). **Finite Element Analysis:** Introduction – Development - Basic steps – Advantage.	**14**
II	**COMPUTER AIDED MANUFACTURING AND RAPID PROTOTYPING** **CAM:** Definition – functions of CAM – benefits of CAM – Group technology – Part families - Parts classification and coding - coding structure – Optiz system, MICLASS system and CODE System - process planning – CAPP – Types of **CAPP :** Variant type, Generative type – advantages of CAPP - production planning and control – computer integrated production management system – Master Production Schedule (MPS) – Capacity planning – Materials Requirement Planning (MRP) –Manufacturing Resources Planning (MRP-II)– Shop floor control system - Just in time manufacturing philosophy- Introduction to enterprises resources planning. Product Development Cycle – Sequential engineering – Concurrent engineering. Rapid proto typing: concept and applications – materials – types - Stereo lithography – laser sintering – Deposition Modeling - 3D printing.	**14**
III	**CNC MACHINE AND COMPONENTS** **CNC Machines:** Numerical control – definition – components of NC systems – development of NC – DNC – Adaptive control systems – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning centre – Construction and working principle of machining centers – machine axes conventions turning centre and machining centre – design considerations of NC machine tools.	**14**

	CNC EDM machine – Working principle of die sinking and wire EDM machines - Coordinate Measuring Machines: construction and working principles. **Components of CNC machine.** **Drives:** spindle drive – dc motor – Feed drives – dc servo motor and stepper motor – hydraulic systems – Slide ways – requirement – types – friction slide ways and anti friction slide ways - linear motion bearings – recirculation ball screw – ATC – tool magazine – feedback devices – linear and rotary transducers – Encoders - in process probing.	
IV	**PART PROGRAMMING** **PART PROGRAMMING:** NC part programming – methods - manual programming – conversational programming – APT programming - Format: sequential and word address formats - sequence number – coordinate system – types of motion control: point-to-point, paraxial and contouring – Datum points: machine zero, work zero, tool zero NC dimensioning – reference points – tool material – tool inserts - tool offsets and compensation - NC dimensioning – preparatory functions and G codes, miscellaneous functions and M codes –interpolation: linear interpolation and circular interpolation - CNC program procedure. Part Program – macro – sub-program – canned cycles: stock – mirror images – thread cutting – Sample programs for lathe : Linear and circular interpolation - Stock removal turning – Peck drilling – Thread cutting and Sample programs for milling: Linear and circular interpolation – mirroring – sub program – drilling cycle – pocketing – Generating CNC codes from CAD models – post processing	**14**
V	**FMS, AGV AND INTEGRATED MATERIAL HANDLING** Types of manufacturing - introduction to FMS – FMS components – FMS layouts – Types of FMS: flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible machining systems – benefits of FMS - introduction to intelligent manufacturing system – virtual machining. Computer Integrated material handling – AGV: working principle – types - benefits – Automatic Storage and Retrieval Systems (ASRS).	**14**

Text Books :

1) CAD/CAM/CIM , R.Radhakrishnan, S.Subramanian, New Age International Pvt. Ltd.
2) CAD/CAM , Mikell P.Groover, Emory Zimmers, Jr.Prentice Hall of India Pvt., Ltd.
3) NC Programming, S.K.Sinha, Galgotia Publications Pvt. Ltd.

Reference Books :

1. CAD/CAM Principles and Applications, Dr.P.N.Rao, Tata Mc Graw Hill publishing Company Ltd.
2. CAD/CAM, Ibrahim Zeid, Mastering Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Automation, Production Systems, and Computer-Integrated Manufacturing,
4. Mikell P. Groover, Pearson Education Asia.
5. Computer control of manufacturing systems,Yoram Koren, McGraw Hill Book.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

V SEMESTER

2015-2016 onwards

MICROCONTROLLER PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code :34755

Semester :V

Subject Title : **MICROCONTROLLER PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
MICROCONTROLLER PRACTICAL	Hours / week	Hours / semester	Marks			Duration
	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

MICROCONTROLLER PRACTICAL

Note1: ALL THE EXPEIMENTS SHOULD BE CONDUCTED
2: DIFFERENT DATA ARE TO BE GIVEN FOR EACH BATCH

Part – A

1. Write an Assembly Language Programme for Multi-byte Addition and execute the same in the 8051 Kit.
2. Write an Assembly Language Programme for Multiplication and Division of two numbers and execute the same in the 8051 Kit.
3. Write an Assembly Language Programme for arranging the given data in Ascending order and execute the same in the 8051 Kit.
4. Write an Assembly Language Programme for BCD to Hex conversion and execute the same in the 8051 Kit.
5. Write an Assembly Language Programme for Hex to BCD conversion and execute the same in the 8051 Kit.
6. Write an Assembly Language Programme for ASCII to Binary and execute the same in the 8051 Kit.
7. Write an Assembly Language Programme for Parity bit generation and execute the same in the 8051 Kit.
8. Write an Assembly Language Programme for using timer / Counter and execute the same in the 8051 Kit.

Part – B

INTERFACING WITH APPLICATION BOARDS

1. Write an Assembly Language Programme for interfacing Digital I/O board and test it.
2. Write an Assembly Language Programme for interfacing Matrix keyboard and test it.

3. Write an Assembly Language Programme for interfacing seven segment LED displays and test it.
4. Write an Assembly Language Programme for interfacing Traffic light control and test it.
5. Write an Assembly Language Programme for interfacing 8 bit ADC and test it.
6. Write an Assembly Language Programme for interfacing 8 bit DAC and test it.
7. Write an Assembly Language Programme for interfacing STEPPER MOTOR and test it.
8. Write an Assembly Language Programme for interfacing DC motor and test it.
9. Write an Assembly Language Programme for Sending data through serial port between controller kits and test it.

EQUIPMENT REQUIREMENTS

SI.NO	NAME OF THE EQUIPMENTS	REQUIRED NOS
1	8051 MICROCONTROLLER KIT	18 NOS.
2	DIGITAL I/O INTERFACE BOARD	2 NOS.
3	MATRIX KEYBOARD INTERFACE BOARD	2 NOS.
4	SEVEN SEGMENT LED DISPLAY INTERFACE BOARD 2 NOS	2 NOS.
5	TRAFFIC LIGHT INTERFACE BOARD	2 NOS.
6	8BIT ADC INTERFACE BOARD	2 NOS.
7	8 BIT DAC INTERFACE BOARD	2 NOS.
8	STEPPER MOTOR CONTROL INTERFACE BOARD	2 NOS.
9	DC MOTOR CONTROL INTERFACE BOARD .	2 NOS.
10	SENDING DATA THROUGH SERIAL PORT BETWEEN CONTROLLER KITS	2 NOS.

QUESTION PAPER PATTERN:

WRITING PROGRAM	30 MARKS
EXECUTION	30 MARKS
OUTPUT & RESULT	10 MARKS
VIVA – VOCE	5 MARKS
TOTAL	75 MARKS

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

V SEMESTER

2015-2016 onwards

PROGRAMMING IN C PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name: DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code: 34756

Semester :V Semester

Subject Title : PROGRAMMING IN C PRACTICAL

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
Programming in C Practical	Hours / week	Hours / semester	Marks			Duration
	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES :

At the end of the course the students will be able to

- Analyze the given problem
- Think the logic to solve the problem
- Develop programs using input and output operations, functions with decision making statements.

- Proficient to Write programs using array, string, pointers

THEORY:

Keywords, Constants, Variables and Datatypes:

Character Set – Constants – Integer Constants – Character Constants – String Constants; Variables – Declaration of Variables; Assigning value to Variables.

Operations and Expressions:

Arithmetic, Relational, Logical, Assignment, Increment, Decrement, Conditional, Bitwise Operator, Arithmetic Expressions, Evaluation of Expression.

I/O Statements:

printf() and scanf() functions (Unformat and formatted), getchar() and putchar() functions.

Functions:

Predefined functions – isdigit, isupper, islower and ispunct functions in header file<ctype.h> ; cos, tan, exp, ceil, floor, abs, pow and sqrt functions in header file <math.h>; strlen, strcpy, strcmp and strcat in header file <string.h>.

Decision Making, Branching, Looping and Arrays

Introduction:

Simple if statement.

Decision Making & Branching:

The if…else statement; Nesting of if…else statement; else…if ladder; switch case statement; goto statement.

Looping:

While statement; do…while statement; for statement, break & continue statement.

Arrays:

One Dimensional Arrays; Two Dimensional Arrays – Initializing One dimensional & Two-Dimensional Arrays; Multidimensional Arrays.

Character String and Functions

Character Strings:

Introduction – declaring & initializing string variables; Reading Strings; Writing Strings; Comparison of two Strings; String handling functions;

User Defined Functions:

Function – declaration, function – definition, function call, passing arguments, returning values, return statement.

Structures & Unions:

Structure definition; Structure Initialization; Arrays of Structures; Structure within structure; Union.

Pointers and File Management

Macro Substitution; File Inclusion; Compiler Controlled Directives.

Pointers

Understanding Pointers: Accessing the address of Variables; Declaring and Initializing Pointers; Accessing a variable through its pointer; Pointer Expressions; Pointer Increments; Pointers and Arrays; Pointer and character Strings; Pointer and functions; Pointers and Structures.

List of Exercises:

1. Program to calculate simple and compound interest.
2. Solution of a Quadratic Equation.
3. Program for Pay bill calculation.
4. Program to compute sum of series using While loop.
5. Printing of multiplication table using Do…While loop.
6. Program to find whether the given number is a positive number, negative number or zero.
7. Program to sort a list of numbers

8. Program to sort the strings.
9. Preparation of the rank list of a class of students.
10. Program to implement Matrix addition.
11. Program to implement Matrix Multiplication.
12. Program to implement Fibonacci series.
13. Program to find factorial of given N numbers without recursion.
14. Program to find factorial of given N numbers with recursion.

HARDWARE REQUIRMENT:

DESKTOP/LAPTOP COMPUTERS	36 NOS
LASER PRINTER	1 NOS

SOFTWARE REQUIREMENT:

C-COMPILER AND EDITOR

QUESTION PAPER PATTERN

WRITING PROGRAM	30 MARKS.
EXECUTION	30 MARKS
RESULT	10 MARKS
VIVA VOICE	5 MARKS
TOTAL	75 MARKS

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

V SEMESTER

2015-2016 onwards

CNC PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code: 34757

Semester : V

Subject Title: CNC PRACTICAL

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
CNC PRACTICAL	Hours / week	Hours / semester	Marks			Duration
	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

CNC PRACTICAL

Introduction

1. Study of CNC Lathe, Milling
2. Study of international standards G-codes, M codes
3. Program writing – Turning simulator – Milling simulator, IS practice – commands – menus

Exercise Practice

CNC Lathe

1. Simulate and Produce a part for step turning.
2. Simulate and Produce a part for taper turning
3. Simulate and Produce a part for circular interpolation
4. Simulate and Produce a part for multiple turning operation
5. Simulate and Produce a part for thread cutting and grooving
6. Simulate and Produce a part for internal drills and boring

CNC Milling

1. Simulate and Produce a part for grooving
2. Simulate and Produce a part for drilling
3. Simulate and Produce a part for mirroring with subroutine
4. Simulate and Produce a part for rectangular and circular pocketing

EQUIPMENT REQUIREMENTS

CNC TURN	2 NOS
CNC MILL	2 NOS

QUESTION PAPER PATTERN

CNC PROGRAM	30 MARKS
SIMUALTION	10 MARKS
MACHINE SETTING AND OPERATION	30 MARKS
VIVA VOCE	5 MARKS
TOTAL	75 MARKS

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

VI SEMESTER

2015-2016 onwards

INDUSTRIAL ENGINEERING AND MANAGEMENT

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME
(Implementation Year - From the Academic year 2015 - 2016 onwards)
Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.
Subject Code: 32061

Semester : VI

Subject Title: INDUSTRIAL ENGINEERING AND MANAGEMENT

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
INDUSTRIAL ENGINEERING AND MANAGEMENT	Hours / week	Hours / semester	Marks			Duration
	6	90	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME (Hours)
1	Plant Engineering and Plant Safety	16
2	Work Study, Method Study and Work Measurement	16
3	Production Planning and Quality Control	16
4	Basic and Modern Management Principles	16
5	Financial Management, Material Management and Organisational Behaviour	16
6	Test & Revision	10
	Total	90

RATIONALE:

In the Indian Economy ,Industries and enterprises always find prominent place . After globalization , the government of India has announced liberalization

policy of starting enterprises . Student must be trained not only in manufacturing process but also in managing activities of industries. Student must be trained to work as a good Manager.

The knowledge about plant, safety, work study techniques, personnel Management and financial management will definitely mould the students as managers to the industries.

OBJECIVES:

- To study the different types of Layout.
- To study the safety aspects and its impacts on an organization
- To study different work measurement techniques.
- To study production planning and control and its functions.
- To study basic and modern management techniques.
- To study the staff selection procedure and training of them.
- To study capital and resources of capital.
- To study inventory control system.
- To study about organization and its behavior.

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	**PLANT ENGINEERING AND PLANT SAFETY** Plant Engineering: Plant – Selection of site of industry – Plant layout – Principles of good layout – types – process, product and fixed position –- techniques to improve layout – Principles of material handling equipment – Plant maintenance – importance – Break down maintenance, preventive maintenance and scheduled maintenance. Plant Safety : Importance – accident – causes and cost of accident – accident proneness – prevention of accidents – Industrial disputes-settlement of industrial disputes –Collective Bargaining ,Conciliation, Mediation ,Arbitration-Indian factories Act 1948 and its provisions related to health ,Welfare and Safety	**16**
II	**WORK STUDY, METHOD STUDY AND WORK MEASUREMENT** Work Study: Productivity – Standard of living – method of improving productivity – Objectives – Importance of good working conditions. Method Study: Definition – Objectives – Selection of a job for method study – Basic procedure for conduct of method study – Tools used – Operation process chart, Flow process chart, two handed process chart, Man machine chart, String diagram and flow diagram. Work Measurement: Definition – Basic procedure in making a time study – Employees rating factor – Application of time allowances – Rest, Personal, Process , Special and Policy allowances – Calculation of standard time – Problems – Basic concept of production study – Techniques of work measurement. Ratio Delay study ,Synthesis from standard data , Analytical estimating and Pre determined Motion Time System(PMTS)	**16**

UNIT	NAME OF THE TOPICS	HOURS
III	**PRODUCTION PLANNING AND QUALITY CONTROL** Production Planning and Control: Introduction – Major functions of production planning and control – Pre planning – Methods of fore casting – Routing and scheduling – Dispatching and controlling –Concept of Critical path method (CPM) – Description only. Production – types –Mass Production, batch Production and job order production - Characteristics – Economic Batch Quantity (EBQ) – Principles of product and process planning – make or buy decision. Quality Control: Definition – Objectives – Types of inspection – First piece, Floor and centralized inspection – Advantages and disadvantages. Quality control – Statistical quality control – Types of measurements – Method of variables – Method of attributes – Uses of X, R, p, and c Charts – Operating Characteristics curve (O.C curve) – Sampling inspection – Single and double sampling plan – Concept of ISO:9001:2008 Quality Management System Registration Certification Procedure – Benefits of ISO to the Organization.	**16**
IV	**Principles, Modern Management Techniques and Organizational Behavior.** Principles of Management: Definition of management – Administration – Organization – F. W. Taylor's and Henry Fayal's Principles of Management – Functions of Manager – Directing – Leadership – Styles of Leadership – Qualities of a good leader – Motivation – Positive and negative motivation –Modern Management Techniques –Just in Time – Total Quality Management - Quality circle- Zero defect concept - 5S Concept – Management Information Systems – Strategic Management – SWOT Analysis – Business Process Reengineering (BPR) – Enterprises Resource Planning (ERP) – Supply Chain Management (SCM) – Activity Based Management (ABM) – Global Perspective – Principles and brief Description..	

UNIT	NAME OF THE TOPICS	HOURS

IV	Personnel Management: Responsibility of human resource management – Selection procedure – Training of workers – Apprentice training – On the job training and vestibule school training – Job evaluation and merit rating – objectives and importance – wages and salary administration – Components of wages – Wage fixation – Type of wage payment – Halsey's 50% plan, Rowan's plan and Emerson's efficiency plan – Problems. Organizational Behavior: Definition – Organization- Types of Organization – Line, staff, Taylor's pure functional types – Line and staff and committee type – Organizational Approaches, Individual behavior-causes – Environmental effect – Behavior and performance, Perception-Organizational implications	**16**
V	**FINANCIAL MANAGEMENT, MATERIAL MANAGEMENT** Financial Management: Fixed and working capital – Resources of capital – Shares preference and equity shares – debentures – Type of debentures – Public deposits, Factory costing – Direct cost – Indirect cost – Factory overhead – Selling price of a product – Profit – Problems. Depreciation – Causes – Methods – Straight line, Sinking fund and percentage on diminishing value method – Problems. Material Management: Objectives of good stock control system – ABC analysis of inventory – Procurement and consumption cycle – Minimum stock, Lead time, Reorder Level – Economic order quantity problems – Supply chain management – Introduction – Purchasing procedure – Store keeping – Bin card.	**16**

Text book:

1. "Industrial Engineering and Management", O.P Khanna Revised Edition Publications (P) Ltd., -2004 67/4 Madras House, Daryaganj, New delhi 110002.

2. "Engineering Economics and Management", T. R. Banga & S. C. Sharma, McGraw Hill Edition -2 2001, New Delhi.

3.Herald Koontz and Heina weihrich, 'Essentials of Mangement, Mcgraw hill Publishing company, Singapore International Edition Latest

Reference books:

1.Management, A global Perspective, Heinz weihrich, Harold koontz, 10th Edition, Mcgraw International Edition Latest.

2.Essentials of Management,4th Edition, Joseph L Massie, Prentice Hall of India, New Delhi 2004

3.S Chandran, Organisational Behaviour, Vikas Publicshing House Pvt Ltd. Lates M.Govindrajan and S Natarajan, Principles of Mangaement, Prentice Hall of India Pvt. Ltd., New Delhi Latest.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

VI SEMESTER

2015-2016 onwards

PROCESS CONTROL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code :34762

Semester VI

Subject Title : PROCESS CONTROL

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
PROCESS CONTROL	Hours / week	Hours / semester	Marks			Duration
	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPICS	TIME (Hrs)
1	Simple Process Control Systems and Terminology	14
2	Controller Principles	14
3	Tuning of Controllers	14
4	Final Control Elements	14
5	Complex Control Systems	14
6	Test & Revision	5
	Total	**75**

RATIONALE:

In process industries, controllers are used in controlling temperature, pressure, flow, liquid level, and other process variables. This is provided to get necessary knowledge that may help the students getting employed in process industries.

OBJECTIVES:

- Study the basic concepts of instrumentation.
- Compare the different types of sensors and transducers
- Explain the signal conditioning.
- Explain the working of digital display unit.
- Explain the functioning of recorders.
- Explain the measurement technique of strain, force torque and power.
- Explain the measurement technique of pressure, temperature and flow

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	**SIMPLE PROCESS CONTROL SYSTEMS AND TERMINOLOGY** Definition – Process – Functional block diagram of an Automatic process control system – Set point – Measured variable – Comparator – Error – Controller – Final control element. Controlled variable – Manipulated variable – disturbances –Advantages of Automatic control system – Simple Liquid level control system – Flow control system – Temperature control system with transportation Lag – Self Regulation – Capacitance and Capacity. Piping and Instrumentation flow Diagram (BIS standard) for the above system.	14
II	**CONTROLLER PRINCIPLES** Controller – Block diagram, Types, General properties – Reverse and Direct action, Controller modes – Discontinuous – On – Off Control with differential gap, without differential gap – Neutral zone– Continuous – Proportional controller – Proportional band (PB) – Effect of PB on a controller output – Offset –Integral control – PI – PD – PID – Definition, salient features, applications and limitations of the above controllers – Selection of control action – Electronic controllers – Error detector – Two position controller – P,I,D,PI,PD, PID controllers –reverse action – pneumatic controllers – Flapper – Nozzle mechanism, Pneumatic relay.	14
III	**TUNING OF CONTROLLERS** Concept of tuning – Criteria for controller tuning – Quarter decay ratio, IAE, ISE,ITAE – Methods of tuning – Open loop response method – Process reaction curve –Closed loop response method – Ultimate cycle method, Damped oscillation method.	14

UNIT	NAME OF THE TOPICS	HOURS
IV	**FINAL CONTROL ELEMENTS:** Signal converters – P to I Converter, I to P Converter – Actuators – Electrical, Pneumatic, Hydraulic and Electro pneumatic – Valve Positioners – Control valve –Characteristics Quick opening, Linear, Equal percentage – Control valve sizing – Cv rating – Selection of a control valve – Effects of Cavitation and Flashing on control valve performance.	14
V	**COMPLEX CONTROL SYSTEMS** Cascade control system, Ratio control systems, feed forward control system, Comparison of feedback control system and feed forward control system. (One specific application for each of the above systems) – Introduction DCS and SCADA Block Diagram of Fuzzy logic controller – block diagram – typical application-washing machine	14

Text books

1. Donald P Eckman, Process control,Wiely Eastern limited,1991
2. Peter Hariot, Process control,TataMcgraw Hill.
3. B. SankaraGomathi, Process control (Principles and applications), J J Publications,
1981.

Reference books

1. George Stephanopoulos, Chemical process control.
2. Michael P Lukas, Distributed control system (Their evaluation and design), Van Nostrand Reinhold Company Inc, 1986.
3. James A Freeman / David M Skapura, Neural networks, Pearson Education,Eighth reprint, 2003.
4. C.D.Johnson, Process control instrumentation Technology, Prentice Hall of India Pvt,
Ltd,
5. C.L. Smith , Digital computer process control.Douglas M. Considine, Process / Industrial Instruments Handbook, fourthedition,McGraw Hill, Inc.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

VISEMESTER

2015-2016 onwards

ROBOTICS

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.
Subject Code :34763

Semester : VI

Subject Title : ROBOTICS

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
ROBOTICS	Hours / week	Hours / semester	Marks			Duration
	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS

Sl.No	TOPICS	TIME (Hrs)
1	Basic Configuration of Robotics and its Working	14
2	Robot Controller and Servo Systems	14
3	Robot Motion Analysis and Vision System	14
4	Robot Programming	14
5	Robot Application in Manufacturing	14
6	Test & Revision	5
	Total	75

RATIONALE:

In Recent days robots are used in automation industries. Knowledge & Familiarization of robots will be considered as an added advantage in the field of Automation.

OBJECTIVES:

- Explain different components of robot
- compare various types of Robot
- Study the working of various robot controller.
- Differentiate various robot controller.
- Explain the kinematics of robot.
- Explain the working of vision system
- Appreciate the application of robot s in various industries.
- Compare the uses of various sensors & warning system

DETAILED SYLLABUS

CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	**Basic Configuration of Robotics and its Working** Introduction – definition – basic configuration of robotics and its working –robot components – manipulator, end effectors, drive system, controller, sensors –mechanical arm – degrees of freedom – links and joints – construction of links, types of joint – classification of robots – Cartesian, cylindrical, spherical, horizontal articulated (SCARA), vertical articulated – structural characteristics of robots –work envelope and work volume - robot work volumes and comparison – wrist rotations – mechanical transmission, pulleys, belts, gears, harmonic drive – conversion between linear and rotary motion and its devices.	14
II	**Robot Controller, Servo Systems**	14

	Robot controller – level of controller – open loop and closed loop controller –servo systems –– robot path control – point to point – continuous path control – sensor based path control – controller programming – actuators – dc servo motors – stepper motors – hydraulic and pneumatic drives - feedback devices – potentiometers – optical encoders – dc tachometers.	
III	**Robot Motion Analysis and Vision System** Robot motion analysis – robot kinematics – robot dynamics - end effectors –grippers and tools - gripper design – mechanical gripper – vacuum gripper –magnetic grippers – sensors – transducers – tactile sensors – proximity sensors and range sensors – force and moment sensors and its applications and problems photoelectric sensors – vision system – image processing and analysis – robotic applications – robot operation aids – teach pendent – MDI and computer control	**14**
IV	**Robot Programming** Robot programming – lead through methods and textual robot languages – motion specification - motion interpolation - basic robot languages – generating of robot programming languages – On-Line & Off-Line programming - robot language structure – basic commands – artificial intelligence and robotics.	**14**
V	**Robot Application in Manufacturing** Robot application in manufacturing – material handling –assembly finishing –adopting robots to work station - requisite and non – requisite robot characteristics –stages in selecting robot for individual application – precaution for robot –future of robotics. Economics analysis for robotics – cost data required for the analysis – methods of economic analysis – pay back method – equivalent uniform annual cost method – return on investment method.	**14**

Text Books:

1. Mikkel P.Groover, Mite chell weiss, Rogern Negal and Nicholes G.Odress, Industrial
Robotics Technology- Programming and Applications
2. R.K.Mittal, I.J.Nagrath, Robotics and controls, Tata Mcgraw Hill Education Pvt.

Reference Books:

1. Doughlaes –R. HAlcoojr, An Introduction to robotics.
2. Robotics – An Introduction – Doughales – R. Halconnjr.An Introduction to Robotics

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

VI SEMESTER

2015-2016 onwards

PROCESS CONTROL PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code: 34764

Semester : VI

Subject Title : PROCESS CONTROL PRACTICAL

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
PROCESS CONTROL PRACTICAL	Hours / week	Hours / semester	Marks			Duration
	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES

- Study the basic concepts of instrumentation
- Categories the different types of sensors and transducer.
- Explain the signal conditioning.
- Explain the working of recorder
- Explain the measurement technique of strain,force,Torque and power.
- Explain the measurement technique of pressure ,temperature and flow.

LIST OF EXPERIMENTS

1. Transient response of thermocouple
2. Effect of Capacity
3. On- off control of temperature process
4. On – off control of pressure process
5. On off control of level process
6. Differential output of a thermocouple
7. Measurement of temperature using RTD
8. Measurement of temperature using thermistor
9. Characteristics of control valve
10. Measurement of Pressure
11. Response of PID controller
12. Measurement of displacement using LVDT

EQUIPMENT REQUIREMENTS

ON-OFF LEVEL PROCESS	2
ON-OFF PRESSURE PROCESS	2
TEMPERATURE PROCESS	2
LVDT TRAINER MODULE	2
RTD TRAINER MODULE	2
PID CONTROLLER	2
THERMISTER TRAINER MODULE	2
CONTROL VALVE TRAINER KIT	2
THERMOCUPLE	2

QUESTION PAPER PATTERN

BLOCK/CIRCUIT DIAGRAM	20 MARKS
CONNECTIONS	20 MARKS
READING AND GRAPH	20 MARKS
RESULT	10 Marks
VIVA VOCE	5 MARKS
TOTAL	75 MARKS

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

VI SEMESTER

2015-2016 onwards

ROBOTICS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code: 34765

Semester : VI

Subject Title : ROBOTICS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

<table>
<tr><th>SUBJECT</th><th colspan="2">INSTRUCTIONS</th><th colspan="4">EXAMINATION</th></tr>
<tr><td rowspan="3">ROBOTICS PRACTICAL</td><td>Hours / week</td><td>Hours / semester</td><td colspan="3">Marks</td><td>Duration</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">75</td><td>Internal Assessment</td><td>Board Examination</td><td>Total</td><td rowspan="2">3 Hrs</td></tr>
<tr><td>25</td><td>75</td><td>100</td></tr>
</table>

OBJECTIVES:

- Identify different part of robot
- Record positions using Cartesian co ordinate and joint co ordinates
- Write programmers for pick and place
- Operate and control robot through teach pendant
- Operate and control robot through programming
- Study and use vision system in robot application

LIST OF EXERCISES:

1. Robot system connection and component recognition
2. Robot operation, moving the various axis continuous and intermittent motions.
3. Writing programs off-line
    a. Homing operation
    b. Recording positions
4. Writing programs for pick and place at least three programs
5. Write a Program for stacking the object using offline
6. Write a Looping program using offline.
7. Writing programs on-line
    a. Homing operation
    b. Recording positions
8. Teaching positions via XYZ co-ordinates
9. Write a Program using XYZ Coordinates
10. Write a program using wait, speed commands
11. Measurement of Robot work envelope
12. Measurement of Robot of motion
13. Measurement of Repeatability
14. Practical's connected with Photo sensor/transducer
15. Study of Vision system in Robot

EQUIPMENT REQUIREMENTS

ROBOT OFF LINE SIMULATION SOFTWARE	10 USERS
SIX AXIS ROBOT	1
COMPUTERS	10
TRANSDUCERS/PHOTO SENSOR	2

QUESTION PAPER PATTERN

WRITING PROGRAM	30 MARKS
EXECUTION/SIMULATION	30 MARKS
RESULT	10 MARKS
VIVA VOCE	5 MARKS
TOTAL	75 MARKS

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

VI SEMESTER

2015-2016 onwards

CAD PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code:34766

Semester : VI

Subject Title : CAD PRACTICAL

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

<table>
<tr><th>SUBJECT</th><th colspan="2">INSTRUCTIONS</th><th colspan="3">EXAMINATION</th></tr>
<tr><td rowspan="3">CAD PRACTICAL</td><td>Hours / week</td><td>Hours / semester</td><td colspan="3">Marks</td><td>Duration</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">75</td><td>Internal Assessment</td><td>Board Examination</td><td>Total</td><td rowspan="2">3 Hrs</td></tr>
<tr><td>25</td><td>75</td><td>100</td></tr>
</table>

OBJECTIVES:

- Understand the types of sections and sectional views
- Understand limits, fits and Tolerances
- Explain the use of threaded fasteners and the types of threads
- Select different types of fits and tolerances for various mating parts
- Draw assembled drawings of various joints and couplings using CAD
- Draw assembled drawings of various types of machine elements using CAD.

CAD PRACTICAL

Sl.no	Topics
1	Introduction
2	Sectional views, Limits, fits and tolerances
3	Keys and surface finish
4	Screw threads and threaded fasteners
5	Draw Group commands, Osnap options, Drafting setting and Function keys
6	Commands Practice
7	Edit and Modify Group commands, Pedit, Text edit
8	Commands Practice
9	View groups, Inquiry, Block commands
10	Commands Practice
11	Hatching, Layer, color and line types
12	Commands Practice
13	Technical drawing with AutoCAD, Creating Isometric Drawing Ex. Practice
14	Detailed drawing, sectional views Practice
15	Isometric Drawing Ex. Practice
16	File commands, Plotting, External reference
17	Drawing Ex. Practice (Machine & Assembly drawings in 2D only) i) Sleeve and cotter joint ii) Stuffing box iii) Knuckle joint iv) Protected type flange coupling v) Universal coupling vi) connecting rod vii) Machine vice
18	3D Fundamentals
19	Predefined 3D objects, Creating surfaces, 3D solid primitives, Working with UCS-3D coordinate system
20.	Solid Rendering

21. 3D solid modeling practice
i) Geneva Mechanism
ii) Cast iron block
iii) Bushed bearing
iv) Bearing block
v) Screw jack

EQUIPMEN REQUIREMENTS

COMPUTER	30 NOS
SOFTWARE:	CAD SOFTWARE

QUESTION PAPER PATTERN

ASSEMBLY DRAWING	25 MARKS
SOLID MODEL	25 MARKS
ISOMETRIC DRAWING	20 MARKS
VIVA VOCE	5 MARKS
TOTAL	75 MARKS

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN

MECHATRONICS ENGINEERING
&
ELECTRONICS (ROBOTICS) ENGINEERING

II YEAR & III YEAR

M SCHEME

VI SEMESTER

2015-2016 onwards

PROJECT WORK

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN MECHATRONICS ENGG. & ELECTRONICS (ROBOTICS) ENGG.

M - SCHEME

(Implementation Year - From the Academic year 2015 - 2016 onwards)

Course Name : DIPLOMA IN MECHATRONICS ENGG & ELECTRONICS (ROBOTICS) ENGG.

Subject Code: 34767

Semester : VI

Subject Title : PROJECT WORK

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: 15 weeks

<table>
<tr><th>SUBJECT</th><th colspan="2">INSTRUCTIONS</th><th colspan="4">EXAMINATION</th></tr>
<tr><td rowspan="3">PROJECT WORK</td><td rowspan="2">Hours / week</td><td rowspan="2">Hours / semester</td><td colspan="3">Marks</td><td rowspan="2">Duration</td></tr>
<tr><td rowspan="2">4</td><td rowspan="2">60</td><td>Internal Assessment</td><td>Board Examination</td><td>Total</td></tr>
<tr><td>25</td><td>75</td><td>100</td><td>3 Hrs</td></tr>
</table>

Minimum Marks for Pass is 50 out of which minimum 35 marks should be obtained out of 75 marks in the board Examination alone.

OBJECTIVES:

- Implement the theoretical and practical knowledge gained through the curriculum into an application suitable for a real practical working environment preferably in an industrial environment
- Get exposure on industrial environment and its work ethics.
- Understand what entrepreneurship is and how to become an entrepreneur.
- Learn and understand the gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key dates, asynchronous document sharing and discussions, as well as to prepare collaborative edition of the final project report.
- Understand the facts and importance of environmental management.
- Understand and gain knowledge about disaster management

INTERNAL ASSESSMENT:

The internal assessment should be calculated based on the review of the progress of the work done by the student periodically as follows.

Detail of assessment	**Period of assessment**	**Max. Marks**
First Review	6th week	10
Second Review	12th week	10
Attendance	Entire semester	5
	Total	**25**

EVALUATION FOR BOARD EXAMINATION:

Details of Mark allocation	Max Marks
Marks for Report Preparation, Demo, Viva-voce	65
Marks for answers of 4 questions which is to be set by the external examiner from the given question bank consisting of questions in the following two topics Disaster Management and Environmental Management. Out of four questions two questions to appear from each of the above topics i.e. 2 questions x 2 topics = 4 questions 4 questions x 2 ½ marks = 10 Marks	10
Total	**75**

DETAILED SYLLABUS

ENVIRONMENTAL & DISASTER MANAGEMENT

1. ENVIRONMENTAL MANAGEMENT

Introduction – Environmental Ethics – Assessment of Socio Economic Impact – Environmental Audit – Mitigation of adverse impact on Environment – Importance of Pollution Control – Types of Industries and Industrial Pollution.

Solid waste management – Characteristics of Industrial wastes – Methods of Collection, transfer and disposal of solid wastes – Converting waste to energy – Hazardous waste management Treatment technologies.

Waste water management – Characteristics of Industrial effluents – Treatment and disposal methods – Pollution of water sources and effects on human health.

Air pollution management – Sources and effects – Dispersion of air pollutants – Air pollution control methods – Air quality management.

Noise pollution management – Effects of noise on people – Noise control methods.

2. DISASTER MANAGEMENT

Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Man made Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life..

Disaster Mitigation measures – Causes for major disasters – Risk Identification – Hazard Zones – Selection of sites for Industries and residential buildings – Minimum distances from Sea – Orientation of Buildings – Stability of Structures – Fire escapes in buildings - Cyclone shelters – Warning systems.

Disaster Management – Preparedness, Response, Recovery – Arrangements to be made in the industries / factories and buildings – Mobilization of Emergency Services - Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Fire fighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbors / Other organizations in Recovery and Rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.

LIST OF QUESTIONS

1. ENVIRONMENTRAL MANAGEMENT

1. What is the responsibility of an Engineer-in-charge of an Industry with respect to Public Health?
2. Define Environmental Ethic.
3. How Industries play their role in polluting the environment?
4. What is the necessity of pollution control? What are all the different organizations you know, which deal with pollution control?
5. List out the different types of pollutions caused by a Chemical / Textile / Leather / Automobile / Cement factory.
6. What is meant by Hazardous waste?
7. Define Industrial waste management.
8. Differentiate between garbage, rubbish, refuse and trash based on their composition and source.
9. Explain briefly how the quantity of solid waste generated in an industry could be reduced.
10. What are the objectives of treatments of solid wastes before disposal?
11. What are the different methods of disposal of solid wastes?
12. Explain how the principle of recycling could be applied in the process of waste minimization.
13. Define the term ‘Environmental Waste Audit’.
14. List and discuss the factors pertinent to the selection of landfill site.
15. Explain the purpose of daily cover in a sanitary landfill and state the minimum desirable depth of daily cover.
16. Describe any two methods of converting waste into energy.
17. What actions, a local body such as a municipality could take when the agency appointed for collecting and disposing the solid wastes fails to do the work continuously for number of days?
18. Write a note on Characteristics of hazardous waste.

19. What is the difference between municipal and industrial effluent ?
20. List few of the undesirable parameters / pollutants anticipated in the effluents from oil refinery industry / thermal power plants / textile industries / woolen mills / dye industries / electroplating industries / cement plants / leather industries (any two may be asked)
21. Explain briefly the process of Equalization and Neutralization of waste water of varying characteristics discharged from an Industry.
22. Explain briefly the Physical treatments “Sedimentation” and “Floatation” processes in the waste water treatment.
23. Explain briefly when and how chemical / biological treatments are given to the waste water.
24. List the four common advanced waste water treatment processes and the pollutants they remove.
25. Describe refractory organics and the method used to remove them from the effluent.
26. Explain biological nitrification and de-nitrification.
27. Describe the basic approaches to land treatment of Industrial Effluent.
28. Describe the locations for the ultimate disposal of sludge and the treatment steps needed prior to ultimate disposal.
29. List any five Industries, which act as the major sources for Hazardous Air Pollutants.
30. List out the names of any three hazardous air pollutants and their effects on human health.
31. Explain the influence of moisture, temperature and sunlight on the severity of air pollution effects on materials.
32. Differentiate between acute and chronic health effects from Air pollution.
33. Define the term Acid rain and explain how it occurs.
34. Discuss briefly the causes for global warming and its consequences
35. Suggest suitable Air pollution control devices for a few pollutants and sources.
36. Explain how evaporative emissions and exhaust emissions are commonly controlled.
37. What are the harmful elements present in the automobile smokes? How their presence could be controlled?
38. What is the Advantage of Ozone layer in the atmosphere? State few reasons for its destruction.
39. Explain the mechanism by which hearing damage occurs.
40. List any five effects of noise other than hearing damage.
41. Explain why impulsive noise is more dangerous than steady state noise.
42. Explain briefly the Source – Path – Receiver concept of Noise control.
43. Where silencers or mufflers are used ? Explain how they reduce the noise.
44. Describe two techniques to protect the receiver from hearing loss when design / redress for noise control fail.

45. What are the problems faced by the people residing along the side of a railway track and near to an Airport? What provisions could be made in their houses to reduce the problem?

2. DISASTER MANAGEMENT

1. What is meant by Disaster Management? What are the different stages of Disaster management?
2. Differentiate Natural Disasters and Man made Disasters with examples.
3. Describe the necessity of Risk identification and Assessment Surveys while planning a project.
4. What is Disasters recovery and what does it mean to an Industry?
5. What are the factors to be considered while planning the rebuilding works after a major disaster due to flood / cyclone / earthquake? (Any one may be asked)
6. List out the public emergency services available in the state, which could be approached for help during a natural disaster.
7. Specify the role played by an Engineer in the process of Disaster management.
8. What is the cause for Earthquakes? How they are measured? Which parts of India are more vulnerable for frequent earthquakes?
9. What was the cause for the Tsunami 2004 which inflicted heavy loss to life and property along the coast of Tamilnadu ? Specify its epicenter and magnitude.
10. Specify the Earthquake Hazard Zones in which the following towns of Tamilnadu lie: (a) Chennai (b) Nagapattinam (c) Coimbatore (d) Madurai (e) Salem.
11. Which parts of India are experiencing frequent natural calamities such as (a) heavy rain fall (b) huge losses due to floods (c) severe cyclones
12. Define basic wind speed. What will be the peak wind speed in (a) Very high damage risk zone – A, (b) High damage risk zone, (c) Low damage risk zone.
13. Specify the minimum distance from the Sea shore and minimum height above the mean sea level, desirable for the location of buildings.
14. Explain how the topography of the site plays a role in the disasters caused by floods and cyclones.
15. Explain how the shape and orientation of buildings could reduce the damages due to cyclones.
16. What is a cyclone shelter ? When and where it is provided ? What are its requirements ?
17. What Precautionary measures have to be taken by the authorities before opening a dam for discharging the excess water into a canal/river ?
18. What are the causes for fire accidents ? Specify the remedial measures to be taken in buildings to avoid fire accidents.
19. What is a fire escape in multistoried buildings ? What are its requirements ?

20. How the imamates of a multistory building are to be evacuted in the event of a fire/Chemical spill/Toxic Air Situation/ Terrorist attack, (any one may be asked).
21. Describe different fire fighting arrangements to be provided in an Industry.
22. Explain the necessity of disaster warning systems in Industries.
23. Explain how rescue operations have to be carried out in the case of collapse of buildings due to earthquake / blast / Cyclone / flood.
24. What are the necessary steps to be taken to avoid dangerous epidemics after a flood disaster?
25. What relief works that have to be carried out to save the lives of workers when the factory area is suddenly affected by a dangerous gas leak / sudden flooding ?
26. What are the difficulties faced by an Industry when there is a sudden power failure? How such a situation could be managed?
27. What are the difficulties faced by the Management when there is a group clash between the workers? How such a situation could be managed?
28. What will be the problems faced by the management of an Industry when a worker dies because of the failure of a mechanical device due to poor maintenance? How to manage such a situation ?
29. What precautionary measures have to be taken to avoid accidents to labourers in the Industry in a workshop / during handling of dangerous Chemicals / during construction of buildings / during the building maintenance works.
30. Explain the necessity of medical care facilities in an Industry / Project site.
31. Explain the necessity of proper training to the employees of Industries dealing with hazardous products, to act during disasters.
32. What type of disaster is expected in coal mines, cotton mills, Oil refineries, ship yards and gas plants?
33. What is meant by Emergency Plan Rehearsal? What are the advantages of such Rehearsals?
34. What action you will take when your employees could not reach the factory site because of continuous strike by Public Transport workers?
35. What immediate actions you will initiate when the quarters of your factory workers are suddenly flooded due to the breach in a nearly lake / dam, during heavy rain?
36. What steps you will take to avoid a break down when the workers union of your Industry have given a strike notice?
37. List out few possible crisis in an organization caused by its workers? What could be the part of the middle level officials in managing such crisis?
38. What types of warning systems are available to alert the people in the case of predicted disasters, such as floods, cyclone etc.
39. Explain the necessity of Team work in the crisis management in an Industry / Local body.
40. What factors are to be considered while fixing compensation to the workers in the case of severe accidents causing disability / death to them?

41. Explain the legal / financial problems the management has to face if safely measures taken by them are found to be in adequate.
42. Describe the importance of insurance to men and machinery of an Industry dealing with dangerous jobs.
43. What precautions have to be taken while storing explosives in a match/ fire crackers factory?
44. What are the arrangements required for emergency rescue works in the case of Atomic Power Plants?
45. Why residential quarters are not constructed nearer to Atomic Power Plants?

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DIPLOMA IN MECHATRONICS ENGG - 1047

Equivalent Papers of L Scheme Subjects in M Scheme

III Semester – With Effect from October 2016

L Scheme		M Scheme	
Sub Code	**Subject**	**Sub Code**	**Subject**
24031	Electronic Devices and Circuits	34031	Electronic Devices and Circuits
24232	Electrical Circuits and Machines	34232	Electrical Circuits and Machines
24733	Manufacturing Technology	34733	Manufacturing Technology
24734	Electronic devices and Circuits Practical	34034	Electronic devices and Circuits Practical
24735	Electrical Circuits and Machines Practical	34735	Electrical Circuits and Machines Practical
24736	Manufacturing Technology Practical	34736	Manufacturing Technology Practical
20001	Computer Application Practical	30001	Computer Application Practical

IV SEMESTER – With Effect from Apr 2017

L Scheme		M Scheme	
Sub Code	**Subject**	**Sub Code**	**Subject**
24241	Analog and Digital Electronics	34241	Analog and Digital Electronics
24742	Mechanics of Materials	34742	Mechanics of Materials
24743	Programming in C	No Equivalent	
24744	Measuring Instruments and Sensors	34744	Measuring Instruments and Sensors
24245	Analog and Digital Electronics Practical	34245	Analog and Digital Electronics Practical
24746	Programming in C Practical	34756	Programming in C Practical (with effect from OCT ’17)
20002	Communication and Life skill Practice	30002	Life and Employability skill Practical

V SEMESTER – With Effect from Oct '17

L Scheme		M Scheme	
Sub Code	**Subject**	**Sub Code**	**Subject**
24751	Industrial Instrumentation and Automation	34751	Industrial Instrumentation and Automation
24052	Microcontroller	34752	Microcontroller and PIC
24753	Hydraulics and Pneumatics Systems	34743	Hydraulics and Pneumatics Systems
24754	CAD/CAM	34754	CAD/CAM
24055	Microcontroller Practical	34755	Microcontroller Practical
24756	Hydraulics, Pneumatics and PLC Practical	34746	Hydraulics, Pneumatics and PLC Practical
24757	CNC Practical	34757	CNC Practical

VI SEMESTER – With Effect from Apr '18

L Scheme		M Scheme	
Sub Code	**Subject**	**Sub Code**	**Subject**
22061	Industrial Engineering and Management	32061	Industrial Engineering and Management
24762	Process Control	34762	Process Control
24763	Robotics and Auto Electronics	34763	Robotics
24764	Process Control Practical	34764	Process Control Practical
24765	Robotics and Auto Electronics Practical	34765	Robotics Practical
24766	CAD Practical	34766	CAD Practical
24767	Project Work	34767	Project Work

DIPLOMA IN MECHATRONICS ENGG (SW)- 2047

Equivalent Papers of L Scheme Subjects in M Scheme

III Semester With Effect from Oct '16

L Scheme		M Scheme	
Sub Code	**Subject**	**Sub Code**	**Subject**
24031	Electronic Devices and Circuits	34031	Electronic Devices and Circuits
24232	Electrical Circuits and Machines	34232	Electrical Circuits and Machines
24733	Manufacturing Technology	34733	Manufacturing Technology
24744	Measuring Instruments and sensors	34744	Measuring Instruments and sensors
24734	Electronic devices and Circuits Practical	34034	Electronic devices and Circuits Practical
24735	Electrical Circuits and Machines Practical	34735	Electrical Circuits and Machines Practical
24736	Manufacturing Technology Practical	34736	Manufacturing Technology Practical
20001	Computer Applications Practical	30001	Computer Applications Practical

IV SEMESTER - With Effect from April 2017

L Scheme		M Scheme	
Sub Code	**Subject**	**Sub Code**	**Subject**
24245	Analog and Digital Electronics Practical	34245	Analog and Digital Electronics Practical
24736	Manufacturing Technology Practical	34736	Manufacturing Technology Practical
24791	Industrial Training -I	34791	Industrial Training -I

V SEMESTER - With Effect from October 2017

L Scheme		M Scheme	
Sub Code	**Subject**	**Sub Code**	**Subject**
24241	Analog and Digital Electronics	34241	Analog and Digital Electronics
24743	Programming in C	No Equivalent	
24052	Micro controller	34752	Microcontroller and PIC
24753	Hydraulic and Pneumatic Systems	34743	Hydraulic and Pneumatic Systems
24746	Programming in C Practical	34756	Programming in C Practical
24055	Microcontroller Practical	34755	Microcontroller Practical
24756	Hydraulics, Pneumatics and PLC Practical	34746	Hydraulics, Pneumatics and PLC Practical
20002	Communication and Life skill Practical	30002	Life and Employability skill Practical

VI SEMESTER - With Effect from April 2018

L Scheme		M Scheme	
Sub Code	**Subject**	**Sub Code**	**Subject**
22061	Industrial Engineering and Management	32061	Industrial Engineering and Management
24762	Process Control	34762	Process Control
24751	Industrial Instrumentation and Automation	34751	Industrial Instrumentation and Automation
24763	Robotics and Auto Electronics	34763	Robotics
24754	CAD/CAM	34754	CAD/CAM
24764	Process control Practical	34764	Process control Practical
24765	Robotics and Auto Electronics Practical	34765	Robotics Practical
24766	CAD Practical	34766	CAD Practical
24757	CNC Practical	34757	CNC Practical

VII SEMESTER – with Effect from Oct '18

L Scheme		M Scheme	
Sub Code	**Subject**	**Sub Code**	**Subject**
24767	Project Work	34767	Project Work
24792	Industrial Training -II	34792	Industrial Training -II