DIPLOMA IN ENGINEERING AND TECHNOLOGY

(1030,2030,3030)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER PATTERN

N – SCHEME

IMPLEMENTED FROM 2020 - 2021

CURRICULAM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICALEDUCATION, CHENNAI – 600025, TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS (II / III YEAR)

Chairperson

N Scheme

(Implemented from Academic Year 2020-21 onwards)

Tmt. G. LAXMI PRIYA, I.A.S

Director, Directorate of Technical Education, Chennai 600 025.

Co-Ordinator

Tmt. J. Rama,

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(1030,2030,3030)</td></tr>
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DIPLOMA COURSES IN ENGINEERING / TECHNOLOGY

(SEMESTER SYSTEM)

(Implemented from 2020 - 2021)

N – 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.*

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 Sandwich Diploma in Engineering 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 4thand/or during 7thsemester 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 Part Time 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 16 weeks duration of study with 35 hrs. / Week for Regular Diploma Course and 18 hrs. / Week for Part-Time Diploma Course.***

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 2020 — 2021 academic years onwards.

2. Condition for Admission:

Condition for admission to the Diploma courses shall be required to have passed inthe S.S.L.C Examination of the Board of Secondary Education, Tamil Nadu.

(OR)

The Anglo-Indian High School Examination with eligibility for Higher Secondary Course in Tamil Nadu.

(OR)

The Matriculation Examination of Tamil Nadu.

(OR)

Any other Examinations recognized as equivalent to the above by the Board of Secondary Education, Tamil Nadu.

Note: In addition, at the time of admission the candidate will have to satisfy certainminimum 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 Tamil Nadu affiliated to the Tamil Nadu Higher Secondary Board with eligibility for university Courses of study or equivalent examination& should have studied the following subjects.

A pass in 2 Years ITI with appropriate Trade or Equivalent examination.

Sl. No	**Courses**	**H.SC Academic**	**H.SC Vocational**		**Industrial Training Institutes Courses**
		Subjects Studied	**Subjects Studied**		
			Related subjects	**Vocational subjects**	
1.	All the Regular and Sandwich Diploma Courses	Physics and Chemistry as compulsory along with Mathematics / Biology	Mathematics / Physics / Chemistry	Related Vocational Subjects Theory& Practical	2 years course to be passed with appropriate Trade

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 Secretary ship.	

- For the Diploma Courses related with Engineering/Technology, the related / equivalentsubjects prescribed along with Practicals 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, Tamil Nadu, 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 is as givenbelow:

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

This will come into effect from N Scheme onwards i.e., from the academic year 2020-2021.

7. Subjects of Study and Curriculum outline:

The subjects of study shall be in accordance with the syllabus prescribed from time totime, both in theory and practical subjects.

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. Board Examinations are conducted for 100 marks and reduced to 75.

The total marks for result are 75 + 25 = 100 Marks

9. Continuous Internal Assessment:

For Theory Subjects:

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

i) Subject Attendance 5 Marks

(Award of marks for subject attendance to each subject Theory/Practical will be as perthe 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 Marks** **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks areto be conducted. Average of these two test marks will be taken and the marks to be reduced to: **05 Marks**

The Test – III is to be the Model Examination covering all the five unitsand the marks obtained will be reduced to: **05 Marks**

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit – I & II	End of 6th week	50	2 Hours
Test II	Unit – III & IV	End of 12th week	50	2 Hours
Test III	**Model Examination:** Covering all the5 Units. (Board Examinations-question paper-pattern).	End of 16th week	100	3 Hours

From the Academic Year 2020 – 2021 onwards.

Question Paper Pattern for the Test -I and Test–II is as follows. The tests should be conducted by proper schedule. Retest marks should not be considered for internal assessment.

Without Choice:

Part A Type questions:	6 Questions ×1 mark	06 marks
Part B Type questions:	7Questions ×2marks	14 marks
Part C Type questions:	2 Questions ×15 marks	30 marks
	Total	**50 marks**

iii) Assignment **5 Marks**

For each subject Three Assignments are to be given each for 20 marks and theaverage marks scored should be reduced for 5 marks.

iv) Seminar Presentation **5 Marks**

The students have to select the topics either from their subjects or general subjects which will help to improve their grasping capacity as well as their capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present seminar (For First and Second Year, the students will be permitted to present the seminar as a group not exceeding six members and each member of the group should participate in the presentation. For the Third Year, the students should present the seminar individually.) The seminar presentation is mandatory for all theory subjects and carries 5 marks for each theory subject. The respective subject faculty may suggest topics to the students and will evaluate the submitted materials and seminar presentation. (2½ marks for the material submitted in writing and 2 ½ marks for the seminar presentation). For each subject minimum of two seminars are to be given and the average marks scored should be reduced to 5 marks.

All Test Papers, Assignment Papers / Notebooks and the seminar presentation written material after getting the signature with date from the students must be kept in safe custody in the department for verification and audit. It should be preserved for one semester after publication of Board Exam results and produced to the flying squad and the inspection team at the time of inspection/verification.

A. <u>For Practical Subjects:</u>

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

a) Attendance :**5Marks**

(Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/

Other Practical related Work : **10Marks**

c) Record writing : **10Marks**

TOTAL : **25Marks**

- ***** All the Experiments/Exercises indicated in the syllabus should be completed and the same to be given for final Board examinations.
- ***** The observation notebook / manual should be maintained for 10 marks. The observation notebook / manual with sketches, circuits, program, reading and calculation written by the students manually depends upon the practical subject during practical classes should be evaluated properly during the practical class hours with date.
- ***** The Record work for every completed exercise should be submitted in the subsequent practical classes and marks should be awarded for 10 marks 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 (including Observation and Record writing) and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)

- ***** Only regular students, appearing first time must submit the duly signed bonafied record notebook/file during the Practical Board Examinations.

All the marks awarded for Assignments, Tests, Seminar presentation and Attendance should be entered periodically in the Personal Theory Logbook of the staff, who is handling the theory subject.

The marks awarded for Observation, Record work and Attendance should be entered periodically in the Personal Practical Logbook of the staff, who is handling the practical subject.

10. Communication Skill Practical, Computer Application Practical and Physical Education:

The Communication Skill Practical and Computer Application Practical with more emphasis are being introduced in First Year. Much Stress is given to increase theCommunication skill and ICT skill of students.

As per the recommendation of MHRD and under Fit India scheme, the Physicaleducation is introduced to encourage students to remain healthy and fit by including physical activities and sports.

11. Project Work and Internship:

The students of all the Diploma Courses must 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, Tamil Nadu. 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. The project work is approved during the V semester by the properly constituted committee with guidelines.**

a) Internal assessment mark for Project Work &Internship:

Project Review I	. . .	**10 marks**
Project Review II	. . .	**10 marks**
Attendance	. . .	**05 marks** (Award of marks same as theory subject pattern)
Total	. . .	**25 marks**

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work &Internship in Board Examinations:

Demonstration/Presentation	25 marks
Report	25 marks
Viva Voce	30 marks
Internship Report	20 marks
Total	**100* marks**

*Examination will be conducted for 100 marks and will be converted to 75 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year "Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centers / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format must be submitted by individual student during the Project Work &Internship 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 subjects out of the total prescribed maximum marks including both the Internal Assessment and the Board Examinations marks put together, subject to the condition that he/she secures at least

3. a minimum of 40 marks out of 100 marks in the Board Theory Examinations and a minimum of 50 marks out of 100 marks in the Board Practical Examinations.

14. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2023onwards (Joined first year in 2020 -2021) 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 withinthe stipulated period of study 2 / 3/ 3½/ 4 years [Full time (lateral entry)/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 marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3/ 3½/ 4 years [Full time (lateral entry)/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 the semesters put together and passes all the subjects within the stipulated period of study 2 / 3/ 3½/ 4 years [Full time (lateral entry)/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 classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2023 /April 2024 onwards (both joined First Year in 2020 -2021)

15. Duration of a period in the Class Timetable:

The duration of each period of instruction is1 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).

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

ANNEXURE – I

CURRICULUM OUTLINE

1030 DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING (FULL TIME)

III Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4040310	Electronic Devices and Circuits	5	-	-	5
4030320	Electrical Circuit Theory	6	-	-	6
4030330	Electrical Machines -1	5	-	-	5
4040340	Electronic Devices and Circuits Practical	-	-	4	4
4030350	Electrical Circuits and Machines Practical	-	-	4	4
4030360	Electrical Workshop Practical	-	-	4	4
4030370	Wiring & Winding Practical	-	-	4	4
		16	-	16	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

IV Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030410	Electrical Machines -II	5	-	-	5
4030420	Measurements, Instruments and Transducers	5	-	-	5
4040430	Analog and Digital Electronics	4	-	-	4
4020440	E-Vehicle Technology and Policy	4	-	-	4
4030450	Electrical Machines and Instrumentation Practical	-	-	5	5
4040460	Analog and Digital Electronics Practical	-	-	5	5
4030470	Electrical Circuits and Simulation Practical	-	-	4	4
		18	-	14	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

V Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030510	Generation Transmission and Switchgear	5	-	-	5
4040520	Micro Controller and its Applications	5	-	-	5
Elective I Theory					
4030511	Control of Electrical Machines	5	-	-	5
4030512	Programmable Logic Controllers	5	-	-	
4030513	Renewable Energy Sources	5	-	-	
Elective I Practical					
4030514	Control of Electrical Machines Practical	-	-	5	5
4030515	Programmable Logic Controller Practical	-	-	5	
4030516	Renewable Energy Sources Practical	-	-	5	
4030540	Computer Aided Electrical Drawing Practical	-	-	4	4
4040550	Microcontroller and its Applications Practical	-	-	4	4
4040570	Entrepreneurship and Startups	-	-	4	4
		15	-	17	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

Common to all Departments

VI Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030610	Distribution and Utilization	6	-	-	6
4030630	Energy Conservation and Audit	4	-	-	4
Elective II Theory					
4030621	Power Electronics	5	-	-	5
4030622	Bio-Medical Instrumentation	5	-	-	
4030623	Computer Hardware and Networks	5	-	-	
4030640	Electrical Estimation and Costing Practical	-	-	5	5
Elective II Practical					
4030624	Power Electronics Practical	-	-	6	6
4030625	Bio-Medical Instrumentation Practical	-	-	6	
4030626	Computer Hardware and Networks Practical	-	-	6	
4020660	Project Work and Internship	-	-	6	6
		15	-	17	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

ANNEXURE-II

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

SCHEME OF EXAMINATION

1030 DIPLOMA IN ELETRICAL AND ELETRONICS ENGINEERING (FULL TIME)

THIRD SEMESTER

Subject Code	SUBJECT	EXAMINATION MARKS			Min. Marks for PASS	Exam Hours
		Internal Assessment Marks	Board Exam Marks	Total Marks		
4040310	Electronic Devices and Circuits	25	75	100	40	3
4030320	Electrical Circuit Theory	25	75	100	40	3
4030330	Electrical Machines - I	25	75	100	40	3
4040340	Electronic Devices and Circuits Practical	25	75	100	50	3
4030350	Electrical Circuits and Machines Practical	25	75	100	50	3
4030360	Electrical Workshop Practical	25	75	100	50	3
4030370	Wiring & Winding Practical	25	75	100	50	3

1030 DIPLOMA IN ELETRICAL AND ELETRONICS ENGINEERING (FULL TIME)

III Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4040310	Electronic Devices and Circuits	5	-	-	5
4030320	Electrical Circuit Theory	6	-	-	6
4030330	Electrical Machines -1	5	-	-	5
4040340	Electronic Devices and Circuits Practical	-	-	4	4
4030350	Electrical Circuits and Machines Practical	-	-	4	4
4030360	Electrical Workshop Practical	-	-	4	4
4030370	Wiring & Winding Practical	-	-	4	4
		16	-	16	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

IV Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030410	Electrical Machines -II	5	-	-	5
4030420	Measurements, Instruments and Transducers	5	-	-	5
4040430	Analog and Digital Electronics	4	-	-	4
4020440	E-Vehicle Technology and Policy	4	-	-	4
4030450	Electrical Machines and Instrumentation Practical	-	-	5	5
4040460	Analog and Digital Electronics Practical	-	-	5	5
4030470	Electrical Circuits and Simulation Practical	-	-	4	4
		18	-	14	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

V Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030510	Generation Transmission and Switchgear	5	-	-	5
4040520	Micro Controller and its Applications	5	-	-	5
Elective I Theory					
4030511	Control of Electrical Machines	5	-	-	5
4030512	Programmable Logic Controllers	5	-	-	
4030513	Renewable Energy Sources	5	-	-	
Elective I Practical					
4030514	Control of Electrical Machines Practical	-	-	5	5
4030515	Programmable Logic Controller Practical	-	-	5	
4030516	Renewable Energy Sources Practical	-	-	5	
4030540	Computer Aided Electrical Drawing Practical	-	-	4	4
4040550	Microcontroller Practical	-	-	4	4
4040570	Entrepreneurship and Startups	-	-	4	4
		15	-	17	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

Common to all Departments

VI Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030610	Distribution and Utilization	6	-	-	6
4030630	Energy Conservation and Audit	4	-	-	4
Elective II Theory					
4030621	Power Electronics	5	-	-	5
4030622	Bio-Medical Instrumentation	5	-	-	
4030623	Computer Hardware and Networks	5	-	-	
4030640	Electrical Estimation and Costing Practical	-	-	5	5
Elective II Practical					
4030624	Power Electronics Practical	-	-	6	6
4030625	Bio-Medical Instrumentation Practical	-	-	6	
4030626	Computer Hardware and Networks Practical	-	-	6	
4020660	Project Work and Internship	-	-	6	6
		15	-	17	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

DEPARTMENT OF ELETRICAL AND ELETRONICS ENGINEERING

LIST OF ELECTIVE SUBJECTS

Note: Select the Elective Theory and Related Practical subjects.

V Semester

Elective I Theory					
4030511	Control of Electrical Machines	5	-	-	5
4030512	Programmable Logic Controllers	5	-	-	
4030513	Renewable Energy Sources	5	-	-	
Elective I Practical					
4030514	Control of Electrical Machines Practical	-	-	5	5
4030515	Programmable Logic Controller Practical	-	-	5	
4030516	Renewable Energy Sources Practical	-	-	5	

VI Semester

Elective II Theory					
4030621	Power Electronics	5	-	-	5
4030622	Bio-Medical Instrumentation	5	-	-	
4030623	Computer Hardware and Networks	5	-	-	
Elective II Practical					
4030624	Power Electronics Practical	-	-	6	6
4030625	Bio-Medical Instrumentation Practical	-	-	6	
4030626	Computer Hardware and Networks Practical	-	-	6	

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

ANNEXURE – I

CURRICULUM OUTLINE

3030: DIPLOMA IN ELETRICAL AND ELETRONICS ENGINEERING (PART TIME)

THIRD SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4040310	Electronic Devices and Circuits	4	-	-	4
4030320	Electrical Circuit Theory	4	-	-	4
40015	Engineering Graphics - I	-	4	-	4
40001	Communication Skill Practical	-	-	3	3
4040340	Electronic Devices and Circuits Practical	-	-	3	3
TOTAL		**8**	**4**	**6**	**18**

FOURTH SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4030330	Electrical Machines -1	4	-	-	4
4030350	Electrical Circuits and Machines Practical	4	-	-	4
40025	Engineering Graphics - II	-	4	-	4
40002	Computer Application Practical	-	-	3	3
4030360	Electrical Workshop Practical	-	-	3	3
TOTAL		**8**	**4**	**6**	**18**

FIFTH SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4030410	Electrical Machines -II	4	-	-	4
4030420	Measurements, Instruments and Transducers	3	-	-	3
4030510	Generation Transmission and Switchgear	4	-	-	4
4030450	Electrical Machines and Instrumentation Practical	-	-	4	4
4030370	Wiring & Winding Practical	-	-	3	3
TOTAL		**11**	**-**	**7**	**18**

SIXTH SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4040430	Analog and Digital Electronics	4	-	-	4
4030610	Distribution and Utilization	4	-	-	4
4030630	Energy Conservation and Audit	4	-	-	4
4040460	Analog and Digital Electronics Practical	-	-	3	3
4030470	Electrical Circuits and Simulation Practical	-		3	3
TOTAL		**12**	**-**	**6**	**18**

SEVENTH SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4040520	Micro Controller and its Applications	4	-	-	4
Elective-I Theory					
4030511	Control of Electrical Machines	3			3
4030512	Programmable Logic Controllers				
4030513	Renewable Energy Sources				
4030540	Computer Aided Electrical Drawing Practical	-	-	3	3
4040550	Microcontroller Practical	-	-	3	3
Elective-I Practical					
4030514	Control of Electrical Machines Practical			3	3
4030515	Programmable Logic Controller Practical				
4030516	Renewable Energy Sources Practical				
4040570	Entrepreneurship & Startups	-	-	2	2
TOTAL		**7**	**-**	**11**	**18**

EIGHTH SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4020440	E-Vehicle Technology and Policy	4			4
Elective-II Theory		4			4
4030621	Power Electronics				
4030622	Bio-Medical Instrumentation				
4030623	Computer Hardware and Networks				
4030640	Electrical Estimation and Costing Practical			4	4
Elective-II Practical				3	3
4030624	Power Electronics Practical				
4030625	Bio-Medical Instrumentation Practical				
4030626	Computer Hardware and Networks Practical				
4020660	Project Work and Internship			3	3
TOTAL		**8**	**-**	**10**	**18**

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N – SCHEME

ANNEXURE – I

CURRICULUM OUTLINE

2020 DIPLOMA IN MECHANICAL ENGINEERING (SANDWICH)

III Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4040310	Electronic Devices and Circuits	5	-	-	5
4030320	Electrical Circuit Theory	6	-	-	6
4030330	Electrical Machines -1	5	-	-	5
4040340	Electronic Devices and Circuits Practical	-	-	4	4
4030350	Electrical Circuits and Machines Practical	-	-	4	4
4030360	Electrical Workshop Practical	-	-	4	4
4030370	Wiring & Winding Practical	-	-	4	4
		16	-	16	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

IV Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030410	Electrical Machines -II	4	-	-	4
4030450	Electrical Machines and Instrumentation Practical	-	-	3	3
4020491	Industrial Training - I	-	-	-	NA
		4		3	7
Extra / Co-Curricular activities					
	Library	-	-	-	-
	TOTAL				7

V Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030420	Measurements, Instruments and Transducers	4			4
4040430	Analog and Digital Electronics	4			4
4020440	E Vehicle Technology and Policy	4			4
4030510	Generation Transmission and Switchgear	4			4
	Elective Theory I	4			4
4030450	Electrical Machines and Instrumentation Practical			3	3
4040460	Analog and Digital Electronics Practical			3	3
4030470	Electrical Circuits and Simulation Practical			3	3
	Elective Practical I			3	3
		20		12	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education*		-	-	-	2*
TOTAL					**35**

- Physical Education hour will be allocated after regular working hour.

VI Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030440	Energy Conservation and Audit	4			4
4040520	Micro Controller and its Applications	5			5
4030610	Distribution and Utilization	5			5
	Elective Theory II	4			4
4030540	Computer Aided Electrical Drawing Practical			3	3
4040550	Microcontroller Practical			3	3
	Elective Practical II			4	4
4040570	Entrepreneurship and startups			4	4
		18		14	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education*		-	-	-	2*
TOTAL					**35**

- Physical education hour will be allocated after regular working hour.

VII Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020660	Project Work and Internship			6	6
4020791	Industrial Training II				NA
Extra / Co-Curricular activities					
Library		-	-	-	1
TOTAL					**7**

DEPARTMENT OF ELECTRICAL AND ELCTRONICS ENGINEERING

LIST OF ELECTIVE SUBJECTS

Note: Select the Elective Theory and Related Practical subjects.

V Semester

Elective I Theory					
4030511	Control of Electrical Machines	4	-	-	4
4030512	Programmable Logic Controllers	4	-	-	
4030513	Renewable Energy Sources	4	-	-	
Elective I Practical					
4030514	Control of Electrical Machines Practical	-	-	3	3
4030515	Programmable Logic Controller Practical	-	-	3	
4030516	Renewable Energy Sources Practical	-	-	3	

VI Semester

Elective II Theory					
4030621	Power Electronics	4	-	-	4
4030622	Bio-Medical Instrumentation	4	-	-	
4030623	Computer Hardware and Networks	4	-	-	
Elective II Practical					
4030624	Power Electronics Practical	-	-	4	4
4030625	Bio-Medical Instrumentation Practical	-	-	4	
4030626	Computer Hardware and Networks Practical	-	-	4	

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS

N SCHEME

(To be Implemented for the Students admitted from the year 2020 - 2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject Code : 4040310

Semester : III Semester

Subject title : ELECTRONIC DEVICES AND CIRCUITS

TEACHING AND SCHEME OF EXAMINATION

No of weeks/ semester: 16weeks

Subject	Instruction		Examination			
	Hours /Week	Hours /Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ELECTRONIC DEVICES AND CIRCUITS	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	Hrs
I	Filters, Zener diode and Opto-electronic devices	14
II	Bipolar Junction Transistor, Field Effect Transistor and UJT	16
III	Feedback, Amplifiers and Oscillators	16
IV	Special Semiconducting Devices (SCR, DIAC AND TRIAC)	14
V	Wave shaping Circuits	13
	Tests and Model Exam	7
Total		80

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:

- Know the importance of Filters
- Know the construction, working principle and applications of Zener diode
- Know the construction, working principle and applications of Optoelectronic devices
- Know the biasing methods of Transistors and their applications
- Study the performance of special devices like UJT, FET
- Study the Concept of Feedback, different types of Negative feedback connections
- Know the Types of Transistor amplifiers, Transistor oscillators and their applications
- Study the performance of Special semiconducting devices like SCR, DIAC, and TRIAC
- Explain the concept of wave shaping circuits, Bistable Multivibrator and Schmitt trigger
- Study the working principle of Clippers, Clampers, Voltage Multipliers and their applications

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topics	Hours
I	**FILTERS, ZENER DIODES AND OPTO-ELECTRONIC DEVICES** **1.1: FILTERS** Definition - Types - Capacitor filter - Inductor filter - L section filter - Pi section and RC filter - Comparison and Applications of Filters **1.2: ZENER DIODE** Construction, Working principle and Characteristics of Zener Diodes- Zener Breakdown-Avalanche breakdown- Zener diode as a Voltage regulator.	**5** **5**
II	**BIPOLAR JUNCTION TRANSISTOR (BJT), FIELD EFFECT TRANSISTOR (FET) AND UNI JUNCTION TRANSISTOR (UJT)** **2.1: BIPOLAR JUNCTION TRANSISTOR** Transistor biasing: Need for biasing - Types- Fixed bias, Collector to base bias and Self bias (Operation only, no derivation of circuit elements and parameters)– Define: Stability factor - Operation of Common Emitter Transistor as an Amplifier and as a switch. **2.2**: **FIELD EFFECT TRANSISTOR (FET)** Construction – Working principle–Classification - Drain and Transfer Characteristics -Applications–Comparison between FET and BJT - FET amplifier (common source amplifier). **2.3: UNIJUNCTION TRANSISTOR (UJT)** Construction- Equivalent Circuit-Operation-Characteristics- UJT as a relaxation oscillator.	**7** **5** **4**
III	**FEEDBACK, AMPLIFIERS AND OSCILLATORS** **3.1: FEEDBACK** Concept - effects of negative feedback-Types of negative feedback connections - Applications **3.2: AMPLIFIERS** Transistor amplifiers - Types - RC coupled amplifier - Working and Frequency response characteristics –Working of Common Collector Amplifier (Emitter follower) **3.3: OSCILLATORS** **Transistor oscillators**–Conditions for oscillation (Barkhausen criterion)-	**6** **6** **4**

	Classifications– Hartley Oscillator– Colpitts Oscillator – RC Phase shift oscillator.	
IV	**SPECIAL SEMICONDUCTING DEVICES (SCR, DIAC AND TRIAC)** **4.1:SCR (SILICON CONTROLLED RECTIFIER)** Symbol – Layered Structure – Transistor analogy - Working–VI characteristics– Applications - Comparison between SCR and Transistor **4.2: DIAC (Diode for Alternating Current)** Symbol – Layered structure - Working – VI characteristics- Applications **4.3: TRIAC (Triode for Alternating Current)** Symbol – Layered structure - Working – VI characteristics- Applications	**5** **5** **4**
V	**WAVE SHAPING CIRCUITS** **5.1: CLIPPERSAND CLAMPERS** Construction and working of Positive, Negative and biased Clippers - Construction and working of Positive and Negative Clamper **5.2: Voltage Multipliers** Construction and working of Voltage Doubler and Tripler. **5.3: Multivibrator and Schmitt Trigger** Construction – Working – Waveform of Astable and Monostable Multivibrator using Transistors and Schmitt Trigger using Transistors.	**5** **3** **5**

TEXT BOOKS:

1. Electronics Devices & Circuits by Salivahanan S,N.Suresh Kumar, A.Vallavaraj Tata McGraw Publication 3rdEdition 2016
2. Electronics Devices & Circuits by Jacob Millman and Halkias 3rd Edition, 2010, Tata McGraw– Hill publication

REFERENCE BOOKS:

1. Electronics Devices & Circuits by Salivahanan S,N.Suresh Kumar, A.Vallavaraj Tata McGraw Publication 3rdEdition 2016
2. Electronics Devices and circuit theory by Boyestad & Nashelsky, PHI, New Delhi 2009
3. Electronic Principles by Malvino, -Tata McGraw Hill Publication 2010.
4. Optical Fiber Communication by Gerd Keiser 5th Edition, Tata McGraw– Hill.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030320

Semester : III

Subject Title : ELECTRICAL CIRCUIT THEORY

TEACHING AND SCHEME OF EXAMINATION

No of weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL CIRCUIT THEORY	**6**	**96**	**25**	**100***	**100**	**3 Hrs.**

*** Examinations will be conducted for 100 Marks, and it will be reduced to 75 Marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	DC Circuits	18
II	Circuit Theorems	18
III	Single Phase Circuits	18
IV	Three phase Circuits	18
V	Storage Batteries	17
Test & Model Exam		7
Total		96

RATIONALE:

- Electric circuit analysis is the process of finding the voltages across, and the currents through the components in the network. Many Techniques are available for calculating these values.
- Part of the course is deal with basics of Network Analysis, introduction to network elements and explains methods for finding voltage and current across any network Component with DC Source, Single Phase AC and Three Phase AC Sources.
- This Course aims at making the student to conversant with different techniques of solving the problems in the field of Electric Circuits and Analysis.

OBJECTIVES:

The students should be able to:

- Explain the concept of Resistance, Capacitance and analyze different Circuit Elements, Energy Sources and analysis of Networks by Kirchhoff's Laws.
- Analyze the concepts of Nodal and Mesh Analysis and Analyze different Theorems for DC Circuits.
- Analyze Single Phase Circuits using Resistor, Inductor & Capacitor Elements.
- Analyze Balanced Three Phase AC Circuits and perform the Three Phase Power Measurement Calculations.
- Explain the Concept of storage batteries, care, maintenance and applications.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**DC CIRCUITS** Basic Concepts of Current, EMF, Potential Difference, Resistance and Resistivity– Ohm's Law –Work, Power, Energy- Resistance in Series, Parallel and Series - Parallel Circuits — Kirchhoff's Laws — Concept of Capacitance - Capacitors in Series and in Parallel - Problems in the above Topics.	18
II	**CIRCUIT THEOREMS** Definitions of Node, Branch and Network – Mesh Equations–Nodal Equations–Star / Delta Transformations – Superposition Theorem – Thevenin's Theorem –Norton's Theorem – Maximum Power Transfer Theorem. (Problems in DC Circuits only)	18
III	**SINGLE PHASE CIRCUITS** Definitions of Sinusoidal Voltage and Current– Instantaneous, Peak, Average and Effective Values – Form Factor and Peak Factor (Derivation for Sine Wave) – Pure Resistive, Inductive and Capacitive Circuits –RL, RC, RLC Series Circuits – Impedance – Phase Angle – Use of 'J' Notations–Rectangular and Polar Coordinates - Phasor Diagram Power and Power Factor – Power Triangle – Apparent Power, Active and Reactive Power– Parallel Circuits (Two Branches Only)- Conductance, Susceptance and Admittance–Problems in all above topics. **RESONANCE** Concept of Series Resonance — Parallel Resonance (R, L & C)- Applications (No Problems)	10 8

IV	**THREE PHASE AC CIRCUITS** Three Phase AC Systems-Phase Sequence –Necessity of Three Phase System–Concept of Balanced and Unbalanced Load - Balanced Star & Delta Connected Loads–Relation between Line andPhase Voltages and Currents — Phasor Diagram Three Phase Power — Power Factor — Three Phase Power and Power Factor Measurement by Single Wattmeter and Two Wattmeter Methods–Problems in all Topics.	8 10
V	**STORAGE BATTERIES** Classification of cells – Construction, Chemical action and physical changes during charging and discharging of Lead Acid, Nickel Iron and Nickel Cadmium Cells – Advantages and Disadvantages of Nickel Ion and Nickel Cadmium Cells over Lead Acid Cell - indication of fully charged and discharged battery – defects and their remedies – capacity - AH efficiency and WH efficiency (no problems) – methods of charging - care and maintenance – applications – maintenance free batteries – Lithium Cells, Lithium - Ion Cells and Mercury Cells – Concept of Recharged Cell.	17

TEXTBOOK

S.No	Name of the Book	Author	Publisher
1.	Electric Circuit Theory	Dr.M.Arumugam	Khanna Publishers

REFERENCE BOOKS

S.No	Name of the Book	Author	Publisher
1.	Circuits and Networks Analysis and Synthesis	A Sudhakar Shyammohan S Palli	Tata McGraw Hill Education Private
2.	Electric Circuits	Mahamood Nahvi Joseph A Edminister	Schaum Publishing Company, Newyork

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030330

Semester : III Semester

Subject Title : ELECTRICAL MACHINES-I

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL MACHINES-I	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	DC Generators	15
II	DC Motors	15
III	Single Phase Transformer	15
IV	Three Phase Transformer	15
V	Maintenance of DC Machines and Transformers	13
	Test & Model Exam	07
	Total	**80**

RATIONALE

- ✓ This subject is classified under core technology group which intends to teach the facts, concepts, principles of electrical machines, such as DC generators, DC motors, Brushless DC motor, Single & Three Phase Transformers and DC Electrical Source (battery).
- ✓ Students will be able to analyze the characteristics of DC Generators and Motors, Brushless Dc Motor, Single & Three Phase Transformer, Battery & Qualitative Parameters of these Static and Dynamic Machines. These Machines are used in Transmission, Distribution and Utilization Systems.
- ✓ Knowledge gained by students will be helpful in the study of advanced subjects like Utilization of Electrical Energy, Switchgear & Protection, Manufacturing Processes and Maintenance of Electrical Machines.

OBJECTIVES

Students will be able to:

1. Explain the concept Electromagnetism and Principles.
2. Know the constructional details and working principles of DC Machines and Transformers.
3. Evaluate the performance of DC Generators, Motors and Transformers.
4. Study the applications of DC Generator, Motor and Transformer for specific fields.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**DC GENERATORS** Review of electromagnetic induction – Faraday's laws –Lenz's law - Fleming's right hand rule – Principle of operation of D.C. generator – Construction of D.C. generator – Types of armature windings(No Winding diagram) – EMF equation(Simple problems) –Types of D.C. generators – No load and load characteristics of DC generators – Causes of failure to build-up voltage and remedy – armature reaction – methods of compensating armature reaction – process of commutation – methods of improving commutation. Load characteristics of DC generators – Applications of DC generators	15
II	**DC MOTORS** Principle of operation of D.C. Motor – Fleming's left-hand rule – Construction Back emf – Torque equation – Types of DC motors –Torque-current, Speed-current, Speed- Torque characteristics of different DC motors – Speed control of DC motors– Field control and armature control – necessity of Starters– 3 Point and 4 Point starters –losses in D.C. Machines – Testing of D.C. Machines – Predetermination of efficiency of motor and generator by Swinburne's test – Problems in the above topics – Applications of D.C. Motors.	15
III	**SINGLE PHASE TRANSFORMER** Principle of operation – Constructional details of core and shell type Transformers – EMF Equation – Voltage ratio –Transformer on No load – Transformer Full load – Current ratio – Phasor diagram on no load and Full load at different power factors. O.C. test, S.C. test –Determination of equivalent circuit constants– Determination of voltage regulation and efficiency – Condition for maximum efficiency– All day efficiency – Problems on the above topics - polarity test–Parallel operation of Single Phase transformers– Auto transformer –principle – Applications of	15

	transformers – Energy Efficient Transformer – Dry Type Transformer & Amorphous Core Transformer.	
IV	**THREE PHASE TRANSFORMER** Three phase Transformer – construction, types of connections of transformer. Parallel operation of three phase transformers – grouping of transformers – Pairing of transformers - Load sharing of transformers with equal and unequal ratings –Cooling of transformers – Various cooling arrangements – Transformer accessories – conservator, breather, explosion vent, bucholz relay – ON load and OFF load tap changer.	15
V	**MAINTENANCE OF DC MACHINES AND TRANSFORMERS** Maintenance – Importance, Preventive and Breakdown maintenance - Advantages of preventive maintenance - Causes of Sparking in Commutators – Defects in Commutators and Remedies – Resurfacing of Commutators and Brushes – Maintenance of Brush Holder – Staggering of Brushes, Brush Pressure - Defects in DC Armature winding – Maintenance of Earthing of DC Machines. Maintenance of Transformer Oil - Transformer oil tester – Acidity test, BDV Test - Earthing – Measurement of earth resistance.	13

TEXTBOOK

Sl.No.	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	A Textbook of Electrical Technology Volume II	B.L. Theraja	S.Chand & Co.New Delhi
2	Electrical Technology	Edward Hughes	Addision – Wesley International Student Edition

REFERENCE BOOK

Sl.No.	NAME OF THE BOOK	AUTHOR	PUBLISHER
1	Elements of Electrical Engineering	Maria Louis	Prentice - Hall of India Pvt
2	Electrical Machines	Nagarath	TMH Publications
3	Electrical Machines	Bhattacharya	TMH Publications

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject code : 4040340

Semester : III

Subject title : ELECTRONIC DEVICES AND CIRCUITS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
ELECTRONIC DEVICES AND CIRCUITS PRACTICAL	**4**	**64**	**25**	**100***	**100**	**3 Hours**

***Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

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 Practical. By doing practical experiments in this, they will be skilled in handling all types of electronic circuits and able to apply the skill in electronic systems.

OBJECTIVES:

On completion of the following experiments, the students must be able to

- Know the Cold Checking of Active and Passive Component
- Find out the Unknown Resistance value of a Resistor using Colour Coding
- Find out the Unknown Capacitance value of a Capacitor using Colour Coding

- Find out the Unknown Inductance value of an Inductor using Colour Coding
- Understand the concept, working principle and applications of PN Junction diode
- Understand the concept, working principle and applications of Zener diode
- Understand the concept, working principle and applications of BJT and FET
- Understand the concept, working principle and applications of UJT
- Understand the concept, working principle and applications of SCR
- Understand the concept, working principle and applications of DIAC and TRIAC
- Understand the concept, working principle and applications of Clippers and Clampers
- Understand the concept, working principle and applications of various types of Negative feedback amplifiers
- Understand the concept, working principle and applications of Astable Multivibrator

DETAILED SYLLABUS

Contents: Practical

Exercises

Note: At least 5 experiments should be done using Soldering board / Bread board

1. Construct a circuit to test the forward and reverse bias characteristics of a PN Junction Silicon diode. Find the value of its cut-in voltage
2. Construct a circuit to test the forward and reverse bias characteristics of a Zener diode. Find the value of its reverse breakdown voltage
3. Construct a Full wave (center tapped) rectifier and test its input and output waveforms with and without Capacitor filter. Find its maximum voltage.
4. Construct a Full wave (Bridge) rectifier and test its input and output waveforms with and without Capacitor filter. Find its maximum voltage.
5. Construct a Common Emitter Transistor circuit and test its input and output characteristic curves.
6. Construct a Common Source Field Effect Transistor circuit and test its drain and transfer characteristic curves.
7. Construct a circuit to test the Turning on and Turning off characteristics of SCR and find out the forward break over voltage, the value of Latching and Holding currents.
8. Construct a circuit to test the bidirectional characteristics of DIAC and plot its switching characteristics.

9. Construct a circuit to test the bidirectional characteristics of TRIAC and plot its switching characteristics.
10. Construct a Common emitter amplifier circuit and test its frequency response characteristics with and without Current series feedback introduced in it.
11. Construct a circuit to test the switching characteristics of Astable Multivibrator
12. Construct a circuit to test the negative resistance Characteristics of UJT.

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	CIRCUIT DIAGRAM	25
2	CONNECTIONS	25
3	EXECUTION AND HANDLING OF EQUIPMENT	25
4	OUTPUT / RESULT	15
5	VIVA VOCE	10
	TOTAL	100

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

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

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030350

Semester : III Semester

Subject Title : ELECTRICAL CIRCUITS AND MACHINES PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL CIRCUITS AND MACHINES PRACTICAL	4	64	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

RATIONALE:

- To impart Practical Knowledge to the Diploma Students and Practical Subjects are introduced for every corresponding Theory Subject.
- This Practical Course supports the aim and objective of Electrical Machines- I and Electrical Circuit Theory Subjects.

OBJECTIVES

On completion of this Practical Subject, the Students will be able to:

- Make the various Circuit connections in Machines Laboratory.
- Practically prove all the Theorems and Principles which are dealing with DC Current.
- Understand the Characteristics of Electrical Machines and to determine the Efficiency of the Machines.

- Test the performance of Transformer to find its Efficiency, Voltage Regulation and Characteristics.
- Study the various Speed Control Methods of DC Motor.

DETAILED SYLLABUS

ELECTRICAL CIRCUITS AND MACHINES PRACTICAL

LIST OF EXPERIMENTS:

CIRCUITS:

1. Verification of Super Position Theorem with two different DC Voltages for a common load.
2. Verification of Thevenin's Theorem with DC Supply
3. Measurement of Power
    a. using Ammeter and Voltmeter
    b. using Wattmeter for Single Phase Resistive Load.

MACHINES:

4. No load and FULL Load Characteristics of Self Excited DC Shunt Generator.
5. Load Characteristics of Self Excited DC Series Generator.
6. Load Test on DC Shunt Motor and Draw the Performance Curve.
7. Load Test on DC Series Motor and Draw the Performance Curve.
8. Predetermine the Efficiency of DC Machines by Swinburne's Test.
9. Speed Control of DC Shunt Motor by
    a. Armature Control Method
    b. Field Control Method
10. Load Test on Single Phase Transformer
11. Load Test on Three Phase Transformer
12. Predetermine the Efficiency and Regulation of Single-Phase Transformer by conducting O.C and S.C Tests
13. Find the Equivalent Circuit Constants of Single-Phase Transformer by conducting O.C and S.C Tests.
14. Connect two Single Phase Transformers for Parallel Operation.
15. a) Perform Breakdown Test And determine the Dielectric Strength of Transformer Oil
    b) Conduct Acidity Test on Transformer Oil.

DETAILLED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	CIRCUIT DIAGRAM	**35**
2	CONNECTIONS AND PROCEEDING THE EXPERIMENT	**30**
3	READING/CALCULATION/GRAPH/RESULT	**30**
4	VIVA VOCE	**05**
5	TOTAL	**100**

LIST OF EQUIPMENTS (For a Batch of 30 Students)

S.No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	DC Shunt Motor 3/5 KW (or more) with Loading Arrangement	2
2	DC Series Motor 3/5 KW (or more) with Loading Arrangement	1
3	DC Compound Motor 3/5 KW (or more) with Loading Arrangement	1
4	DC Shunt Generator 3/5 KW (or more) coupled with Prime Mover	1
5	DC Series Generator 3/5 KW (or more) coupled with Prime Mover	1
6	1 Phase Transformer 1KVA (or more) 220V/110V	3
7	3 Phase Transformer 1KVA (or more) 440V/220V	1
8	1 Phase Variac 15 amps	3
9	3 Phase Variac 15 amps	1
10	Dual Regulated Power Supply 0-30V/2A	2
11	Single Regulated Power Supply 0-30V / 2A	2
12	Single Phase Resistive Load 3/5 KW, 220V	2
13	Three Phase Resistive Load 3KW,415V	2
14	Tachometer Analog type	3
15	Rheostat – various ranges 50Ω/5A,100 Ω/5A, 300 Ω/2A, 600 Ω/2A (or equivalent)	4
16	AC Ammeter – various ranges 0-500mA, 0-1/2A, 0-5/10A,0-10/20A (or equivalent)	8

17	DC Ammeter – various ranges 0-500mA, 0-2A,0-5A,0-10A,0-15/30A (or equivalent)	8
18	DC Voltmeter – 0-5/10V, 0-30V, 0-300V	8
19	AC Voltmeter – 0-75V, 0-150V, 0-300V, 0-600V	8
20	Wattmeter – various ranges LPF 150/300/600V 2.5A/5A,1/2.5A	6
21	Wattmeter – various ranges UPF 75/150/300,5/10A	6
22	Wattmeter – various ranges UPF 150/300/600V 10/20A	6
23	Transformer oil tester kit, Acidity test kit	Each 1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030360

Semester : III Semester

Subject Title : ELECTRICAL WORKSHOP PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ELECTRICAL WORKSHOP PRACTICAL	4	64	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 Marks.**

RATIONALE

- To impart practical knowledge to the Diploma Students for servicing of Domestic Appliances.
- This Subject is assigned to develop Skill on Assembling and test the Household ElectricalAppliances.

OBJECTIVES

At the end of the practical the students will be able to:

- ✓ Identify and use the tools used in servicing of Electrical Appliances.
- ✓ Assemble the various parts of Domestic Appliances.
- ✓ Make the Electrical Connections and test their performance.

DETAILED SYLLABUS

LIST OF EXPERIMENTS:

1. Familiarization of tools used for Electrical repair works and personal Protection Equipments.
2. Dismantling of Electrical Iron Box, identifying the parts, checking theconditions, assembling, and testing.
3. Dismantling of Mixer Grinder, identifying the parts, checking the conditions,assembling and testing.
4. Dismantling of Wet Grinder, identifying the parts, checking the conditions, assembling, and testing.
5. Assembling the accessories of Ceiling Fan, test the connections of winding& Capacitor and run the Fan with Speed Regulator.
6. Connect the Battery and Inverter to supply partial load in a Domestic Wiring during Mains Failure.
7. Assembling and testing of 15watts LED Light.
8. Battery Charging through Solar Panel. Connect Solar Panel to chargeBattery through Charge Controller.
9. Dismantling of Induction Heater, identifying the parts, checking theconditions, assembling, and testing
10. Dismantling of Microwave Oven, identifying the parts, checking theconditions, assembling and testing.

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1.	Tools: Screwdriver, Cutting pliers, Wire Stripper, Hammer, Spanner set, Line Tester, Nose pliers.	Each2set
2.	Personal Protective Equipments: Safety helmet, Google, Safety gloves, Nose mask, Ear plug, Safety Belt.	Each2Set
3.	Automatic Iron Box	2
4.	Wet Grinder	2
5.	Mixer Grinder	2
6.	Ceiling Fan	2
7.	LED Light, PCB, Driver Circuit and Outer Cover	10
8.	Lead Acid Battery	2
9.	Inverter	2
10.	Solar Photo Voltaic Module	2
11.	Charge controller	2
12.	Microwave oven	1
13.	Multi meter	8
14.	Induction Heater	1

DETAILED ALLOCATION OF MARKS

S.No.	NAMEOFTHE ACTIVITY	MARKS ALLOCATED
1.	Connection Diagram	25
2.	Tools Required	20
3.	Dismantling and Assembling Procedure	30
4.	Testing	20
5.	Viva Voce	05
	TOTAL	**100**

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030370

Semester : III Semester

Subject Title : WIRING & WINDING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
WIRING & WINDING PRACTICAL	4	64	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

RATIONALE

To provide concept and hands on experience in Electrical Wiring and Winding including different Wiring Systems, Installation Methods and Basic Winding Preparation. Each topic in the syllabus serves as guide for students to deal with the process of connecting various accessories for the distribution of Electrical Energy from the Meter Board.

OBJECTIVES

At the end of this Practical Course the Students should be able to:

- Execute the Emergency Alarm Circuit
- Execute the wiring for Single Phase Service Connection with necessary items.
- Execute the wiring of Three Phase Supply using 3 Rotary Switches, MCB and DB tochange the Phases by connecting Single Phase Lamp Load
- Execute the wiring to controlling the intensity of Lamp by six places by using two 2-Way Switches and 4 Intermediate Switches.
- Execute the wiring to connect a Single-Phase Motor with Main Switch, D.O.L Starterand M.C.B
- Execute The Wiring to Connect A 3 Phase Induction Motor with Main Switch, Star / Delta Starter and E.L.C.B.
- Execute the wiring to control lamps (Sodium Vapor Lamp, Mercury Vapor Lamp, Fluorescent Lamp)
- Execute the wiring for Test Board with necessary items.
- Execute the Go down /Tunnel wiring
- Prepare winding for Transformer and No Volt Coil.
- Give end connections for 3 Phase Induction Motor Winding.
- Testing of faulty Ceiling Fan.

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

WIRING

1. Emergency alarm wiring with 3 Bells and 3 Pushbuttons.
2. House Wiring for a Service Connection with Single Phase Digital Energy Meter Cutout, Main Switch, 4 Way D.B, Indicator Lamp.
3. Wiring and Testing of 3 Phase Supply using 3 Rotary Switches, MCB and DB to change the Phases by connecting Single Phase Lamp Load.
4. Controlling a Lamp by Six Places by using Two, 2-Way Switches& Four Intermediate Switches.
5. Wiring of Single-Phase Motor using Single Phase Main Switch, D.O.L Starter and MCB
6. Wiring of Three Phase Induction Motor with Main Switch,Star/Delta Starter and ELCB.
7. Wiring of Sodium Vapor and Mercury Vapor Lamp.
8. Wiring and troubleshooting the Fluorescent Tube light.
9. Design and implement a Test Board with Indicator Lamp, FuseUnit to Test Electrical Appliances.
10. Go down / Tunnel wiring using 4 Lamps.

WINDING

1. Design, construct and test a 230/12-0-12 Volt, 500mA Transformer.
2. Design No Volt Coil for a 230/440 AC Contactor.
3. Demonstrate the end connection for a 3 Phase Induction MotorWinding for a 2 Poles / 4Pole Operations.
4. Dismantling a faulty Ceiling Fan and identify the fault, run the fanafter rectifying the fault.

DETAILED ALLOCATION OF MARKS

S. No	NAME OF ACTIVITY	MARK ALLOCATION
1.	Wiring diagram / Design	30
2.	Execution	40
3.	Result	25
4.	Viva-voce	05
	Total Marks	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.NO.	DESCRIPTION	SPECIFICATION	QTY
1.	SPST Flush Type Switch	250V/5A	10
2.	Intermediate Switch	250V/5A	10
3.	Rotary Switches	500V/32A	6
4.	Three Phase Control Panel Board	500V/32A	2
5.	Batten Lamp Holder	-	10
6.	Round Block	-	20
7.	Switch Board	20cm*15 cm	4
		10cm*10cm	15
8.	M.C.B.	250V/10A ,2 pole	6
		440V/32A	3
9.	Push Button Switch	250V/5A	5
10.	2 Plate Ceiling Rose	250V/5A	10
11.	Electric Bell	250V/5A	3
12	Single Phase D.P.I.C. Main Switch	250V/16A	3
13.	Single Phase D.O.L. Starter	250V/10A	1
14.	Three Phase T.P.I.C. Main Switch	500V/30A	2
15.	Star / Delta Starter	440V/5HP	1
16.	E.L.C.B.	30mA/100mA	1
17.	Single Phase, Digital Energy Meter	250V/15A,50HZ	1
18.	Cut out	16A	1
19.	Single Phase, 4 Way Distribution Box	250V/15A	2
20.	Mercury Vapor Lamp with accessories		1 Set
21.	Sodium Vapor Lamp with accessories		1 Set
22.	Fluorescent Tube Light with Electronic Choke and Holder	40W	2 Set
23.	Two Way Flush Type Switch	250V/5A	15
24.	Wooden Box	30 cm*15cm	4
25.	PVC Pipe	¾”/1″	Req.Qty
26.	Saddle Clips	¾”/1 ″	Req.Qty
27.	Copper Wire	2.5Sq.Mm, 1.5Sq.Mm	Req.Qty
28.	1” Junction Box	1 way,2way,3way	Req.Qty
29.	Screws		Req.Qty
30.	Bare Copper Wire	2.5 Sq.Mm	Req.Qty
31.	Lamps (C.F.L. or Incandescent)	Different ratings	Req.Qty

32.	EI60 Type Stampings Of 0.35 Mm Thickness	-	55
33.	Readymade Bobbins (EI60/21)	-	Req.Qty
34.	Enameled Copper Wire	26SWG 36SWG 37SWG 38SWG	Req.Qty
35.	Varnish	-	Req.Qty
36.	Winding Machine	-	1
37.	Ceiling Fan	-	2
38.	Single Phase Induction Motor	0.5 HP/50HZ,240V	1
39.	Three Phase Squirrel Cage Induction Motor	3HP, 500 V, 50 Hz	1
40.	Gauge Plate for Measurement of SWG	-	1
41.	Winding Study Motor (3Φ Squirrel Cage Type)	-	1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030410

Semester : IV

Subject Title : Electrical Machines – II

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL MACHINES - II	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Alternator Principles and Construction	12
II	Alternator Performance and Testing	16
III	Three Phase Induction Motor	16
IV	Single Phase Induction Motor & Synchronous Motor	15
V	Maintenance of Induction Motors & Starters	14
	Test & Model Exam	7
	Total	**80**

RATIONALE

- This subject is classified under Core Technology group intended to teach Students about facts, concepts, Principles of Electrical Machines such as Induction Motor, Alternator and Synchronous Motor.
- Students will be able to analyze the characteristics and qualitative parameters of these Machines.
- These Machines are widely used in Industries and for generation of electricity.
- The knowledge gained by the student is useful in the study of Technological Subjects such as Utilization System, Manufacturing Processes and Testing and Maintenance of Electrical Machines.
- The knowledge and skills obtained will be helpful in discharging Technical Functions such as Supervision, Controlling and as R & D Technicians.

OBJECTIVES

. The students will be able to understand the concepts of:

- Alternator Principle, Construction and their Types, EMF Induced and Cooling Techniques of Machines
- Performance of an Alternator, Testing, Characteristics, Parallel Operation, Load Sharingetc.,
- Three Phase Induction Motor, Principle, Construction, Types, Characteristics and Applications, Starting Methods
- Single Phase Motor Types, Construction, Characteristics and Applications, Synchronous Motor, Starting, Construction, Characteristics and Applications
- Maintenance of Induction Motors and Starters.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**ALTERNATOR PRINCIPLES AND CONSTRUCTION** Basic Principle of Alternators — Types of Alternators — Stationary Armature Rotating Field – Advantages of Rotating Field – ConstructionDetails of Alternator — Salient Pole Rotor — Cylindrical Type Rotor — Types of A.C. Armature Windings – Types of Slots – Full Pitch and ShortPitched Windings – Phase Spread Angle and Effect of Distribution Factor – Pitch Factor – Relation between Frequency, Speed and Number of Poles – EMF Equation – Problems Methods of obtaining Sine Wave – Critical Speed of Rotor – Ventilation of Turbo Alternators – Advantages of Hydrogen Cooling and its Precaution – Excitation and Exciters.	10 2
II	**ALTERNATOR PERFORMANCE AND TESTING** Load Characteristics of Alternators – Reason for Change in Terminal Voltage –Qualitative Treatment of Armature Reaction for various Power Factor Loads — Effective Resistance — Leakage Reactance — Synchronous Reactance, Synchronous Impedance — Voltage Regulation – Determination of Voltage Regulation of Alternator by Direct Load Test - Pre-Determination of Regulation of Alternator by Indirect Method (EMF, MMF, and ZPF). Necessity and conditions for Parallel Operation of Alternators – Synchronizing by Dark Lamp Method, Bright Lamp Method, Dark - Bright Lamp Method and Synchro scope Method– Synchronizing Current, Synchronizing Power and Synchronizing Torque – Load Sharing of Alternators –Infinite Bus Bar.	10 6
III	**THREE PHASE INDUCTION MOTOR** Rotating Magnetic Field — Principle of Operation of Three Phase Induction Motors – Slip and Slip Frequency – Comparison between Cage and Slip Ring Induction Motors –Development of Phasor Diagram – Expression for Torque in Synchronous Watts — Slip-Torque Characteristics – Stable and Unstable Region – No Load Test and Blocked Rotor Test – Development of Approximate Equivalent Circuit – Problems on the above topics-Simplified Circle Diagram	10

	Determination of Maximum Torque, Slip (Problems Not Required) – Starting Torque and Starting Current Expression – Relationship between Starting Torque and Full Load Torque – Speed Control of Induction Motors. Starters of Induction Motors – Direct online Starter and Its Merits for Cage Motors – Star Delta Starter- Auto Transformer Starter - Rotor Resistance Starter – Cogging –Crawling in Induction Motor– Double Cage Induction Motor-Induction Generator.	6
IV	**SINGLE PHASE INDUCTION MOTOR** Single Phase Induction Motors — Not Self Starting — Methods of Making itself Starting – Construction, Working Principle – Phasor Diagram-Slip Torque Characteristics- Split Phase Motor - Capacitor Motor - Shaded Pole Motor - Repulsion Motor - Universal Motor — Operation of Three Phase Motor with Single Phase Supply. **SYNCHRONOUS MOTOR** Principle of Operation –Not Self Starting – Methods of Starting–Effects of Excitation on Armature Current and Power Factor– 'V' Curve and Inverted 'V" Curve of Synchronous Motor — The Phenomenon of Hunting and Prevention of Hunting by Damper Winding — Comparison between Synchronous Motor and Three Phase Induction Motor - Applications -Problems on Power Factor Improvement.	8 7
V	**MAINTENANCE OF INDUCTION MOTORS AND STARTERS** BIS Publication Dealing with The Code of Practice of Induction Motors and Starters – Classification of Cage Motor – Continuous Rating and Intermittent Rating – Various Types of Enclosures – Specifications of Motors – Selecting the Cable Rating – Single Phase Prevention using Current Operated Relay – Commissioning - Annual Maintenance Selection of Starters of Induction Motor – Common Induction Motor Troubles and their Remedies – Causes of Noise and Vibration – Care of Bearings – Static Balancing – Degreasing – Vacuum Impregnation - Varnishing – Effect of Unbalanced Supply on the Performance of Induction Motor.	7 7

TEXTBOOK

S.No	Author	Title	Publisher
1.	B.L. Theraja	A Textbook of Electrical Technology -Volume II	S.Chand& Co. New Delhi
2.	Edward Hughes	Electrical Technology	Addision– Wesley International Student Edition

REFERENCE BOOK

S.No	Author	Title	Publisher
1.	M.G.Say	Performance and Design of AC Machines	Pitman PublishingLtd
2.	Nagarath	Electrical Machines	TMH Publications
3.	Bhattacharya	Electrical Machines	TMH Publications

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME
(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030420

Semester : IV Semester

Subject Title : MEASUREMENTS, INSTRUMENTS AND TRANSDUCERS

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MEASUREMENTS, INSTRUMENS AND TRANSDUCERS	5	80	25	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

TOPICS AND ALLOCATION OF HOURS

Unit	Topic	Hours
I	Classification and Characteristics of Instruments	15
II	Measurement of current Voltage and Resistance	15
III	Measurement of Power, Power Factor and Frequency	15
IV	Measurement of L, C Parameters, Waveforms and Signal Conditioners	13
V	Sensors and Transducers	15
	Revision and Test	07
	Total	**80**

RATIONALE

Measurement is the basic and primary operation, the result of which is used only to describe the system and hence treated as an independent operation. Automation of any kind begins with the measurement of certain system parameters; In fact, Industrial growth moves hand in hand with the growth of the measurement of Science and Technology. Therefore, it is highly essential for Electrical Students to study about the measurement of various Electrical Parameters in a system and the construction and working of different Instruments used in measurement of such parameters.

OBJECTIVES

At the end of the Semester, Students will be able to:

- To define basic measurement terms.
- To learn about various operating Forces and effects used in Instruments.
- To study the construction and working of Moving coil and Moving Iron instruments, CT and PT and Electrostatic Voltmeter.
- To understand the measurement of Resistance using different means.
- To study Single Phase and Three Phase Power Measurement using Wattmeter.
- To study the construction and working of Single Phase, Three Phase Energy Meter and study about calibrations.
- To study the construction and working of Power Factor Meters, and Phase Sequence Indicators.
- To study about the Frequency Measurement using different types of Frequency Meters.
- To learn about the measurement of Inductance and Capacitance using Bridges.
- To study about CRO and its applications.

DETAILED SYLLABUS

CONTENTS: Theory

UNIT	NAME OF THE TOPICS	HOURS
I	**CLASSIFICATION AND CHARACTERISTICS OF INSTRUMENTS** General - Definition of Measurement – Functions of Measurement System (Indicating, Recording and Controlling Function) – Applications of Measurement Systems – Classification – Absolute and Secondary Instruments – Indicating Recording and Integrating Instruments –Analog and Digital	**10**
	Definition of True Value, Accuracy, Precision, Error and Error Correction – Instrument Efficiency – Effects used in Instruments – Operating Forces – Deflecting, Controlling and Damping Forces.	**5**
II	**MEASUREMENT OF CURRENT, VOLTAGE AND RESISTANCE** Types of Instruments — Construction, Working and Torque Equation of Moving Coil, Moving Iron, Dynamometer Type (Shaded Pole) Instruments — Extension of Instrument Range Using Shunts and Multipliers. (Calculation, Requirements and Simple Problems). Tong Tester — Electrostatic Voltmeter — Rectifier Type Instruments –Instruments Transformers CT and PT – Testing, Errors and Characteristics of CT and PT.	**10**
	Classification of Resistance – Measurement using Conventional Method – (Ammeter – Voltmeter Method) Measurement of Low Resistance using Kelvin's Bridge Ohmmeter – Measurement of Medium Resistance using Wheatstone Bridge – High Resistance using Megger - Earth Resistance- –u Earth Tester – Multimeters.	**5**

III	**MEASUREMENT OF POWER, POWER FACTOR AND FREQUENCY** Power in D.C and A.C Circuits — Watt Meters in Power Measurement —Measurement of Energy in AC Circuits – Single Phase and Three Phase Energy Meters Construction and Operation —- Digital Energy Meter. Power Factor Meters – Single Phase Electro Dynamometer Type – Construction and Working – Phase Sequence Indicator – Phase Difference Measurement using Synchro scope –Tri-vector Meter – Merz Price Maximum Demand Indicator. Frequency Measurement Frequency Meter – Digital Frequency Meter (Simplified Block Diagram)	**7** **8**
IV	**MEASUREMENT OF L, C PARAMETERS, WAVEFORMS AND SIGNAL CONDITIONERS** Inductance – Maxwell's Inductance Bridge – Andersons Bridge – Measurement of Capacitance using Schering Bridge. CRO — Block Diagram — CRT — Applications - Measurements of Voltage, Frequency and Phase Difference Using CRO – Digital Storage Oscilloscope – Block Diagram. **SIGNAL CONDITIONER:** Basic Components of Signal Conditioning System	**5** **5** **3**
V	**SENSORS AND TRANSDUCERS** Definition – Types of Transducers **PASSIVE TRANSDUCERS**: Resistive Transducer – Strain Gauge – Capacitive Transducer – Inductive Transducer – Proximity Sensor – Construction and Operation of LVDT and RVDT **ACTIVE TRANSDUCERS**: RTD – Thermistor - Thermocouple – Synchrous – Piezoelectric Transducer-Measurement of Pressure and Vibration – Hall Effect Transducer – Photovoltaic Transducer – Photoconductive Transducer. **TELEMETRY:** Block Diagram and its Applications	**8** **7**

TEXT BOOKS:

S.No	Title	Author	Publishers
1.	A Course in Electrical and Electronics Measurements and Instrumentation	A.K. Sawhney	Puneet Sawhney Dhanpat Rai & Co (P) Ltd., New Delhi 1993

REFERENCE BOOKS:

S.No	Title	Author	Publishers
1.	Electronic Instrumentation	HS Kalsi	Tata Mc Graw Hill Publishing Co., Delhi 2010
2.	Modern Electronic Instrumentation and Measurement techniques	Albert D. Helfrick William David Cooper	Prentic – Hall of India (P)Ltd., New Delhi 2010
3.	Electronics and Instrumentation	Dr.S.K.Battachariya Dr. Renu Vig	S.K. Kataria & Sons, New Delhi
4.	A course in Electrical and Electronic Measurement and Instrumentation	Umesh Sinha	Satya Prakashan, New Delhi

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING/TECHNOLOGY SYLLABUS

N SCHEME

(To be Implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject Code : 4040430

Semester : IV

Subject title : ANALOG AND DIGITAL ELECTRONICS

TEACHING AND SCHEME OF EXAMINATION

No of weeks/ semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /Week	Hours /Semester	Internal Assessment	Board Examination	Total	
ANALOG AND DIGITAL ELECTRONICS	**4**	**64**	**25**	**100***	**100**	**3 Hrs**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of hours

Unit	Topic	Hrs
I	Linear ICs and OP-amps	10
II	A/D, D/A, Special Function ICs and IC Voltage Regulators	13
III	Boolean Algebra and Arithmetic operations	10
IV	Combinational and Sequential Logic Circuits	12
V	Memories	12
	Tests and Model Exam	7
Total		**64**

RATIONALE:

The subject Analog and Digital Electronics holds applications in all branches of engineering instrumentation and Industrial Automation. This will impart in depth knowledge of Number Systems, Logics of Combinational &Sequential circuits and memories.

OBJECTIVES:

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

- Understand the basics of operational amplifier.
- Know the op-amp applications.
- Know the waveform generator and Active filter.
- Know the concept of D/A and A/D converters
- Know the applications of Special function IC, IC 555 Timer.
- Understand various Number Systems used in Digital Circuits
- Understand basic Boolean postulates and laws.
- Understand the De-Morgan's theorem.
- Understand the concept of Karnaugh Map.
- Learn about Basic logic Gates.
- Study about Boolean techniques.
- Learn the different digital logic families
- Learn arithmetic circuits- Adder/Subtractor
- Understand the encoder/decoder & MUX / DEMUX
- Understand the concept of parity Generator and checker
- Understand various types of flip-flops.
- Understand various types of counters
- Understand various modes of shift registers
- Understand various types of memories

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the topics	Hours
I	**LINEAR ICS AND OP-AMPS** **1.1: OPERATIONAL AMPLIFIER** Ideal Op-Amp – Block diagram and Characteristics – Op-amp parameters CMRR – Slew rate – Concept of Virtual ground **1.2: APPLICATIONS OF OP-AMP** Inverting amplifier –Summing amplifier – Non inverting amplifier – Voltage follower - Comparator – Zero crossing detector – Integrator – Differentiator- waveform generation (Schmitt Trigger only)–RC Low pass Active filter. **1.3: OP-AMP SPECIFICATIONS** OP-amp 741 – Symbol – Pin diagram – Specifications	**4** **4** **2**
II	**A/D, D/A, SPECIAL FUNCTION ICs AND IC VOLTAGE REGULATORS** **2.1: SAMPLING AND QUANTIZATION** **2.2: A/D CONVERTER** Analog to digital conversion using Ramp method – Successive approximation method – Dual slope method – Specifications of A/D converter **2.3: D/A CONVERTER** Basic concepts – Weighted Resistor D/A converter – R-2R Ladder D/A converter – Specifications of DAC IC **2.4: SPECIAL FUNCTION ICs** 2.4.1: IC 555 Timer – Pin diagram - Functional Block diagram of IC 555 in Astable and Monostable Multivibrator mode - Schmitt trigger using IC 555 2.4.2: IC 565-PLL-Pin Diagram-Functional Block diagram of IC 565 2.4.3: IC 566-VCO-Pin Diagram-Functional Block diagram of IC 566 **2.5.: IC VOLTAGE REGULATORS** Positive IC Voltage Regulators: 78XX - Negative IC Voltage Regulators: 79XX and General-purpose IC Voltage Regulators using LM 723.	**2** **3** **2** **3** 3

III	**BOOLEAN ALGEBRA AND ARITHMETIC OPERATIONS** **3.1: NUMBER SYSTEMS** Decimal – Binary – Octal – Hexadecimal – BCD – Conversion from one number system to other – Boolean Algebra – Basic laws and Demorgan's Theorems **3.2: UNIVERSAL GATES** Realization of basic logic gates using universal gates NAND and NOR -Tristate Buffer circuit **3.3: 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 **3.4:ARITHMETIC OPERATIONS** Binary Addition-Binary Subtraction-1's compliment and 2's compliment-Signed binary numbers **3.5: ARITHMETIC CIRCUITS** Half Adder-Full Adder-Half Subtractor-Full Subtractor	**2** **2** **2** **2** **2**
IV	**COMBINATIONAL AND SEQUENTIALLOGIC CIRCUITS** **4.1: PARITY GENERATOR AND CHECKER** **4.2: DECIMAL to BCD ENCODER** **4.3: 3 to 8 DECODER** **4.4: MULTIPLEXER:** 4 to 1 Multiplexer **4.5: DEMULTIPLEXER** :1 to 4 Demultiplexer **4.6: FLIP-FLOPS (FF)** RS FF– JK FF: Master Slave FF and Edge triggered FF – D and T FF **4.7: COUNTERS** 4 bit Asynchronous Up Counter –Mod N counter – Decade counter – 4 bit Synchronous up counter **4.8: SHIFT REGISTER** 4 bit shift register – Serial in Serial out	**1** **1** **1** **1** **1** **2** **3** **2**

V	**MEMORIES** **5.1: CLASSIFICATION OF MEMORIES** **5.2:RAM** RAM organization-Address Lines and Memory Size- Read/write operations-Static RAM-Bipolar RAM cell- Dynamic RAM- SD RAM- DDR RAM. **5.3:ROM** ROM organization-Expanding memory- PROM- EPROM- and EEPROM- Flash memory- Anti Fuse Technologies.	**6** **6**

TEXT BOOKS:

1. Roger L. Tokheim Macmillan – Digital Electronics – McGraw – Hill –1994.
2. D.Roychoudhury & shail. B.Jain- Linear Integrated Circuits -New age International publishers - II Edition -2004.

REFERENCE BOOKS:

1. Albert Paul Malvino and Donold P. Leach – Digital Principles and Applications
2. William H.Goth Mann – Digital Electronics – An introduction to theory and practice – PHI 1998.
3. Linear Integrated Circuits by B.Suseela & T.R.Ganesh babu -Scitech publications-2018
4. Integrated circuits by K.R.Botkar-Khanna publisher's-1996.
5. R.P.Jain – Modern Digital Electronics – TMH 2003.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : All branches of Diploma in Engineering and Technology

Subject Code : 4020440

Semester : VI

Subject Title : E - VEHICLE TECHNOLOGY & POLICY

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
E - VEHICLE TECHNOLOGY AND POLICY	4	64	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Environmental impact and history& Electric vehicle Types	12
II	Electric vehicle & Drive System	12
III	Energy Storages, Charging System, Effects and Impacts	12
IV	Electric Mobility Policy Frame work India	11
V	Tamilnadu E-Vehicle Policy 2019	10
Test & Model Exam		7
Total		64

RATIONALE

The world is transitioning to cleaner mobility options with the aim at improving air quality and reducing dependency on fossil fuels. Electric Vehicles (EVs) have emerged a popular clean mobility choice to reduce emissions. EVs are powered fully or partially by batteries, they can help to reduce dependence on fossil fuels also air quality. Tamil Nadu is one of the most advanced states in India. Tamil Nadu has a highly developed industrial eco-system and is very strong in sectors like automobiles and auto-components. Many globally renowned companies have setup their manufacturing facilities in Tamil Nadu. Due the rapid depletion of fossil fuel and increase in fuel cost, environmental pollution, the shift to clean transport is necessary. This subject introduced by keeping all the above factors.

OBJECTIVES

1. To learn the environmental impact and history of Electric Vehicles.
2. To understand the concept of Electric Vehicle and its types.
3. To study the configurations of Electric Vehicles
4. To acquire knowledge about Energy Storages, Charging System, Effects and Impacts
5. To appreciate the Electric Mobility Policy Frame work India and EV Policy Tamil Nadu 2019.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Environmental impact and history& Electric vehicle Types:** Environmental impact and history: Air pollution – Petroleum resources – History of Electric vehicles - History of Hybrid Electric Vehicles – Historyof Fuel Cell Vehicles – Hybrid electric Vehicle (HEV) - Plug-in Hybrid Electric Vehicle (PHEV) - Battery Electric Vehicle (BEV) – Fuel Cell Electric Vehicle (FCEV) – Description.	12
II	**Electric vehicle & Drive System:** Electric Vehicles: Configurations of Electric Vehicle – Performance ofElectric Vehicles— Tractive Effort in Normal Driving — Energy Consumption. Hybrid Electric Vehicles: Concept of Hybrid Electric Drive Trains – Architecture of Hybrid Electric Drive Trains. Electric Propulsion Systems: Drive Systems: DC Motor Drives - Principle of Operation – Induction Motor Drives - Basic Operation Principles – Permanent Magnetic Brush Less DC Motor Drives – Principles – Construction and Classification.	12
III	**Energy Storages, Charging System, Effects and Impacts:** Energy Storages: Electrochemical Batteries – Battery Technologies – Lead Acid Batteries – Nickel Based Batteries – Lithium Based Batteries – Charging system –DC charging – Wireless charging – Power conversiontechniques. Effects of EV — Impacts on Power grid — Impacts on Environment — Impacts on Economy.	8 4
IV	**Electric Mobility Policy Frame work India:** Government of India Electric Mobility Policy Frame Work – Global Scenario of EV Adoption – Electric Mobility in India – National Electric Mobility Mission Plan 2020 –Action led by Original Equipment Manufacturers – Key Performance Indicator - Global Impact – Trends and Future Developments.	11

V	**Tamilnadu E-Vehicle Policy 2019:** Tamilnadu E-vehicle Policy 2019: Vehicle Population in Tamilnadu – Need of EV Policy — Advantage of EV Eco system — Scope and Applicability of EV Policy – Objectives of EV Policy – Policy Measures –Demand Side Incentives – Supply Side Incentives to promote EV. Manufacturing – Revision of Transport Regulation of EV – City Building Codes — Capacity Building and Skilling — Charging Structure — Implementing Agencies – R&D and Business Incubation – Recycling Ecosystem – Battery and EVs.	5 5

TEXT BOOKS:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles, Mehrdad Ehsani, Yimin Gao, Sebastien E.Gay, Ali Emadi, CR Press, London, New York.
2. Comparison of Electric and Conventional Vehicles in Indian Market: Total Cost of Ownership, Consumer Preference and Best Segment for Electric Vehicle (IJSR),Akshat Bansal, Akriti Agarwal

REFERENCE BOOKS:

1. A Comprehensive Study of Key Electric Vehicle (EV) Components, Technologies, Challenges, Impacts, and Future Direction of Development (MDPI), Fuad Un-Noor, Sanjeevi kumar Padmanaban, Lucian Mihet-Popa, Mohammad NurunnabiMollah and Eklas Hossain.
2. Electric Vehicles: A future Projection CII October 2020 report.
3. Design and analysis of aluminum/air battery system for electric vehicles, Shaohua Yang, Harold Knickle, Elsevier.
4. Propelling Electric Vehicles in India, Technical study of Electric Vehicles and Charging Infrastructure
5. Zero Emission Vehicles (Zevs): Towards A Policy Framework – Niti Aayog.
6. Faster Adoption of Electric Vehicles in India: Perspective of Consumers and Industry, The Energy and Resources Institute, New Delhi.
7. India EV Story: Emerging Opportunities by Innovation Norway.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME
(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030450

Semester : IV

Subject Title : Electrical Machines and Instrumentation Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL MACHINES AND INSTRUMENTATION PRACTICAL	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

RATIONALE:

- To impart practical knowledge to the Diploma Students, Practical's are introduced for every corresponding Theory Subject.
- This Practical Subject supports the Aim and Objective of Electrical Machines II and Measurements and Instruments subjects.

OBJECTIVES:

On completion of this practical Subject the Students will be able to:

- Understand the characteristics of AC Machines.
- Make various Electrical Measurements.
- Use Transducers in Non-Electrical Quantity Measurement

DETAILED SYLLABUS

Contents: Practical

Name of the Topics: Electrical Machines and Instrumentation Practical

Exercise:

1. Predetermine the Regulation of Alternator.
2. Load test on 3 Phase Alternator.
3. Synchronization of 3 Phase Alternator
4. Load test on Single Phase Induction Motor.
5. Load test on 3 Phase Induction Motor.
6. Determine the Equivalent Circuit Constants of 3 Phase Induction Motor.
7. Predetermine the performance of a 3 Phase Induction Motor.
8. Improvement of Power Factor of an Induction Motor with load.
9. Calibration of given Ammeter and Voltmeter.
10. Calibration of given Wattmeter.
11. Calibration of 3 Phase Energy Meter.
12. Measurement of Alternator Winding Resistance using Wheatstone Bridge
13. Measurement of value of unknown Capacitance using Schering Bridge.
14. Measurement of value of unknown Inductance using Anderson Bridge.
15. Displacement measurement using LVDT.
16. Measurement of earth Resistance by using Megger.

LIST OF EQUIPMENTS (For a Batch of 30 Students)

S.NO	NAME OF TH EQUIPMENTS	QUANTITY REQUIRED
1.	Three Phase Squirrel Cage Induction motor 5 HP, 440V,1440 rpm with starting and loading arrangement	2
2.	Three Phase Squirrel Cage Induction motor 5 HP,440V,1440 rpm without starting and loading arrangement	1
3.	Three phase Slip ring Induction motor 5HP, 440V, 940/1450 rpm with starting and loading arrangement	1
4.	Single phase induction motor with staring and loading arrangement 2HP, 250V, 10A, 1440 rpm.	1
5.	Wheatstone bridge.	2
6.	Anderson Bridge.	2
7.	Schering Bridge.	2
8.	1 Phase Energy meter induction type, 250V, 10A.	2
9.	3 Phase Energy meter Induction type 440V, 10/20A.	2
10.	Earth megger with necessary connecting leads and rods.	1
11.	3 phase Alternator with prime mover.	2
12.	Synchronizing panel.	1
13.	PF meter (power factor meter).	2
14.	LVDT trainer.	2
15.	3 phase capacitor bank rating of 1KVAR, 400/440 V.	1

DETAILLED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	Circuit Diagram	30
2	Connections And Conduction of the Experiment	30
3	Reading/Calculation	20
4	Graph/Result	15
5	Viva Voce	05
	Total	100

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject code : 4040460

Semester : IV

Subject title : ANALOG AND DIGITAL ELECTRONICS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks/ Semester: 16weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours /week	Hours /semester	Internal Assessment	Board Examination	Total	
ANALOG AND DIGITAL ELECTRONICS PRACTICAL	**5**	**80**	**25**	**100***	**100**	**3 Hours**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

Every Electronic Engineer should have sound knowledge about the ICs 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, Analog and Digital Electronics Practical. By doing practical experience in this, they will be skilled in handling all types of ICs and able to apply the skill in electronic system design and the designing of PCBs.

OBJECTIVES:

On completion of the following experiments, the students must be able to

- Know the Verification of truth table of OR, AND, NOT, NOR, NAND, EX-OR gates
- Know the Realization of basic gates using NAND & NOR gates.
- Know the verification of Half Adder and Full Adder using IC's.
- Know the verification of Half Subtractor and Full Subtractor using IC's.
- Know the Verification of Truth Table for Decoder/Encoder.

- Know the Verification of truth table for RS, D, T & JK flip-flop.
- Test Inverting Amplifier and Non inverting amplifier using Op-amp
- Test Summing Amplifier, Difference Amplifier and Voltage Comparator using Op-amp.
- Test Integrator and Differentiator.
- Test Astable multivibrator using IC 555
- Design IC Voltage Regulator Power Supplies using IC 7805, IC 7912
- Design the PCB of 4- bit ripple counter using FF

4040460 ANALOG AND DIGITAL ELECTRONICS PRACTICAL

DETAILED SYLLABUS

Contents: Practical

Exercises

Note: At least 6 experiments should be constructed using breadboard

1. Realization of basic gates using NAND & NOR gates.
2. Realization of logic circuit for De-Morgans Theorems
3. Test the performance of Half Adder and Full Adder.
4. Test the performance of Half Subtractor and Full Subtractor.
5. Test the performance of Decoder/Encoder.
6. Test the performance of RS, D, T & JK flip-flops.
7. Test the performance of Parity generator and checker using parity checker/ generator IC's.
8. Test the performance of Multiplexer/De-multiplexer using IC 4051
9. Test the performance of Inverting Amplifier and Non inverting amplifier using Op-amp IC 741.
10. Test the performance of Summing Amplifier, Difference Amplifier.
11. Test the performance of Zero Crossing Detector and Voltage Comparator using Op-amp IC 741.
12. Test the performance of Integrator and Differentiator using Op-amp IC 741.
13. Test the performance of Astable multivibrator using IC 555.
14. Test the performance of IC Voltage Regulator Power Supplies using IC 7805, IC 7912.
15. Design the PCB of 4- bit ripple counter using FF using Software tool Multisim/OrCAD

DETAILED ALLOCATION OF MARKS

S.No.	NAME OF THE ACTIVITY	MARK ALLOCATION
1	CIRCUIT DIAGRAM	25
2	CONNECTION	30
3	EXECUTION & HANDLING OF EQUIPMENT	20
4	OUTPUT / RESULT	15
5	VIVA – VOCE	10
	TOTAL	100

LIST OF EQUIPMENTS (For a Bach of 30 Students)

S. NO	Name of the Equipments	Range	Required Nos
1	DC Regulated power supply	0-30V,1A	5
2	IC Voltage Power Supply	0-5V,1A 15-0-15V, 1A	5 5
3	Signal Generator	1MHz	4
4	Dual trace CRO	20MHz/ 30MHz	5
5	Digital Trainer	-	10
6	DC Voltmeter (Analog/Digita)	Different Ranges	5
7	DC Ammeter (Analog/Digital)	Different Range	5
8	Desk Top Computer	-	5
9	Simulation Tool	Multisim/OrCAD	1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030470

Semester : IV

Subject Title : Electrical Circuits and Simulation Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL CIRCUITS AND SIMULATION PRACTICAL	4	64	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

RATIONALE

All the Engineering applications are simulated through Computers. They are tested and then built using real components for commercial implementation. Simulation Software is available for all Engineering Fields. Hers is an attempt to impart the knowledge of using Simulation Software for realizing some of the Electrical and Electronics Circuits for the Diploma students.

OBJECTIVES

On Completion Of This Practical subject, the Students will be able to know :

- ✓ The Various Aspects of Simulation Software
- ✓ Simulate and Test the Simple Electrical and Electronics Circuits
- ✓ Simulate and Test the Wave Generating Circuits

- ✓ Simulate and Prove the Simple Theorems
- ✓ Simulate and Test the Performance Characteristics of Converters
- ✓ Design and Verify the Results of Various Electric Circuits Using Simulation Software

DETAILED SYLLABUS

Contents: Practical

Name of the Topics: Electrical Circuits and Simulation Practical

Exercise

1. Generate the following waveforms
   (i) Sinusoidal waveform of Fundamental Frequency (50Hz)
   (ii) 3^{rd} Order, 5^{th} Order and 7^{th} Order Harmonics for the Fundamental frequency.
2. Simulation of RLC series and RLC Parallel Response Circuits.
3. Step Response of RL and RC Series Circuit.
4. Simulation of Mesh and Nodal analysis for DC Circuits.
5. Verification of Superposition Theorem.
6. Verification of Thevenin's and Norton's Theorem.
7. Verification of Maximum Power Transfer Theorem.
8. Simulation of Full Wave Rectifier (Center Tapped and Bridge) with RL load.
9. Simulation of Single-Phase Half Wave Controlled Converter with RL Load and FreeWheeling Diode.
10. Simulation of Single-Phase Full Wave Controlled Converter with RL Load and FreeWheeling Diode.
11. Simulation of Three Phase Star Connected Balanced and Unbalanced Load
12. Simulation of Three Phase Delta Connected Balanced and Unbalanced Load
13. Simulation of Three Phase Non-Linear Star Connected Load with Three Phase 3 WireSystem.
14. Simulation of Three Phase Non-Linear Star Connected Load with Three Phase 4 Wire System.
15. Simulation basic Logic Gates, Universal Logic Gates and Realization of Logic Gates usingUniversal Logic Gates.
16. Simulation of Half Adders and Full Adder.

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No.	LISTOFEQUIPMENTS	QUANTITYREQUIRED
1.	PC with any suitable simulation software	30
2.	UPS 5KVA with half an hour battery backup	1
3.	Printer	1

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	Circuit Diagram (Manual Diagram)	30
2	Development of circuit diagram	30
3	Simulation Performance & print out	35
4	Viva Voce	05
	Total	100

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030510

Semester : V Semester

Subject Title : GENERATION, TRANSMISSION AND SWITCH GEAR

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
GENERATION, TRANSMISSION AND SWITCHGEAR	5	80	25	100*	100	3 Hrs.

Examinations will be conducted for 100 marks and it will be reduced to 75 Marks.

Topics and Allocation of Hours

Unit	Topic	Hours.
I	Generation of Electrical Power	16
II	A.C. And H.V.D.C Transmission	14
III	FACTS, Line Insulators and Underground Cables	14
IV	Circuit Breakers and Over Voltage Protection	14
V	Protective Relays and Grounding	15
Test & Model Exam		7
Total		**80**

RATIONALE

Energy is the basic necessity for the Economic Development of a Country and also there is a growing impulse towards green and reduction in the use of Fossil Fuels. As a matter of fact, there is a close relationship between the Energy used per person and his standard of living. The Modern Society is so much dependent upon the use of Electrical Energy that it has become a part of our life. So, to have adequate knowledge in Electrical Power Generation and Transmission, Switch Gear and efficiency associated with them, it becomes necessary to include this subject.

OBJECTIVES

To Understand

- Conventional Power Plants-Layout and choice of site
- Renewable Energy Sources and Power Generation
- A.C Transmission-Supports, Conductors, Effects, Regulation and Efficiency
- H.V.D.C Transmission
- FACTS, Line Insulators and Underground Cables
- Circuit Breakers, Protective Relay and Lightning Arresters

DETAILED SYLLABUS

Contents: Theory

UNIT	NAME OF THE TOPICS	HOURS
I	**GENERATION OF ELECTRICAL POWER** Introduction- Conventional methods of power generations — schematic arrangement and choice of site for Hydro, Thermal, Nuclear power plants-Advantages and Disadvantages-comparison of these power plants - Principle and types of co-generation.	4
	Schematic arrangement of Diesel, Gas, Pumped storage schemes-Advantages and Disadvantages-Grid or Inter connected system-Advantages of Inter connected systems- Load Transfer through Inter connector-Load curves and Load duration curves-connected load-Average load-Maximum Demand Factor- Plant capacity factor-Load factor and its significance-Diversity factor-Simple problems- Load sharing between base load and peak load plants.	10
	Renewable Energy sources- Basic principle of Solar Energy, Wind Power Generation-Hybrid Renewable Energy Systems.	2

II	**A.C. AND H.V.D.C TRANSMISSION** **A.C. Transmission:** Introduction-Typical Layout of A.C. Power supply scheme -Advantages and Disadvantages of A.C Transmission- High Transmission Voltage-Advantages-Economic choice of Transmission voltage-Elements of a Transmission Line-over Head Line-Conductor materials and their properties-Line supports-its properties-Types of supports and their applications-spacing between conductors-length of span-Sag in overhead lines-Calculation of Sag-When the supports are at equal and unequal levels- Problems- Effect of wind and ice loading over the line conductor (Qualitative treatment only) - constants of a Transmission line- Transposition of Transmission lines-Skin Effect- Ferranti Effect-Corona formation and corona loss-Factors affecting corona-Advantages and Disadvantages –Classification of O.H Transmission lines-Performance of single phase short transmission line-voltage regulation and Transmission Efficiency-Problems. **H.V.D.C Transmission:** Advantages and Disadvantages of D.C Transmission- Layout Scheme and principle of High Voltage D.C Transmission-D.C link configurations (Monopolar, Bipolar and Homopolar)-HVDC convertor Station (Schematic diagram only).	10 4

III	**FACTS, LINE INSULATORS AND UNDERGROUND CABLES:** Definition-Need for FACTS controllers- types of FACTS controllers-SVS-STATCOM-UPFC (block diagram explanation only) **Line Insulators:** Introduction - Line Insulator Materials-Properties of Insulators- Types & causes of failure of Insulators-Testing of Insulators-Potential Distribution over suspension Insulator String-String Efficiency - Methods of improving string efficiency- problems. **Underground cables:** Introduction-Advantages and requirement of cables-construction of a three-core cable-Insulating materials for cables- properties of Insulating materials used in cables-classification of cables- cables for three phase service-construction of Belted cable, screened cable, pressure cables-Laying of underground cables-Direct laying, Drawing system, Advantages and Disadvantages.	7 7
IV	**CIRCUIT BREAKERS AND OVER VOLTAGE PROTECTION** Switch gear-Essential features of Switch gear-faults in a Power system (definition only). **CIRCUIT BREAKERS:** Basic principle of circuit Breaker -Arc Phenomenon- methods of Arc Extinction-Arc voltage –Re-striking voltage and recovery voltage-Rate of rise of re-striking voltage C.B ratings – Breaking capacity, making capacity, short time rating - Auto reclosing in circuit Breakers - Classification of Circuit Breakers — Construction and Working principle of Air Circuit Breakers, E.L.C.B, Residual current circuit breaker SF6 and vacuum Circuit Breaker Maintenance of Circuit Breakers – Rupturing capacity of circuit breaker-conditions to trip – Auto reclose breaker – Fault clearance time – Inverse time overload relay – Maintenance Requirement for oil circuit breakers – SF6 Circuit Breakers. **FUSES**- L.V fuses- Re-wirable fuse, HRC fuse-H.V. fuses & Cartridge Type, Liquid Type and Metal Clad-Fuses. **OVER VOLTAGE PROTECTION:** Voltage surge- causes of over voltage-Lightning-Types of lightning strokes -	7 3 4

	Direct stroke, indirect stroke-Harmful Effects of lightning Protection against lightning- Earthing screen, overhead ground Wires, Lightning arresters- Expulsion type, Gapless arrester.	
V	**PROTECTIVE RELAYS AND GROUNDING** **PROTECTIVE RELAYS:** Basic principle-Fundamental requirements of protective relaying- Primary and back up Protection-relay characteristics-relay timing - Instantaneous relay -Inverse time relay and Definite time lag relay- Inverse definite minimum time relay -classification of relays-Construction, Principle of operation and applications of Induction type over current relay (Directional and Non-directional), Differential relay. Static relays- Basic elements of static relay-Over Current-Distance relay (Block diagram explanation only). **GROUNDING:** Introduction-Equipment grounding- system grounding- ungrounded neutral system-Necessity of Neutral grounding — Methods- solid grounding Resistance grounding, Reactance grounding, Resonant grounding.	10 5

TEXT BOOK

S.No	Name of the Book	Author	Publisher	Edition
1	Principles of PowerSystem	V.K.Metha	S.Chand & Company, NewDelhi	4th Edition Reprint 2007

REFERENCE BOOK

Sl. No	Name of the Book	Author	Publisher	Edition
1.	Electrical Power System	CLWadhawa	New Age International, New Delhi	Fourth Edition, 2009
2.	A Course in Electrical Power	Soni, Gupta	DhanpathRai&Co (P) Ltd, New Delhi	
3.	Electrical Power	S.L Uppal	Khanna Delhi Publishers	

4.	A Course in Electrical Power	J.B. Gupta	Kaison Publishing House	Reprint 2004
5.	HVDC Power Transmission System & Technology	KR. Padiyar	New Age International, New Delhi	Reprint 2005
6.	Digital Protection – Protective Relaying from Electromechanical to Microprocessor	LP Singh	New Age International	Second Edition 1997
7.	Power System Protection and Switchgear	B Ram & DN Viswakarma	TMH 1995	Reprint 2000
8.	Thyristor-Based Facts Controllers for Electrical Transmission Systems	Mohan Mathur.R., Rajiv. K.Varma,	IEEE press and John Wiley & Sons, Inc., New	2005
9.	Understanding FACTS - Concepts and Technology of Flexible AC Transmission Systems	Narain G. Hingorani, Laszio. Gyugyi	Standards publishers, New Delhi	2001

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject Code : 4040520

Semester : V

Subject Title : MICROCONTROLLER AND ITS APPLICATIONS

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
MICROCONTROLLER AND ITS APPLICATIONS	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Architecture of 8051 Microcontroller	15
II	8051 Instruction set and Programming	16
III	Peripherals of 8051	15
IV	Interfacing techniques	16
V	Advanced Microcontrollers	11
Test & Model Exam		7
Total		**80**

RATIONALE:

The introduction of this subject will enable the students to learn about microcontroller 8051 architecture, Pin details, Instruction sets, Programming and interfacing. This subject enables the students to do the project effectively. It also helps the students to choose the field of interest. If the student is aiming for higher studies, this subject is foundation.

OBJECTIVES:

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

-> Know the difference between microprocessor and microcontroller.

-> Understand the architecture of 8051.

-> Write programs using 8051 ALP.

-> Understand the programming of I/O ports, Timer, Interrupt and Serial Programming.

-> Use the interfacing techniques

-> Know the types of microcontrollers

-> Explain IoT.

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DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Architecture Of 8051 Microcontroller** **1.1 : Architecture** Microprocessor-Microcontroller-Comparison of microprocessor and microcontroller-Architecture diagram of microcontroller 8051-Functions of each block-Pin details of 8051-ALU- ROM-RAM-Memory organization of 8051- Special function registers-Program counter-PSW register-Stack-I/O ports-Timer-Interrupt-serial port-External memory- Oscillator and Clock-Reset-Power on reset-Clock cycle-machine cycle-Instruction cycle-Overview of 8051 family.	15
II	**8051 Instruction set and programming** **2.1: Instruction Set Of 8051** Instruction set of 8051-Classification of 8051 instructions-data transfer instructions - Arithmetic Instructions-Logical Instructions-Branching Instructions-Bit manipulation instructions- Assembling and running an 8051 program-Structure of Assembly Language-Assembler Directives-Different Addressing modes of 8051-Time delay routines. **2.2: Assembly language programs** 16-bit addition and 16-bit subtraction-8-bit multiplication and 8 bit division-BCD to HEX code conversion-HEX to BCD code conversion. - Smallest number/ Biggest number.	8 8
III	**Peripherals of 8051** **3.1: I/O Ports** Bit addresses for I/O ports-I/O port programming-I/O bit manipulation programming. **3.2: Timer/Counter** SFRS for Timer- Modes of Timers/counters- Programming 8051 Timer (Simple programs). **3.3: Serial Communication** Basics of serial communication-SFRs for serial communication-RS232 standard-8051 connection to RS 232-8051 serial port programming.	3 4 4

	3.4: Interrupts 8051 interrupts-SFRs for interrupt-Interrupt priority.	4
IV	**Interfacing Techniques** **4.1: IC 8255** IC 8255-Block Diagram-Modes of 8255-8051 interfacing with 8255 **4.2: Interfacing** Interfacing external memory to 8051-Relay interfacing- Sensor interfacing -Seven segment LED display interfacing-Keyboard Interfacing-Stepper motor interfacing-ADC interfacing- DAC interfacing-DC motor interfacing using PWM-LCD interfacing.	3 13
V	**Advanced Microcontrollers** **5.1: Types of microcontrollers** PIC microcontroller-General Block diagram-Features-Applications-Arduino- General Block diagram-Variants-Features-Applications-Raspberry pi-General Block diagram-Features-Applications-Comparison of microcontrollers. **5.2: IoT** Introduction to IoT-Block diagram of home automation using IoT.	8 3

TEXT BOOKS:

1. ”Ajit pal” “Microcontrollers, Principles and Applications ”,PHI Ltd,-2011.
2. ”Mazidi,Mazidi and D.MacKinlay” “8051 Microcontroller and Embedded Systems using Assembly and C”,2006 Pearson Education Low Price Edition.

REFERENCE BOOKS:

1. ”R. Theagarajan” “Microprocessor and Microcontroller”, Sci Tech Publication, Chennai.
2. www.microchip.com, www.raspberrypi.org,www.arduino.org.
3. “J.B. Peatman” ”Design with PIC microcontrollers”.
4. ”Michael McRoberts”, ”beginning Arduino.
5. ”Matt Richardson”, ”Getting started with Raspberry Pi”.
6. 8.”Samuel Greengard”, ”The Internet of Things”.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030511

Semester : V

Subject Title : CONTROL OF ELECTRICAL MACHINES

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
CONTROL OF ELECTRICAL MACHINES	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Control Circuit Components	16
II	Motor Control Circuits	15
III	Industrial Control Circuits	14
IV	Programmable Logic Controller	14
V	PLC Programming and SCADA	14
	Test & Model Exam	7
	Total	**80**

RATIONALE

The Energy Conversion between Electrical and Mechanical Systems is performed by the Control of Electrical Machines in both directions.

Various Control Operations are to be performed on the Electrical Machines to meet the Industrial requirements. Especially Technicians are mainly employed to look after the control Panels. To make our students Employable, they have to be trained in using various Control Components and Circuits. This subject fulfills the requirement.

OBJECTIVES

At the end of the Semester the Students must be able to understand theconcepts of:

1. Electrical Control Circuit Elements including Various Types of Industrial Switches, Relays, Timers, Solenoids, Contactors and Interlocking arrangements.
2. DC Motor and AC Motor Control Circuits for Acceleration Control, Speed Control, Direction Control, Braking Control and jogging using Contactors.
3. Different Control Circuits for Industrial Applications.
4. Basics of Programmable Logic Controllers.
5. PLC Programming and SCADA.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**CONTROL CIRCUIT COMPONENTS** Switches – Push Button, Selector, Drum, Limit, Pressure, Temperature (Thermostat), Float, Zero Speed and Proximity Switches. Relays — Voltage Relay, DC Series Current Relay, Frequency Response Relay, Latching Relay and Phase Failure Relay (Single Phasing Preventer). Over Current Relay — Bimetallic Thermal Over Load Relay and Magnetic Dash Pot Oil Filled Relay. Timer — Thermal Pneumatic and Electronic Timer. Solenoid Valve, Solenoid Type Contactor (Air Break Contactor), Solid State Relay, Simple ON-OFF Motor Control Circuit, Remote Control Operation and Interlocking of Drives.	10 6
II	**MOTOR CONTROL CIRCUITS** **CHAPTER: 2.1: DC MOTOR CONTROL CIRCUITS** Series Relay and Counter EMF Starters – Field Failure Protection – Jogging Control, Dynamic Braking **CHAPTER: 2.2:AC MOTOR CONTROL CIRCUITS** DOL Starter – Automatic Auto Transformer Starter (Open Circuit and Closed-Circuit Transition) – Star/Delta Starter (Semi-Automatic and Automatic) – Starter for Two Speed Two Winding Motor – Reversing the Direction of Rotation of Induction Motor – Dynamic Braking – Three Step Rotor Resistance Starter for Wound Induction Motor – Secondary Frequency Acceleration Starter.	3 12
III	**INDUSTRIAL CONTROL CIRCUITS** Planner Machine Control – Skip Hoist Control – Automatic Control of a Water Pump – Control of Electric Oven – Control of Air Compressor – Control of Over Head Crane - Control of Battery-Operated Truck – Control of Conveyor System – Control of Elevator - Trouble Spots in Control Circuits – General Procedure for Trouble Shooting.	14

IV	**PROGRAMMABLE LOGIC CONTROLLER** Automation — Types of Automation (Manufacturing and Non-Manufacturing) – Advantages of Automation –PLC Introduction – Block Diagram of PLC–Principle of Operation–Modes of Operation– PLC Scan–Memory Organization–Input Module (Schematic and Wiring Diagram) – Output Module (Schematic and Wiring Diagram). Types of Programming Devices – Comparison between Hardwire Control System and PLC System –PLC Types (Fixed and Modular) — Input Types — Output Types – Criteria for Selection of Suitable PLC – List of Various PLCs available.	7 7
V	**PLC PROGRAMMING AND SCADA** Different Programming Languages – Ladder Diagram – Relay Type Instruction — Timer Instruction — ON Delay and OFF Delay Timer — Retentive Timer Instruction – Cascading Timers – Counter Instruction UP Counter — Down Counter — UP/DOWN Counter - Ladder Logic Diagram for DOL Starter, Automatic STAR-DELTA Starter - Rotor Resistance Starter and EB to Generator Change over System. Supervisory Control Data Acquisition System (SCADA) – Block Diagram of SCADA, Features and Functions of SCADA – Introduction to DCS.	7 7

TEXT BOOKS:

1. "S.K.Battacharya" "Control of Electrical Machines", New Age International Publishers, New Delhi

REFERENCE BOOKS:

1. "Pradeep Kumar, Srivastava" Exposing Programmable Logic Controllers with Application", BPB Publications
2. "Stephen Herman" Industrial Motor Control", 6th Edition, Cengage Learning
3. "David Bailey, Edwin Wright" "Practical SCADA for Industry", Newnes Publishers

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030512

Semester : V

Subject Title : PROGRAMMABLE LOGIC CONTROLLER

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
PROGRAMMABLE LOGIC CONTROLLER	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Introduction to PLC	16
II	**I**nput / Output Modules	15
III	PLC Programming	14
IV	Networking	14
V	Data Acquisition Systems	14
Test & Model Exam		7
Total		80

RATIONALE

Various control operations are to be performed automatically and sequentially on the electrical machines to suit the industrial requirements. Programmable controllers are mainly employed to control the process in industries. In order to impart knowledge on programmable Logic Controller this theory subject is introduced.

OBJECTIVES

Unit: 1

After completing this chapter, students should able to:

- ✓ Explain the meaning of automation and List the types of automation
- ✓ Define PLC and Explain why their use is valuable
- ✓ Explain what PLC can do
- ✓ Compare fixed and modular PLC
- ✓ Explain the advantages of PLC
- ✓ Explain the functions of various elements of power supply unit

Unit: 2

After completing this chapter, students should able to:

- ✓ Know the difference between digital and analog input and output signals
- ✓ Observe how digital field device information gets into a PLC
- ✓ Observe how analog field device information gets into a PLC
- ✓ Understand I/O addresses and how they are used in a PLC

Unit: 3

After completing this chapter, students should able to:

- ✓ Describe PLC timer instruction and differentiate between a non-retentive and retentive timer
- ✓ Program the control of outputs using the timer instruction
- ✓ List and describe the functions of PLC counter instructions
- ✓ Create PLC programs involving program control instructions, math instructions

Unit: 4

After completing this chapter, students should able to:

- ✓ Explain the functionality of different levels of industrial network
- ✓ Explain the concept of network topology and network protocols
- ✓ Explain the concept of I/O bus networks etc.,

Unit: 5

After completing this chapter, students should able to:

- ✓ Describe the computer control of process
- ✓ Explain the operation of SCADA
- ✓ Explain the functions of the major components of a process control system
- ✓ Explain how on/off control and PID control work.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**INTRODUCTION TO PLC:** Automation – Types of Automation (Manufacturing and Non-Manufacturing) – Advantages of Automation - PLC Introduction - Definition – Block diagram of PLC – Principle of Operation – Modes of Operating System – PLC Scan - Hardwire Control System compared with PLC System - Advantages and Disadvantages of PLCs. Criteria for selection of suitable PLC –Memory Organization – Input Types – Discrete input – Analog in/out - Elements of Power Supply Unit - PLC Types (Fixed I/O and Modular I/O) - List of various PLCs available –Applications of PLC.	**10** **6**
II	**INPUT/OUTPUT MODULES** The I/O Section - Discrete I/O Modules (DC and AC) – Analog I/O Modules - Special I/O Modules– I/O Module Specification - Typical Discrete and Analog I/O field Devices –Sensors — Limit Switch– Reed Switch — Proximity Sensor (Inductive and Capacitive). Types of Photo Electric Sensor - Sinking and Sourcing I/O Modules– TTL Output Module — Relay Output Module –Isolated Output Module –Input /Output Addressing Scheme in important commercial PLCs.	7 8

III	**PLC PROGRAMMING** Types of Programming Methods – Types of Programming Devices – Logic Functions – AND Logic – OR Logic – NOT Logic - Relay Typeinstructions –Timer Instructions – ON Delay and OFF Delay Timer. Retentive Timer Instruction — Cascading Timers — Counter Instruction – UP Counter – DOWN Counter – UP/DOWN Counter – Cascading Counters — Program Control Instructions –Data Manipulation Instruction – Data Compare Instructions – Math Instructions - Sequencer Instructions - PID Instruction – PWM Function – Simple programs using above instructions. Develop ladder logic for: Bottle Filling System – Automatic Car Parking System - EB To Generator Changeover System – Batch Process – Elevator System -DOL Starter- Automatic Star-Delta Starter – Traffic Light Control.	**4** **5** **5**
IV	**NETWORKING** Levels of Industrial Network – Network Topology –Network Protocol – OSI Reference Model - Networking with TCP / IP Protocol - I/O Bus networks – Block diagram of I/O Bus networks – Types of I/O Bus networks. Protocol standards — Advantages of I/O Bus networks - Gateway — Token passing — Data Highway — Serial Communication – Device Net – Control Net – Ethernet – Modbus –Fieldbus — Profibus- Sub Netting — Subnet mask - File transfer protocol.	**7** **7**
V	**DATA ACQUISITION SYSTEMS** Computers in Process Control – Types of Processes - Structure of Control system — ON/OFF Control — Closed loop Control - PID Control – Motion Control –Block diagram of Direct Digital Control. Supervisory Control and Data Acquisition (SCADA)– Block diagram of SCADA – Features of SCADA – Functions of SCADA - SCADA software - Data Loggers – Tags – Alarms - landlines for SCADA – use of modems in SCADA.	**7** **7**

TEXT BOOK:

S.No	Name of the Book	Author	Publisher	Edition
1	Introduction to Programmable Logic Controllers	Gary Dunning	Cengage Learning India PvtLtd — Third Edition 2011	
2	Technician's Guide to Programmable Logic Controllers	Richard A. Cox	Delmer — Sixth Edition 2011	
3	Programmable Logic Controllers – Principle andApplications	John W. Webb	Prentice Hall	
4	Programmable Logic Controllers – ProgrammingMethods and Applications	John R Hackworth and Fredrick D. Hackworth	Pearson Education	
5	Programmable Logic Controllers	W. Bolton	Newness	
6	Programmable Controller Theory and Implementation	L.A.Bryan E.A.Bryan	An Industrial Text Company Publication – Second Edition 1997	

REFERENCE BOOKS:

S.No	Name of the Book	Author	Publisher	Edition
1	Programmable Logic Controllers	Frank D.Petruzella	Tata McGraw Hill Edition-Fourth Edition 2011	
2	Practical SCADA for industry	David Bailey Edwin Wright	Newnes	

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030513

Semester : V

Subject Title : **Elective Theory I:** RENEWABLE ENERGY SOURCES

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
RENEWABLE ENERGY SOURCES	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Fundamentals of Energy Systems and Solar Radiation	16
II	Solar Thermal Conversion and Solar PV Systems	15
III	Wind, Tidal and Wave Energy	14
IV	Bio – Energy	14
V	Geothermal and Oceanic Energy	14
Test & Model Exam		7
Total		80

RATIONALE

Electrical Energy requirement is the major crisis and hence any saving in Electrical energy is equivalent to production of Electrical Energy. Saving can be achieved by the utilization of Renewable Energy Sources.

OBJECTIVES

- Study about the fundamentals of Energy.
- Study the applications of solar energy for thermal and powergeneration.
- Understand the concept of wind, tidal and wave energies and theirapplications.
- Understand the Bio energy sources and energy conversion technologies.
- Understand the development of geothermal energy and OTEC principle.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**FUNDAMENTALS OF ENERGY SYSTEMS AND SOLAR RADIATION** 1.1. FUNDAMENTALS OF ENERGY SYSTEMS: Introduction to Energy - Energy consumption and standard of living - classification of Energy Resources-consumption trend of Primary Energy Resources-importance of Renewable Energy Sources- Energy for Sustainable Development. - Various Forms of Renewable Energy 1.2 SOLAR RADIATION: Outside Earth's Atmosphere – Earth Surface —Analysis of Solar Radiation Data — Geometry — Measurement of Solar Radiation – Solar Radiation Data in India.	**8** **8**
II	**SOLAR THERMAL CONVERSION AND SOLAR PV SYSTEMS** 2.1 SOLAR THERMAL APPLICATIONS: Solar Collectors - Flat Plate Collectors- Concentrating Collectors - Comparison of Collectors - Selection of Collector for Various Applications - Solar Water Heaters - Solar Industrial Heating System — Solar Cookers - Solar Pond Electric Power Plant. 2.2. SOLAR PV SYSTEMS: A Brief History of PV, PV in Silicon: Basic Principle, Classification of PV Cells - Equivalent Circuit and Electrical Characteristics of Silicon PV Cells — Series Parallel Connections of Solar Cells - Solar PV Array and Solar Panel - Solar Panel Applications - Grid Connected PV System – Stand Alone Solar PV Power Plant – Hybrid Solar PV System.	**7** **8**

III	**WIND, TIDAL & WAVE ENERGY** **WIND ENERGY**: Introduction-Basic Principles of Wind Energy Conversion: Nature of the Wind, Power in the Wind, Forces on the Blades and Wind Energy Conversion-Wind Data and Energy Estimation-Site Selection-Classification of Wind Energy Conversion Systems - Types of Wind Machines-Horizontal Axis Wind Turbine(HAWT) -Vertical Axis Wind Turbine(VAWT) — Comparison Between HAWT & VAWT - Generating System - Energy Storage — Applications of Wind Energy — Power Generation – Pumping Station -Safety and Environmental Aspects. **TIDAL & WAVE ENERGY:** Basic Principle of Tidal Power – Components and Operation of Tidal Power Plant – Wave Energy- Wave Energy Conversion Devices.	**10** **4**
IV	**BIO – ENERGY** **BIOMASS RESOURCES**: Introduction – Photo Synthesis – Usable Forms of Bio Mass, Their Composition and Fuel Properties - Biomass Resources. **BIOMASS ENERGY CONVERSION**: Biomass Conversion Technologies – Urban Waste to Energy Conversion – Biomass Gasification — Biomass Liquification — Biomass to Ethanol Production – Biogas Production from Waste Biomass – Types of Bio Gas Plants - Applications – Bio Diesel Production – Biomass Energy Scenario in India.	**6** **8**
V	**GEOTHERMAL AND OCEANIC ENERGY** **GEO THERMAL ENERGY**: Energy inside the Earth – Uses of Geothermal Energy – Geothermal Wells – Potential in India - Types of Geothermal Heat Pump Systems - Types of Geothermal Power Plants. **OCEANIC ENERGY**: Ocean Energy Resources – Principle of Ocean Thermal Energy Conversion (OTEC) — Method of Ocean Thermal Electric Power Generation.	**7** **7**

TEXT BOOK

S.No	Name of the Book	Author	Publisher	Edition
1	Non-Conventional Energy Sources	G.D. Rai	Khanna Publishers, New Delhi	1999

REFERENCE BOOKS

S.No	Name of the Book	Author	Publisher	Edition
1	Non-Conventional Energy Sources and Utilization	R.K. Rajput	S.Chand & Company Ltd.	2012
2	Renewable Energy Sources	Twidell J.W. and Weir A	EFN Spon Ltd.	1986
3	Non-Conventional Energy Resources	B.H.Khan	Tata Mc Graw Hill., New Delhi.	2nd Edn, 2009

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADUDIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030514

Semester : V

Subject Title : CONTROL OF ELECTRICAL MACHINES PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
CONTROL OF ELECTRICAL MACHINES PRACTICAL	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

The controlling techniques of various types of AC and DC Electrical Machines are to be practically learned to meet the present industrial requirements. The Controlling Process is mainly to be known to Diploma Engineer and become a successful Employee or Technician. This Subject will make our students with knowledge of application-oriented skills in Industrially Operated Machines.

OBJECTIVES

On completion of this practical subject the students will be able to:

- Make use of various types of control circuit elements like industrial switches, relays, timers, solenoids, contactors and inter locking arrangement.
- Construct various types of automatic starters for electrical motors.
- Construct control circuits for braking, jogging, reversing operations.
- To make use of PLCs for control applications.
- To program PLCs for controlling the motor.

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

Exercise

1. Wire and Test the Control Circuit for Jogging in Cage Induction Motor.
2. Wire and Test the Control Circuit for Semi-Automatic Star –Delta Starter.
3. Wire and Test the Control Circuit for Automatic Star –Delta Starter.
4. Wire and Test the Control Circuit for Dynamic Braking of Cage Motor.
5. Wire and Test the Control Circuit for Two Speed Pole Changing Motor.
6. Wire and Test the Control Circuit for Forward and Reverse Operation.
7. Wire and Test the Control Circuit for Automatic Rotor Resistance Starter.
8. Wire and Test the DOL Starter with Single Phase Preventer using PLC.
9. Wire and Test the Star –Delta Starter using PLC.
10. Wire and Test the Control Circuit for Automatic Rotor Resistance Starter using PLC.
11. Develop and execute the Ladder Logic Diagram in PLC for 3 Stage Lift Operation.
12. Wire and Test the Sequential Operation of Solenoid Valve and a Motor for Tank FillingOperation using PLC.

13. Develop and execute the Ladder Logic to Interface PLC with Conveyor Model for countingthe object moving in the Conveyer.
14. Wire and Test the Control Circuit for Jog Forward, Jog Reverse, Forward and ReverseOperations using PLC.

Note: The performance of control circuit is to be verified with Induction motor for the experiments 1 to 10.

DETAILED ALLOCATION OF MARKS

S.No	NAME OF ACTIVITY	MARK ALLOCATION
1.	Drawing Connection/Ladder Diagram and Writing Details of the Components/Equipment/Machines used	25
2.	Making the correct circuit connections	20
3.	Conducting the Experiment - Following the correct procedure - Verifying the operation / appropriate readings - Following the appropriate safety procedure	30
4.	Tabulation of Readings / Interpretation of Results Graphical Representation (If required)	20
5.	Viva-voce	05
	Total Marks	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S. No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	Transformer oil Tester Kit, Acidity Test kit	Each 1
2	Thermal Overload Relay	3
3	AC Contactor 230v/440v, 16A	26
4	Push Button With NO/NC Elements	30
5	Induction Motor 440 V, 1440 rpm, any HP rating (apart fromEM-II lab)	3
6	Proximity Switch	2
7	PLC (any brand) suitable for above experiments	5
8	Solenoid Valve	2
9.	Three Stage Lift Model, Conveyor Model	Each 1
10.	Forward, Reverse and Jogging (Forward and Reverse) Operation Model	1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics

Subject Code : 4030515

Semester : V Semester

Subject Title : PROGRAMMABLE LOGIC CONTROLLER PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
PROGRAMMABLE LOGIC CONTROLLER PRACTICAL	5	80	25	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

Various control operations are to be performed automatically and sequentially on the electrical machines to suit the industrial requirements. Programmable controllers are mainly employed to control the process in industries. In order to train our students on handling of programmable controllers this practical subject is introduced.

OBJECTIVE

On completion of this practical subject the students will be able to

- Develop ladder logic for different types of starters.
- Develop ladder logic for EB to Generator changeover.
- Develop ladder logic for Automatic load transfer.
- Develop ladder logic for sequential control process like water filling, fire alarm and conveyor sorting etc.,
- To program PLCs for controlling Heater and motors.

DETAILED SYLLABUS

PROGRAMMABLE LOGIC CONTROLLER PRACTICAL

LIST OF EXPERIMENTS

1. Interfacing of Limit switch, Reed switch and Proximity switch with PLC.
2. DOL starter with single phase prevention.
3. EB to Generator Change over switch implementation with interlocking
4. Star Delta starter
    a. Single phasing prevention
    b. Adjustable star-delta transfer time
    c. Pre-settable overload trip time
5. Automatic load transfer
    a. Transfers load from one phase to another when one phase in a three-phase system fails
    b. Automatically restores when power is resumed
    c. Time delays are affected to prevent action during short time failure
6. Fill the water in water tank and maintain the water level.
    a. When water level comes below lower-level switch ON the pump
    b. When water level reaches the high level switch OFF the pump
    c. Include manual switch to operate the pump at any level of water.

7. Fire alarm
    a. Multiple alarms
    b. Sound alarm
    c. If not acknowledged, Sound alarms 1 and 2
    d. Similarly go up to 4 alarm conveyor belt sorting
8. Three floor Lift control
9. Traffic light control
10. Automatic operation of double acting pneumatic cylinder – Multi cycle
11. Sequential operation of two Double Acting Cylinders for the sequence A+,B+,B-,A-
12. Analog input to PLC as a set of valves for a comparator function block
    -The input is multilevel illumination control. The input is setting is by means of a potentiometer in an analog input to the PLC. The outputs turn on several groups of lamps to obtain desired level illumination.
13. Heater control with PID function of the PLC
    - A 1000 W water heater is controlled using the PID function of the PLC. The temperature transducer is a temperature transmitter with 4 to 20 mA output and Pt 100 Probe.
14. Round table liquid filling system
    - Dropping of Reagents into test tubes. The feedback is from potentiometer. The program must ensure that the end limits of the pot are never reached by carefully balancing the clockwise and anti- clockwise revolution.
15. Slow speed motor control using PWM function of the PLC
    - Slow speed 12V DC 18W permanent magnet motor with fly wheel is controlled with the PWM output and feedback from a low-resolution encoder.

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	PLCs suitable to conduct above Experiments	3
2	Limit Switch	1
3	Reed Switch	1
4	Inductive Proximity Sensor	1
5	Capacitive Proximity Sensor	1
6	PC (or) Laptop	3

DETAILED ALLOCATION OF MARKS

S.No.	NAME OF THE ACTIVITY	MARKS ALLOCATED
1.	Drawing Connection/Ladder Diagram and Writing Details of the Components/Equipments/Machines used	20
2.	Making the correct circuit connections	25
3.	Conducting the Experiment - Following the correct procedure - Verifying the operation / appropriate readings - Following the appropriate safety procedure	30
4.	Tabulation of Readings / Interpretation of Results Graphical Representation (If required)	20
5.	Viva-Voce	05
	Total Marks	**100**

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Electrical and Electronics Engineering
Subject Code : 4030516
Semester : V
Subject Title : Elective Practical – I: Renewable Energy Sources Practical

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	M			Duration
			Internal Assessment	Board Examinations	Total	
RENEWABLE ENERGY SOURCES PRACTICAL	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 M and it will be reduced to 75 M.**

RATIONALE

Modern world aims to tap and utilize the Renewable Energy Sources as they are available almost at free of cost and eco-friendly nature. Our government also promotes the utilization of Renewable Energy Sources in full mind.

OBJECTIVES

- To measure the Solar Radiation
- To study the I-V and P-V Characteristics of PV Modules
- To measure Power flow of standalone PV System
- To study the Solar Thermal Equipments

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DETAILED SYLLABUS

Contents: Practical

Name of the topic	Exp. No	Experiment
Solar PV Module	1	Measurement of Solar Radiation
	2	I-V and P-V Characteristics of PV Module
	3	I-V and P-V Characteristics of PV Modules in Series
	4	I-V and P-V Characteristics of PV Modules in Parallel
	5	Effect of Tilt Angle on PV Module power
	6	Effect of shading on output of Solar Panel
	7	Working of Blocking Diode
Power flow calculation	8	Power flow calculation of standalone PV System for AC Load
	9	Power flow calculation of standalone PV system for DC Load
	10	Calculation of Maximum Power Point
Solar Thermal conversion	11	Direct type Solar Dryer
	12	Indirect type Solar Dryer
	13	Solar Water Heater
	14	Solar Cooker
	15	Solar Air Heater
Wind mill	16	Demo model of Wind Mill

DETAILED ALLOCATION OF MARKS

S.No.	Name of the Activity	Marks Allocation
1	Procedure	**25**
2	Sketches/Circuit diagram	**25**
3	Tabulation	**15**
4	Calculation/graph	**15**
5	Result	**15**
6	Viva – voce	**05**
	TOTAL	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

Ex. No	Equipments	Quantity
1	Solar panel PV Training Kit	6
2	Infra-red Thermometer	1
3	Lux Meter	2
4	Solar Power Meter	1
5	Solar Panel 100 Watts (Mono -1, Poly – 2)	3
6	Inverter (PWM, MPPT – 1 no. Each)	2
7	Battery 12V, 13 AH	1
8	Charge Controller 12V/10A	2
9	MC Voltmeter (0 – 100V)	6
10	MC Ammeter (0 – 15A)	6
11	AC/DC Digital Tong Tester	2
12	Rheostat 50 Ohm	1

13	Direct type Solar Dryer Kit	1
14	Indirect type Solar Dryer Kit	1
15	Solar Water Heater Kit	1
16	Solar Cooker Kit	1
17	Solar Air Heater Kit	1
18	Model Wind Mill	1

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030540

Semester : V Semester

Subject Title : COMPUTER AIDED ELECTRICAL DRAWING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
COMPUTER AIDED ELECTRICAL DRAWING PRACTICAL	4	64	25	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

This subject is introduced in order to impart skill of making Computer Aided Electrical Drawing.

OBJECTIVES

At the end of the semester the students must be able to draw:

- 2D Diagrams using Auto CAD
- Symbols widely used in Electrical and Electronics Circuits
- Single Line Diagram of different types of Panels.
- Single Line Diagrams of Substation Layout.
- Winding Diagrams
- Line Diagram of Distribution Panels

DETAILED SYLLABUS

PART-A

ELECTRICAL SYMBOLS-DRAWING (5*2=10)

1. Draw the symbols for Components: Resistor, Capacitor, Inductor, Diode, Transistor, FET, SCR, UJT, TRIAC, DIAC, and Gates AND, OR, NOT, NAND, NOR, EXOR.
2. Draw the Symbols used in Electrical Wiring: Relays, Contactors, Fuses, Main Switch, Electric Bell, Earth, DPST, DPDT, TPST, and Neutral Link.
3. Draw the Symbols for Instruments: Ammeter, Voltmeter, Wattmeter, Energy Meter, Frequency Meter, Power Factor Meter, Timer and Buzzers.
4. Draw the Symbols for Machines: Armatures, Alternators, Field winding (Shunt, Series and Compound) Transformer and Autotransformer.

PART-B

(1*60=60)

ELECTRICAL CONNECTION DIAGRAMS- DRAWING

1. Draw the Single Line Diagram of Single Phase MCB Distribution Board.
2. Draw the Single Line Diagram of Three Phase MCB Distribution Board.
3. Draw the Single Line Diagram of typical MV Panel.
4. Draw the Single Line Diagram of Motor Control Centre (MCC) Panel.
5. Draw the Single Line Diagram of Fire Alarm Riser Arrangement in Multi-Storey Building.
6. Draw the Single Line Diagram of Intercom Arrangement in Multi Storey Building.
7. Draw the Front-End Schematic Diagram of typical Sub Switch Board (SSB).
8. Draw the Winding Diagram of Lap Connected DC Armature withCommutators Connections and Brush Positions.
9. Draw the Control and Main Circuit of Automatic Star Delta Starter.
10. Draw the Mush Winding Diagram of a Three Phase Induction Motor.
11. Draw the Concentric Winding Diagram of a Single-Phase Induction Motor.

NOTE FOR EXAMINERS

1. Five symbols should be asked from part A exercise 1to 4 with at least onefrom each.
2. One sketch should be asked from part B exercise 1 to 13.
3. Printed output of the given symbols and sketch is to be evaluated

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No	NAME OF THE EQUIPMENT	QUANTITY REQUIRED
1.	PC – Pentium Dual Core	30
2.	Electrical CAD Software multi user	01
3.	UPS – 5KVA with half an hour batterybackup	01

ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1.	SYMBOLS IN CAD	20
2.	MANUAL DRAWING OF ELECTRICAL CONNECTIONDIAGRAM	20
3.	ELECTRICAL CONNECTION DIAGRAM IN CAD	40
4.	PRINT OUT	15
5.	VIVA VOCE	05
	Total	**100**

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be Implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject Code : 4040550

Semester : V

Subject Title : MICROCONTROLLER PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
MICROCONTROLLER PRACTICAL	**4**	**64**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

The introduction of this subject will enable the students to have hands on experience in using 8051 trainer kits. The students are exposed to learn simple programs using assembly language. They can also get familiar with the C compiler platform. They also gain knowledge by using application specific interfacing boards.

OBJECTIVES:

The students are able to

-> Understand the use of instruction set by writing and executing simple ALP.

-> Know the connection details between microcontroller and peripherals.

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DETAILED SYLLABUS

Contents: Practical

Exercises

Part A

The following experiments should be written using 8051 assembly language program and should be executed in the 8051-Microcontroller trainer kit.

1. 8 / 16 bit addition
2. 8 / 16 bit subtraction
3. 8 bit multiplication
4. 8 bit division
5. BCD to Hex code conversion
6. Hex to BCD code conversion
7. Smallest / Biggest number
8. Time delay routine (Demonstrate by Blinking LEDS).
9. Using Timer/ counter of 8051

Part B (Interfacing Application Boards)

The following experiments can be written using C compiler or 8051 assembly language and to be executed.

10. Interfacing Digital I/O board
11. Interfacing DAC
12. Interfacing Stepper motor
13. Interfacing Seven segment LED display or LCD
14. Sending data through the serial port between microcontroller kits
15. Interfacing DC motor using PWM.

BOARD EXAMINATION

Note:

1.Students are provided with Hex code sheet for manual hand assembly.

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1.	ALGORITHM OR FLOW CHART	20
2.	PROGRAM	30
3.	EXECUTION	30
4.	RESULT	10
5.	VIVA VOCE	10
	Total	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No.	Name of the Equipments	Required No.s
1	8051 Microcontroller Kit	14
2	Digital I/O Interface Board	2
3	Seven Segment LED Display Interface Board	2
4	8 Bit DAC Interface Board	2
5	Stepper Motor Control Interface Board	2
6	DC Motor Control Interface Board	2
7	RS 232 Serial Port Cable	2
8	LCD Interface Board	2
9	Laptop / Desktop Computer	6

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic Year 2020-2021 onwards)

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

Subject Code : 4040570

Semester : V

Subject Title : ENTREPRENERUSHIP AND STARTUPS

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ENTREPRENEURSHIP AND STARTUPS	**4**	**64**	**25**	**75**	**100**	**3 Hrs**

Topics and Allocation of Hours

UNIT	Topic	Hours
I	Entrepreneurship – Introduction and Process	10
II	Business Idea and Banking	10
III	Startups, E-cell and Success Stories	10
IV	Pricing and Cost Analysis	10
V	Business Plan Preparation	10
Revision, Field visit and Preparation of case study report		14
Total		64

RATIONALE:

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and startups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

OBJECTIVES:

At the end of the study of 5th semester the students will be able to

- To excite the students about entrepreneurship
- Acquiring Entrepreneurial spirit and resourcefulness
- Understanding the concept and process of entrepreneurship
- Acquiring entrepreneurial quality, competency and motivation
- Learning the process and skills of creation and management of entrepreneurial venture
- Familiarization with various uses of human resource for earning dignified means of living
- Know its contribution in and role in the growth and development of individual and the nation
- Understand the formation of E-cell
- Survey and analyze the market to understand customer needs
- Understand the importance of generation of ideas and product selection
- Learn the preparation of project feasibility report
- Understand the importance of sales and turnover
- Familiarization of various financial and non-financial schemes
- Aware the concept of incubation and starts ups

DETAILED SYLLABUS

Unit	Name of the Topics	Hours
I	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** ● Concept, Functions and Importance ● Myths about Entrepreneurship ● Pros and Cons of Entrepreneurship ● Process of Entrepreneurship ● Benefits of Entrepreneur ● Competencies and Characteristics ● Ethical Entrepreneurship ● Entrepreneurial Values and Attitudes ● Motivation ● Creativity ● Innovation ● Entrepreneurs - as problem solvers ● Mindset of an employee and an entrepreneur ● Business Failure – causes and remedies ● Role of Networking in entrepreneurship	**10**
II	**BUSINESS IDEA AND BANKING** ● Types of Business: Manufacturing, Trading and Services ● Stakeholders: Sellers, Vendors and Consumers ● E- Commerce Business Models ● Types of Resources - Human, Capital and Entrepreneurial tools ● Goals of Business and Goal Setting ● Patent, copyright and Intellectual Property Rights ● Negotiations - Importance and methods ● Customer Relations and Vendor Management ● Size and Capital based classification of business enterprises ● Role of Financial Institutions ● Role of Government policy ● Entrepreneurial support systems	**10**

	● Incentive schemes for State Government ● Incentive schemes for Central Government	
III	**STARTUPS, E-CELL AND SUCCESS STORIES** ● Concept of Incubation center's ● Activities of DIC, financial institutions and other relevance institutions ● Success stories of Indian and global business legends ● Field Visit to MSME's ● Various sources of Information ● Learn to earn ● Startup and its stages ● Role of Technology – E-commerce and social media ● Role of E-Cell ● E-Cell to Entrepreneurship	**10**
IV	**PRICING AND COST ANALYSIS** ● Calculation of Unit of Sale, Unit Price and Unit Cost ● Types of Costs - Variable and Fixed, Operational Costs ● Break Even Analysis ● Understand the meaning and concept of the term Cash Inflow and Cash Outflow ● Prepare a Cash Flow Projection ● Pricing and Factors affecting pricing ● Understand the importance and preparation of Income Statement ● Launch Strategies after pricing and proof of concept ● Branding - Business name, logo, tag line ● Promotion strategy	**10**
V	**BUSINESS PLAN PREPARATION** ● Generation of Ideas, ● Business Ideas vs. Business Opportunities ● Selecting the Right Opportunity ● Product selection ● New product development and analysis	**10**

	• Feasibility Study Report – Technical analysis, financial analysis and commercial analysis • Market Research - Concept, Importance and Process • Marketing and Sales strategy • Digital marketing • Social Entrepreneurship • Risk Taking-Concept • Types of business risks	

TEXT BOOKS:

1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra - 282002
2. Dr. G.K. Varshney, Business Regulatory Framework, Sahitya Bhawan Publications, Agra – 282002

REFERNCE BOOKS:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill (India) Private Limited, Noida - 201301
2. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small business management, Pearson Education India, Noida - 201301
3. Charantimath Poornima M. Entrepreneurship Development and Small Business Enterprises, Pearson Education, Noida - 201301
4. Trott, Innovation Management and New Product Development, Pearson Education, Noida - 201301
5. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing House Pvt. Ltd., New Delhi-110044
6. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited, New Delhi
7. I. V. Trivedi, Renu Jatana, Indian Banking System, RBSA Publishers, Rajasthan
8. Simon Daniel, HOW TO START A BUSINESS IN INDIA, BUUKS, Chennai - 600018
9. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioner’s guide to writing the Business Plan, Notion Press Media Pvt. Ltd., Chennai 600095.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030610

Semester :VI

Subject Title : Distribution and Utilization

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
DISTRIBUTION AND UTILIZATION	6	96	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Distribution	20
II	Industrial Drives	18
III	Electric Traction	17
IV	Illumination	17
V	Electric Heating and Welding	17
Test & Model Exam		7
Total		96

RATIONALE

Electrical Energy requirement is the major crisis and hence any saving in Electrical energy is equivalent to production of Electrical Energy. Saving can be achieved by the utilization of Renewable Energy Sources.

OBJECTIVES

At the end of the Semester, Students will be able to understand the concepts of :

- Substation arrangements.
- Distribution of Power.
- Industrial Drives - Suitability for different applications.
- Track Electrification-Traction Mechanics – Traction Motor Controls
- Illumination – Design of Lighting Schemes – Sources of Light.
- Electric Heating – Methods – Electric Furnace – Temperature Control.
- Electric Welding and Welding Equipments.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**DISTRIBUTION** **1.1. Substation:** Introduction-Sub Stations-Classification of Sub Stations-Indoor and Outdoor S.S — Gas Insulated S.S-Comparisons-Layout 110/11KV Substation and 11KV/400V Distribution Substation-Substation Equipments-Bus Bar- Types of Bus Bar Arrangement -Advantages and Disadvantages. **1.2 Distribution:** Distribution System-Requirements of a Distribution System-Part of Distribution System- Classification of Distribution Systems-Comparison of Different Distribution Systems (A.C And D.C) -A.C Distribution -Types-Connection Schemes of Distribution System-A. C Distribution Calculations-Calculation of Voltage At Load Points on Single Phase Distribution Systems (With Concentrated Load Only)- Distribution Fed At One End, Both Ends and Ring Mains-Problems- Three Phase, Four Wire, Star Connected Unbalanced Load Circuit-Problems- Consequence of Disconnection of Neutral in Three Phase Four Wire System (Illustration with an Example)	**8** **12**
II	**INDUSTRIAL DRIVES** Introduction to Electric Drive – Advantages of Electric Drives – Transmission of Power-Types of Electric Drives-Individual, Group and Multi Motor Drives — Advantages and Disadvantages of Individual And Group Drive -Factors Governing The Selection of Motors-Nature and Classification of Load Torque-Matching of Speed Torque Characteristics of Load and Motor-Standard Ratings of Motor- Classes of Load Duty Cycles -Selection of Motors for Different Duty Cycles-Selection of Motors for Specific Application-Braking- Features of Good Braking System- Types of Braking - Advantages of Electric Braking - Plugging, Dynamic	**18**

	and Regenerative Braking - As Applied to Various Motors.	
III	**ELECTRIC TRACTION** Introduction To Traction Systems - Advantages and Disadvantages of Electric Traction. System of Track Electrification - Methods of Supplying Power-Rail Connected System and Over Head System-O.H. Equipments-Contact Wire, Centenary and Droppers — Current Collection Gear for OHE —Bow and Pantograph Collector-Different Systems of Track Electrification-Advantages of Single Phase Low Frequency A. C. System- Booster Transformer-Necessity- Methods of Connecting B.T-Neutral Sectioning. **Traction Mechanics:** Units and Notations used in Traction Mechanics-Speed Time Curve for Different Services - Simplified Speed Time Curve-Derivation of Maximum Speed-Crest Speed, Average Speed, Schedule Speed (Definitions Only)-Tractive Effort and Power Requirement- Specific Energy Output-Specific Energy Consumption - Traction Motors and Control: Desirable Characteristics of Traction Motors-Motors used for Traction Purpose-Methods of Starting and Speed Control of D.C Traction Motors- Rheostatic Control-Energy Saving with Plain Rheostatic Control Series- Parallel Control- Energy Saving with Series Parallel Starting - Shunt Transition -Bridge- Transition-Multiple Unit Control –Regenerative Braking. Recent Trends in Electric Traction-Magnetic Levitation (MEGLEV) — Suspension Systems.	**8** **9**

IV	**ILLUMINATION** Introduction - Definition and Units of Different Terms used in Illumination-Plane Angle, Solids Angle, Light, Luminous Flux, Luminous Intensity, Luminous Efficacy Candle Power, Lumen, Illumination, M.S.C.P, M.H.C.P, M.H.S.C.P- Reduction Factor, Luminance, Glare Lamp Efficiency. Space-Height Ratio, Depreciation Factor Utilization Factor, Waste Light Factor, Absorption Factor, Beam Factor, Reflection Factor. Requirements of Good Lighting System- Laws of Illumination-Problems. Types of Lighting Scheme- Factors to be Considered while Designing Lighting Scheme- Design of Lighting Scheme (Indoor and Outdoor)- Problems- Lighting Systems- Factory Lighting, Flood Lighting, Street Lighting. **Sources of Light:** Arc Lamp, Incandescent Lamp, HalogenLamp, Sodium Vapour Lamp, High Pressure Mercury Vapour Lamp, Fluorescent Tube –Induction Lamp- Energy Saving Lamps (C.F.L And L.E.D Lamps)-Limitation and Disposal Of C.F.L-Benefits of Led Lamps-Comparison of Lumen Output for LED, CFL and Incandescent Lamp **Earthing and Maintenance of Lighting:** Fluorescent Lamp Disposal – Precautions in erecting lighting installations – Symptoms to identify the end of the useful life of lamp – Causes for lowering the illumination level.	**8** **9**

V	**ELECTRIC HEATING AND WELDING** **Electric Heating:** Introduction – Advantages of Electric Heating – Modes of Heat Transfer - Classification of Electric Heating - Power Frequency Electric Heating — Direct and Indirect Resistance Heating-Infrared Heating-Arc Heating –High Frequency Electric Heating – Induction Heating-Induction Stove –Eddy Current Heating and Dielectric Heating. **Electric Furnaces:** Resistance Furnace-Requirements of Heating Elements-Commonly used Heating Element Materials-Resistance Furnace for Special Purposes-Temperature Control of Resistance Furnace-Arc Furnace -Direct and Indirect Arc Furnace- Temperature Control of Arc Furnace-Reasons for Employing Low Voltage and High Current Supply - Induction Furnace-Direct and Indirect Core Type Induction Furnace-Coreless Induction Furnace-Power Supply for Coreless Induction Furnace. **Electric Welding:** Introduction-Types of Electric Welding-Requirements of Good Weld- Preparation of Work -Resistance Welding- Butt Welding, Spot Welding, Seam Welding, Projection Welding and Flash Welding-Arc Welding-Carbon Arc Welding, Metal Arc Welding, Atomic Hydrogen Arc Welding, Inert Gas Metal Arc Welding- Comparison between Resistance and Arc Welding. Radiation Welding - Ultrasonic Welding, Electron Beam Welding, Laser Beam Welding-Electric Welding Equipments (A.C. And D.C).	**5** **6** **6**

TEXT BOOK

S.No	Name of the Book	Author	Publisher	Edition
1	A Course in Electrical Power	Soni&Gupta	Dhanpat Rai& Sons, New Delhi	

REFERENCE BOOKS

S.No	Name of the Book	Author	Publisher	Edition
1	Electric Power	SL Uppal	Khanna Publishers, New Delhi	
2	Modern Electric Traction	H Partab	Dhanpat Rai & sons, New Delhi	
3	Electrical Power Distribution System	AS Pabla	Tata McGraw Hill Publishing Co, New Delhi	
4	Utilization of Electric Power	NV Suryanarayana	Tata McGraw Hill Publishing Co, New Delhi	

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030630

Semester : IV

Subject Title : Energy Conservation and Audit

TEACHING AND SCHEME OF EXAMINATION

No of weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ENERGY CONSERVATION AND AUDIT	**4**	**64**	**25**	**100***	**100**	**3 Hrs.**

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Energy Conservation and its Importance	11
II	Energy Conservation in Electrical Machines	11
III	Energy Conservation in Electrical Installation Systems	11
IV	Energy Audit and Instruments	12
V	Energy Costs and Energy Audit Report	12
	Test & Model Exam	7
	Total	**64**

RATIONALE

Energy conservation is the effort made to reduce the consumption of energy by using less of an energy service. Energy can be conserved by reducing wastage and losses, improving efficiency through technological upgrades and improved operation and maintenance. Energy Audit is the key to a systematic approach for decision-making in the area of energy management. The effective use of energy to maximize profits (minimize costs) and enhance competitive positions, it is necessary to conserve energy. Hence it is necessary to study energy auditing methods and energy saving opportunities in electrical system.

OBJECTIVES

At the end of the Semester, Students will be able to:

- ✓ Explain necessity and importance of Energy Conservation
- ✓ Explain the goal with energy conservation techniques is to reducedemand, protect supplies, develop and use Alternative Energy Sources.
- ✓ Explain the energy efficient technologies in Electrical System
- ✓ Explain the Periodic maintenance of Electrical Systems.
- ✓ Explain Technical losses and commercial losses in installation Systems.
- ✓ Explain How to product output or to lower operating costs.
- ✓ Discuss about Energy Conservation Equipment
- ✓ Explain Energy Conservation in Lighting System
- ✓ Identify where and how energy and factors affecting consumptionconsumed.
- ✓ Explain Energy Costs.
- ✓ Explain how to Detect and improving energy Efficiency.
- ✓ Explain the concept and types of Energy of Energy Audit.
- ✓ Explain the importance of Energy Audit.
- ✓ List the Instruments for Audit and Monitoring Energy and Energy Savings
- ✓ Explain Energy cost in Indian Scenario.
- ✓ Draw the Energy Audit Report Format

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**ENERGY CONSERVATION AND ITS IMPORTANCE** Definition - Need for and importance of Energy Conservation - Primary and Secondary Energy - Energy Demand and Supply - Energy Conservation in Household, Industries and Community Level - Energy for sustainable Development - Energy Conservation in India - Energy Conservation Approaches – Safe working of Electrical Equipments and Electrical Safety. Energy Conservation Techniques - Principles of Energy Conservation Methods - Difference between Energy conservation and Energy audit - Relevant clauses of Energy Conservation - BEE and its Roles - MEDA and its Roles - Energy Audit in Energy Conservation Star Labelling: Need and its benefits – Role of Tamilnadu Energy Development Agency (TEDA) – Introduction to ISO 50001 – Energy Audit Certificate.	**5** **6**
II	**ENERGY CONSERVATION IN ELECTRICAL MACHINES** Need for Energy Conservation in Induction Motor and Transformer - Methods of Energy Conservation in Induction Motor - Energy Saving Opportunities with Energy Efficient Motors - Energy Conservation Techniques in Induction Motor By: Improving Power Quality -Variation in Efficiency and Power Factor with Loading Motor Survey Matching Motor Rating with Load - Minimizing the Idle and Redundant Running of Motor Operating in Star Mode -Rewinding of Motor - Replacement by Energy Efficient Motor Periodic Maintenance Energy Conservation Techniques in Transformer. Loading Sharing Parallel Operation Isolating Techniques. Replacement by Energy Efficient Transformers - Periodic Maintenance - Energy Conservation Equipment: Soft Starters, Automatic Star Delta Convertor, Variable Frequency Drives, Automatic P. F. Controller (APFC), Intelligent P. F. Controller (IPFC)Energy Efficient Motor; Significant Features, Advantages, Applications and Limitations.	**6** **5**

III	**ENERGY CONSERVATION IN ELECTRICAL INSTALLATIONSYSTEMS** Aggregated Technical and commercial losses (ATC); Power system at state, regional, national and global level. Technical losses; causes and measures to reduce by - Controlling I2R losses. Optimizing distribution voltage. Balancing phase currents Compensating reactive power flow Commercial losses: pilferage causes and remedies. Energy conservation equipment: Maximum Demand Controller, KVAR Controller, Automatic Power Factor controller (APFC) Energy Conservation in Lighting System Replacing Lamp sources. Using energy efficient luminaries. Using light-controlled gears. Installation of separate transformer / servo stabilizer for lighting. Periodic survey and adequate maintenance programs. Energy Conservation techniques in fans, electronic regulators.	6 5
IV	**ENERGY AUDIT AND INSTRUMENTS** Definition, objective and principles of Energy Management, Need of Energy Audit and Management, types of Energy Audit, Audit Process, Energy Audit of Building System, Lighting System, HVAC System, Water Heating System, Heat Recovery opportunities during Energy Audit, Industrial Audit Opportunities. Energy Flow Diagram (Sankey Diagram) Simple Payback Period, Energy Audit Procedure (walk through audit and detailed audit) Instruments for Audit and Monitoring Energy and Energy Savings Energy Audit Instruments - Basic Measurements — Electrical Measurements, Light, Pressure, Temperature and Heat Flux, Velocity and Flow Rate, Vibrations, etc. Instruments Used in Energy systems: Load and Power Factor Measuring Equipments, Wattmeter, Flue Gas Analysis, Temperature and Thermal Loss Measurements, Air Quality Analysis etc.	6 6

V	**ENERGY COSTS AND ENERGY AUDIT REPORT** Understanding Energy Costs Energy Cost in Indian Scenario - Co-generation and Tariff - Concept, Significance for Energy Conservation - Co-generation - Types of Cogenerations on basis of sequence of Energy use (Topping cycle, bottoming cycle) - Types of Co-generation basis of Technology (Steam Turbine Co-generation, Gas Turbine Co-generation, Reciprocating Engine Co-generation) Factors governing the selection of Co-generation System. Advantages of Co-generation - Tariff: Types of Tariff Structure: Special Tariffs; Time-Off-Day Tariff, Peak-Off-Day Tariff, Power Factor Tariff, Maximum Demand Tariff, Load Factor Tariff - Application of Tariff System to reduce Energy bill. Benchmarking and Energy Performance - Energy Audit Report Format - Guidelines for writing Energy Audit Report - Data presentation in Report.	6 6

TEXT BOOKS:

1. "M A Chaudhari, S M Chaudhari & S A Asarkar ", "Energy Conservation & Audit ", "Nirali Prakashan" Publication.

2. "Y. B. Mandake", "Pankaj Mohan", "Dr. D.B. Talange" Energy Conservation and Audit, "Tech – Neo" Publications.

REFERENCE BOOKS

1. "Er. Udit Mamodiya" "Electrical Energy Conservation & Auditing", Ashirwad Publication.

2. O.P. Gupta, "Energy Technology", Khanna Publishing House, New Delhi

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030621

Semester : VI

Subject Title : Elective Theory – II - POWER ELECTRONICS

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
POWER ELECTRONICS	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Thyristor Family, Trigger and Commutation Circuits	13
II	Phase Controlled Rectifiers	15
III	Choppers and Inverters	15
IV	Control of DC Drives	15
V	Control of AC Drives	15
Test & Model Exam		7
Total		**80**

RATIONALE

Developments in Electronics have their own impact in other fields of Engineering. Today all the Controls and Drives for the Electrical Machines are formed by Electronic Components and there are many Electronic Devices available to handle Eclectic Power in terms Kilo-Amps and Kilo-Volts. This subject gives a comprehensive knowledge base about the devices and circuits used in Electrical Power Control.

OBJECTIVES

On completion of these units, the student should be able to:

- Explain the scope and application of Power Electronics
- Explain the operating region and working of Thyristor family devices.
- Explain and state the application for Commutation Circuits and Trigger Circuits of SCR.
- Familiarize the Phase Controlled Rectifier for different kinds of Loads.
- Study the complete protection of Converter Circuits.
- Understand the working and applications of different types of Choppers and Inverters.
- Understand the application of Power Electronics devices as UPS, SMPS.
- Understand the control of DC Drives.
- Know the various methods of Speed Control of DC Drives.
- Familiarize the Control of AC Drives.
- Study the Speed Control of Three Phase Induction Motor using PWM and Slip Power Recovery Scheme.
- Understand the Closed Loop Control of DC Drive and AC Drive.
- Know the operation of Single Phase and Three Phase Cyclo Converter.
- Study the need of Microcomputer Based Motor Control.

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DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**THYRISTOR FAMILY, TRIGGER AND COMMUTATION CIRCUITS** Thyristor Family (Review) –SCS, SUS, SBS, LASCR and GTO. Symbol, Circuit, Working, Characteristics and Applications - UJT, SCR, DIAC, TRIAC, IGBT, GTO and MOSFET. Gate Triggering Circuits — Requirements, Types. Circuit, working of — R, RC, Synchronized UJT Triggering Circuits. Pulse Transformer in Trigger Circuits —— IC based Advance Triggering Circuits for SCR & TRIAC (Using IC TCA 785) - Driver and Power circuits for Thyristor. Commutation Circuits – SCR Turn Off Methods – Natural Commutation – Forced Commutation – Class A, Class B, Class C, Class D, Class E and Class F. SCR rating and their importance.	7 6
II	**PHASE CONTROLLED RECTIFIERS** Introduction — Phase Controlled Rectifiers. Circuit Diagram, Working and Waveform - Half Wave, Full Wave Controlled Rectifier with Resistive, Inductive Loads and Free Wheeling Diode - Single Phase Fully Controlled Bridge, Single Phase Dual Converter with R Load, RL Load - Single Phase Semi Converter with Continuous and Discontinuous Load Current. AC – AC Converter. Three Phase Half Controlled Bridge, Fully Controlled Bridge with RL Load - Complete Protection of Thyristors against Surge Current, Surge Voltage, Dv/Dt, Di/Dt Protection.	8 7

III	**CHOPPERS AND INVERTERS** **Choppers** — Introduction, Principle of Chopper Operation. Control Strategies — Constant Frequency System and Variable Frequency System. Chopper Circuit Classification — Step Up Chopper, Step Down Chopper, Voltage, Current, Load Commutated Chopper, Fist Quadrant, Second Quadrant, Two Quadrant and Four Quadrant Choppers. Circuit Diagram, Working and Waveform – Step Up Chopper, Morgan Chopper, Jones Chopper. Applications of Choppers – SMPS	8
	Inverters – Introduction, Classification of Inverter. Circuit Diagram, Working and Waveform Parallel Inverter, Half Bridge Inverter, Full Bridge Inverter, Modified MC Murray Full Bridge Inverter, MC Murray Bedford Full Bridge Inverter.	3
	Three Phase Bridge Inverter Under 180° Mode,120° Mode Operations - Pulse Width Modulated Inverters, (Single Pulse, Multiple Pulse, Sinusoidal Pulse) Applications of Inverters — UPS - Online, Offline.	4
IV	**CONTROL OF DC DRIVES** Introduction — DC Drive. Basic DC Motor Speed Equation — Operating Region, Armature Voltage Control, Field Current Control, Constant Torque and Constant HP Regions - Circuit Diagram, Output Waveforms and Output Equation of — Separately Excited DC Motor in — A) Single Phase Full Converter Drives B) Single Phase Dual Converter Drives C)Three Phase Semi Converter Drives.	7
	DC Chopper for Series Motor Drive – Four Quadrant Control of DC Motor — DC to DC Converter using MOSFET and IGBT - Block Diagram, Explanations of Closed Loop Control of DC Drives, Phase Locked Loop Control of DC Drives - Microprocessor Based Closed Loop Control of DC Drives.	8

V	**CONTROL OF AC DRIVES** Introduction AC Drive - Torque Speed Characteristics of Three Phase Induction Motor, Speed Control of Induction Motor, Stator Voltage Control, Variable Frequency Control, Necessity of Maintaining V/F Ratio. Rotor Resistance Control Inverters for Variable Voltage and Variable Frequency Control -Static VAR Compensation. Speed Control by Rotor Resistance for Slip Ring Induction Motors — Static Scherbius Drive (Slip Power Recovery Scheme) - Closed Loop Control of AC Drive Block Diagram — Micro Computer based PWM Control of Induction Motor – Introduction to Cyclo Converter with Simple Circuit – Single Phase and Three Phase.	8 7

TEXT BOOKS

S. No.	Author	Title	Publication	Edition
1	MD Singh, KB Khanchandani	Power Electronics	McGraw Hill Publishing CompanyNew Delhi	Third reprint 2008

REFERENCE BOOKS

S. No.	Author	Title	Publication	Edition
1.	Mohammed H.Rashid	Power Electronics	New Age Publication.	Third Edition,2004
2.	Mohan, Undeland, Robbins.	Power Electronics	Wiley India Edition.	Media Enhanced Third Edition
3.	Dr.P.S.Bimbhra	Power Electronics	Khanna Publishers.	Fourth Edition, 2011.
4.	M.S.Jamil Asghar	Power Electronics	PHI Learning Private Limited	Eastern Economy Edition, 2010

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030622

Semester : VI

Subject Title : ELECTIVE THEORY - II: BIO MEDICAL NSTRUMENTATION

TEACHING AND SCHEME OF EXAMINATION

Number of Weeks per Semester: 16 weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours / Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
BIO MEDICAL INSTRUMENTATION	5	80	25	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

TOPICS AND ALLOCATION

Unit	Topic	Hours
I	Bio - Electric Signals, Electrodes and Clinical Measurement	13
II	Bio - Medical Recorders	15
III	Therapeutic Instruments	15
IV	Biotelemetry and Patient Safety	15
V	Modern Imaging Techniques	15
VI	Revision & Test	07
	TOTAL	80

RATIONALE

Bio Medical Engineering Education is in the growing stage. But every year, there is a tremendous increase in the use of Modern Medical Equipment in the Hospital and Health Care Industry therefore it is necessary for every Student to understand the functioning of various Medical Equipments. This Subject to enable the students to learn the basic principles of different Biomedical Instruments viz Clinical Measurement, Bio - Medical Recorders, Therapeutic Instruments, Biotelemetry and Modern Imaging Techniques Instruments.

OBJECTIVES

After learning this subject, the student will be able to understand the about:

- The generation of Bio-Potential and its measurement using various Electrodes.
- The measurement of Blood Pressure.
- The measurement of Lung Volume.
- The measurement of Respiration Rate.
- The measurement of Body Temperature and Skin Temperature.
- The principles of operations of ECG Recorder.
- The principles of operations of EEG Recorder.
- The principles of operations of ENG Recorder.
- The working principles of Audio Meter.
- The principles of operations of Pacemaker.
- The basic principle of Dialysis.
- The basic principle of Short-Wave Diathermy.
- The basic principle of Ventilators.
- The working principles of Telemetry.
- The basic principle of Telemedicine.
- To learn about Patient Safety.
- The various methods of Accident Prevention.
- The basic principle of various types of Lasers.
- The basic principle of CT and MRI Scanner.
- The principle of operation of various Imaging Techniques

DETAILED SYLLABUS

Contents: Theory

Units	Name of the topic	Hours
I	**BIO-ELECTRIC SIGNALS AND ELECTRODES** Bio – Potential and Their Generation – Resting and Action Potential –Propagation of Action Potential. Electrodes – Micro – Skin Surface – Needle Electrodes. **CLINICAL MEASUREMENT** Measurement of Blood Pressure (Direct, Indirect) – Blood Flow Meter (Electro Magnetic& Ultrasonic Blood Flow Meter) – Blood Ph Measurement - Measurement Of Respiration Rate – Measurement of Lung Volume – Heart Rate Measurement – Measurement of Body and Skin Temperature - Chromatography, Photometry, Flurometry.	3 10
II	**BIO - MEDICAL RECORDERS** Electro Cardiograph (ECG) – Lead System – ECG Electrodes – ECG Amplifiers — ECG Recording Units — Analysis of ECG Curves. Electroencephalograph (EEG) — 10-20 Lead System — EEG Recording Units – EEG Wave Types – Clinical use of EEG – BrainTumor. Electro Myograph (EMG) — EMG Waves — Measurement of Conduction Velocity - EMG Recording Units – Electro Retino Graph (ERG)- ERG Recording Units, Audiometer - Principle – Types – Basics Audiometer Working.	8 7

III	**THERAPEUTIC INSTRUMENTS** Cardiac Pacemaker — Classification — External Pace Makers — Implantable Pacemaker – Programmable Pacemaker – Cardiac Defibrillators – Types – AC and DC Defibrillators -Heart Lung Machine with Block Diagram. Dialysis – Hemo Dialysis – Peritoneal Dialysis. Endoscopes Endoscopic Laser Coagulator and Applications – Physiotherapy Equipment – Short Wave Diathermy – Micro Wave Diathermy – Ultrasonic Therapy Unit (Block / Circuit) – Ventilators – Types – Modern Ventilator Block Diagram.	15
IV	**BIOTELEMETRY AND PATIENT SAFETY** Introduction to Biotelemetry – Physiological – Adaptable to Biotelemetry – Components of a Biotelemetry System – Application of Telemetry - – Tele-medicine - Introduction, Working, Applications. Patient Safety: Physiological effects of Electric Current – Micro and Macro Shock – Leakage Current – Shock Hazards from Electrical Equipment. Methods of Accident Prevention – Grounding – Double Insulation — Protection by Low Voltage — Ground Fault Circuit Interrupter – Isolation of Patient Connected Parts – Isolated Power Distribution System. Safety Aspects in Electro Surgical Units – Burns, High Frequency Current Hazards, Explosion Hazards.	8 7
V	**MODERN IMAGING TECHNIQUES** LASER Beam Properties – Block Diagram – Operation of CO2 And Ndyag LASER – Applications of LASER in Medicine. X Ray Apparatus –Block Diagram – Operation – Special Techniques in X-Ray Imaging – Tomogram — Computerized Axial Tomography, CT Scanner — Ultrasonic Imaging Techniques – Echo Cardiograph – Angiography – Magnetic Resonance Imaging Techniques.	5 10

TEXT BOOK

1. Dr.M. Arumugam – Biomedical Instrumentation, Anuradha Publications, Chennai.

REFERENCE BOOKS

1. Leslie Cromwell –Fred j. Wibell, Erich A.P Feither – Bio Medical Instrumentation andMeasurements, II Edition.
2. Jacobson and Webstar – Medicine and Clinical Engineering.
3. R.S .Khandpur – Hand book of Bio –Medical Instrumentation.
4. Medical Electronics - Kumara doss
5. Introduction to Medical Electronics. B.R. Klin
6. Introduction to Biomedical Instrumentation Mandeep Singh Printice Hall India2010.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code :4030623

Semester :VI

Subject Title : Elective: III - COMPUTER HARDWARE AND NETWORKS

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 16 Weeks

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examination	Total	
COMPUTER HARDWARE AND NETWORKS	5	80	25	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

TOPICS AND ALLOCATION OF HOURS

Unit	Topic	Hours
1	Mother Board Components and Memory Storage Devices	13
2	I/O Devices and Interface	15
3	Maintenance and Trouble Shooting of Desk top and Mobile Phones	15
4	Computer Network Devices and OSI Layers	15
5	802.X and TCP/IP Protocols	15
	Revision and Test	7
	TOTAL	80

RATIONALE

Maintaining and servicing the computers, laptops and peripherals are essential requirements of the computer students. The clear understanding of computer network devices and protocols are also taught in this subject.

OBJECTIVES

1. On completion of the following units of syllabus contents, the students can Identify the major components that make up the system unit.
2. Understand the principle of operations of Keyboard, mouse and displays.
3. Study about the specification of I/O Ports of all I/O devices like serial, parallel, USB – Game port, Blue tooth and IP Connectors
4. Understand the technology of high-quality multiple color graphic output devices like Dot matrix, Inkjet, Laser, Line, MFP and computer system.
5. Understand the operations to Power Supply devices. Know the use of diagnostic Software. Identify the major components of Laptop. Troubles shoot the problems in Laptop.
6. Understand the concept of data communication.
7. Discuss the advantages and disadvantages of different network topologies. Compare different network classifications based on different category.
8. Know the use of different network devices.
9. Understand the different layers of OSI and their functions. Compare different LAN protocols. Identify the protocols used in TCP /IP and compare with OSI model. Understand IP address concepts and TCP/IP suite.

DETAILED SYLLABUS

UNIT I - MOTHERBOARD COMPONENTS AND MEMORY STORAGE DEVICES		**13 HOURS**
1.1	**Introduction:** Parts - Mother board, sockets, expansion slots, memory, power supply, drives and front panel and rear panel connectors – Hardware, Software and Firmware.	**3**
1.2	**Processors:** Architecture and block diagram of multi core Processor (any one), Features of new processor Definition only chipsets (Concepts only)	**2**
1.3	**Bus Standards** Overview and features of PCI, AGP, USB, PCMCIA, Processor BUS – High	**2**
1.4	**Primary Memory**: Introduction-Main Memory, Cache memory –DDR2- DDR3, RAM versions – 1TB RAM – Direct RDRAM	**1**
1.5	**Secondary Storage:** Hard Disk – Construction – Working Principle – Specification of IDE, Ultra ATA, Serial ATA; HDD Partition - Formatting. Troubleshooting hard disk drives.	**3**
1.6	**Removable Storage:** CD&DVD construction – reading & writing operations; CD-R, CD-RW; DVD-ROM, DVD-RW; construction and working of DVD Reader / Writer. Blue-ray: Introduction – Disc Parameters – Recording and Playback Principles – Solid state memory devices.	**2**
UNIT II I/O DEVICES AND INTERFACE		**15 HOURS**
2.1	**Keyboard and Mouse:** Keyboard: Signals – operation of membrane and mechanical keyboards–troubleshooting; wireless Keyboard**.** Mouse- types, connectors, operation of Optical mouse and Troubleshooting.	**3**
2.2	**Printers:** Introduction – Types of printers– Dot Matrix, Laser, line printer, MFP (Multi-Function Printer), Thermal printer - Operation – Construction – Features and Troubleshooting	**4**
2.3	**I/O Ports:** Serial, Parallel, USB, Game Port, Bluetooth interface, IR connector, fire ware, Signal specification problems with interfaces.	**3**
2.4	**Displays and Graphic Cards:** Panel Displays– Principles of LED, LCD and TFT Displays. SVGA Port signals – common problems and solutions.	**3**
2.5	**Power Supply:** SMPS: Principles of Operation and Block Diagram of ATX Power Supply, connector specifications	**2**

UNIT III Maintenance and Trouble Shooting of Desk top and Mobile Phones		**15 HOURS**
3.1	**BIOS:** Standard CMOS setup, Advanced BIOS setup, Power management, advanced chipset features, PC Bios communication – upgrading BIOS, Flash BIOS - setup.	**3**
3.2	**POST:** Definition – IPL hardware – POST Test sequence – beepcodes and error messages.	**2**
3.3	M**obile phone components:** Basics of mobile communication. Components - battery**-** antenna-ear piece- microphone -speaker-buzzer-LCD- keyboard. Basic circuit board components **—** Namesand functions of different ICs used in mobile phones.	**3**
3.4	**Tools & Instruments used in mobile servicing**: Mobile servicing kit – soldering and de-soldering components using different soldering tools - Use of multi- meter and battery booster.	**2**
3.5	**Installation & Troubleshooting:** Assembling and disassembling of different types of mobile phones – Installation of OS - Fault finding & troubleshooting- Jumpering techniques and solutions.	**2**
3.6	**Software and Antivirus**: Flashing- Formatting- Unlocking -Use of secret codes- Downloading- Routing; Mobile Viruses – Precautions – Antivirus Software.	**3**
UNIT – IV COMPUTER NETWORK DEVICES AND OSI LAYERS		**15 HOURS**
4.1	**Data Communication:** Components of a data communication – Data flow: simplex – half duplex – full duplex; Networks – Definition - Network criteria – Types of Connections: Point to point – multipoint; Topologies: Star, Bus, Ring, Mesh, Hybrid – Advantages and Disadvantages of each topology.	**3**
4.2	**Types of Networks:** LAN – MAN – WAN – CAN – HAN – Internet –Intranet –Extranet, Client-Server, Peer to Peer Networks.	**3**
4.3	**Transmission Media:** Classification of transmission media - Guided – Twisted pair, Coaxial, Fiber optics; Unguided – Radiowaves – Infrared – LOS – VSAT – cabling and standards.	**3**
4.4	**Network devices:** Features and concepts of Switches – Routers (Wired and Wireless) – Gateways.	**3**
4.5	**Network Models:** Protocol definition - standards - OSI Model – layered architecture – functions of all layers.	**3**

UNIT V 802.X AND TCP/IP PROTOCOLS		15 HOURS
5.1	**Overview of TCP / IP:** OSI & TCP/IP – Transport Layers Protocol – connection oriented and connectionless Services –Sockets – TCP & UDP.	**3**
5.2	**802.X Protocols:** Concepts and PDU format of CSMA/CD (802.3) – Token bus (802.4) – Token ring (802.5) – Ethernet – type of Ethernet (Fast Ethernet, gigabit Ethernet) –Comparison between 802.3, 802.4 and 802.5	**3**
5.3	**Network Layers Protocol:** IP –Interior Gateway Protocols (IGMP, ICMP, ARP, RARP Concept only).	**3**
5.4	**IP Addressing:** Dotted Decimal Notation –Subnetting & Super netting – VLSMTechnique-IPv6 (concepts only)	**3**
5.5	**Application Layer Protocols:** FTP– Telnet – SMTP– HTTP – DNS – POP	**3**

TEXT BOOKS

S.No	Title	Author	Publisher	Year of Publishing / Edition
1.	Computer Installation and Servicing	D.Balasubramanian	Arasan Ganesan Institute of Technology	1993
2.	The complete PC upgrade and Maintenance	Mark Minasi	BPB Publication	1997
3.	Troubleshooting, Maintaining and Repairing PCs	Stephen J Bigelow	Tata MCGraw Hill Publication	2004
4.	Computer Networks	Andrew S.Tanenbaum	Prentice-Hall of India, New Delhi	2002
5.	Data Communication and networking	Behrouz A.Forouzan	Tata Mc-Graw Hill, New Delhi	2006
6.	Data and Computer Communications	William Stallings	Prentice-Hall of India	Eighth Edition 2007

REFERENCE BOOKS

S.No	Title	Author	Publisher	Year of Publishing / Edition
1.	Computer Networks	Achyut Godbole	Tata Mc-Graw Hill - New Delhi	
2.	Principles of Wireless Networks– A unified Approach	Kaveh Pahlavan and Prashant krishnamoorthy	Pearson Education	2002

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030640

Semester : VI

Subject Title : ELECTRICAL ESTIMATION AND COSTING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ELECTRICAL ESTIMATION AND COSTING PRACTICAL	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75marks.**

RATIONALE

To enable the students to prepare the schedule of materials with specification and estimate the cost for different types of Electrical Installations. This will empower the students with the necessary principles of Planning, Electrical Rules and Method of Installations.

OBJECTIVES

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

- Draw the Conventional Symbols for various Electrical Installations.
- To quote the relevant IE Rules for a given Electrical Installation, Earthing and clearanceof Service Lines.
- Familiarize the types of Wiring.
- Explain the necessity and types of Earthing.
- Estimate the quantity of materials and cost required for Domestic and Industrial Wiring.

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

Exercise

1. To study the various Electrical Symbols, IE Rules 28, IE Rules 30, IE Rules 31, IE Rules54, IE Rules 56, IE Rules 87.
2. To study the various types of Earthing.
3. To study the various types of Electrical Wiring Methods.
4. Estimate the quantity of material and cost required for Residential Building (1BHK).
5. Estimate the quantity of material and cost required for Computer Centre having 10 Computers, AC Unit, UPS, Light and Fan.
6. Estimate the quantity of material and cost required for Industrial Power Wiring having 4 Machines.
7. Estimate the quantity of material and cost required for street light service having 12 Lamps Light Fitting.
8. Estimate the quantity of material and cost required for 3 Phase Service connection to abuilding having 5KW Load.
9. Estimate the quantity of material and cost required for Irrigation Pump Wiring (5HP).
10. Estimate the quantity of material and cost required for School Building having 3 Class Rooms.
11. Estimate the quantity of material and cost required for erection of a 15HP Induction Motor in a Saw Mill/Flour Mill.

REFERENCE BOOKS

Sl.No.	Title of the book	Author	Publisher
1.	Electrical Design Estimating and Costing.	K.B.Raina&K.Battacharya.	Khanna Publications.
2.	Electrical Installation Estimating and Costing.	J.B.Gupta	S.K.Kataria and Sons
3.	Electrical Wiring, Estimating and Costing.	Dr.S.L.Uppal	New age international (p) limited
4.	Electrical Estimating and Costing.	Surjit Singh	DhanpatRai company.
5.	Electrical wiring, Estimating and costing	B.D.Arora	R.B. Publication.

DETAILED ALLOCATION OF MARKS

Sl.No	NAME OF ACTIVITY	MARK ALLOCATION
1.	LAYOUT / DETAILS OF FITTING	20
2.	LOAD CALCULATION	20
3.	MATERIAL CALCULATION	30
4.	MATERIAL SCHEDULE AND APPROXIMATE COST	25
6.	VIVA-VOCE	05
	TOTAL	**100**

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030624

Semester : VI

Subject Title : POWER ELECTRONICS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
POWER ELECTRONICS PRACTICAL	6	96	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

- The advent of Thyristors has revolutionized art of Electric Power Conversation and its Control.
- The use of the Power Electronic Devices has pervaded the Industrial Applications relating to the field of Electrical, Electronics, Instrumentation and Control Engineering.
- This Subject is introduced to impart practical skills to the students in using some important Power Electronic Devices and Circuits.

OBJECTIVES

At the end of the Course, Students will be able to:

- Construct and test various Triggering Circuits for SCR.
- Construct and test different types of Phases Controlled Converters invarious configurations at different load conditions.
- Construct and observe the performance of different types of Chopper and Inverters.
- Construct and test the performance of Open Loop and Closed LoopControl of DC and AC drives.
- Construct and test the performance of Single Phase Cyclo Converter.

DETAILED SYLLABUS

Contents: Practical

Name of the Topics: Power Electronics Practical

Exercise

1. Construct the Line synchronized Ramp trigger circuit using UJT with ACLoad to measure Firing Angles.
2. Construct Lamp control circuit using DIAC – TRIAC to measure various outputvoltage for Firing Angles.
3. Construct and test the SCR Commutation Circuits (Class B & Class D)
4. Construct and test the Half Wave Controlled Rectifier with R- Load, RL Load
5. Construct and test the Single Phase Fully Controlled Bridge with RL- Load andFree Wheeling Diode.
6. Construct and test the Single-Phase Semi Controlled Bridge with R- Load
7. Construct and test the DC Chopper Control Circuit using Thyristor (any class).
8. Construct and test the Step-Up Chopper.
9. Construct PWM based Step Down DC Chopper using MOSFET/IGBT.
10. Construct and test the Single-Phase Single Pulse / Sinusoidal PWM Inverter using MOSFET/IGBT.
11. Construct and test the SMPS using MOSFET/IGBT.
12. Construct and test the Open Loop Speed Control Circuit for DC Shunt Motor and Single-Phase AC Motor.

13. Construct and test the Control Circuit using TRIAC for Universal Motor.
14. Construct and test the Closed Loop Speed Control for a DC and AC Motor.
15. Construct and test the Single-Phase Parallel Inverter using MOSFET/IGBT
16. Construct and test the Single Phase to Single Phase Cyclo Converter.

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.NO	NAME OF THE EQUIPMENT	NO OF QUANTITY
1.	Line Synchronized Ramp Trigger Circuit Using UJT Trainer Kit.	1
2.	Lamp Control Circuit Using DIAC – TRIAC Trainer Kit.	1
3.	SCR Commutation Circuits (Class B & Class D)	1
4.	Half Wave Controlled Rectifier with R- Load & RL Load Trainer Kit.	
5.	Single Phase Fully Controlled Bridge with RL- Load And Freewheeling Diode Trainer Kit.	1
6.	Single Phase Semi Controlled Bridge with R- Load Trainer Kit.	1
7.	Construct and Test the DC Chopper Control Circuit using Thyristor (Any Class) Trainer Kit.	1
8.	Step Up Chopper Trainer Kit.	1
9.	PWM Based Step Down DC Chopper using MOSFET/IGBT Trainer Kit.	1
10.	Single Phase Single Pulse / Sinusoidal PWM Inverter using MOSFET/IGBT Trainer Kit.	1
11.	SMPS using MOSFET/IGBT Trainer Kit.	1
12.	Open Loop Speed Control Circuit for DC Shunt Motor and Single-Phase AC Motor Trainer Kit	1
13.	Control Circuit Using TRIAC for Universal Motor Trainer Kit.	1
14.	Closed Loop Speed Control of DC and AC Motor Trainer Kit.	1
15.	Single Phase Parallel Inverter using MOSFET/IGBT Trainer Kit	1
16.	Single Phase to Single Phase Cyclo Converter Trainer Kit.	1
17.	CRO With Power Probe	4
18.	Multi Meter	5

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	Circuit Diagram	25
2	Connections	25
3	Procedure	20
4	Reading/Graph/Result	25
5	Viva Voce	05
	Total	100

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030625

Semester : VI

Subject Title : BIO-MEDICAL INSTRUMENTATION PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
BIO-MEDICAL INSTRUMENTATION PRACTICAL	6	96	25	100*	100	3 hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

Recent advances in Medical Field have been fueled by the Instruments developed by the Electronics and Instrumentation Engineers. Pacemakers, Ultrasound Machine CAT, Medical Diagnostic Systems are few names which have been contributed by Engineers. Now Health Care Industry uses many Instruments which are to be looked after by Instrumentation Engineers.

OBJECTIVES

1. Will enable the Students to learn the basic principles of different Instruments/Equipment used in the Health Care Industry.
2. The practical work done in this area will impart skill in the use, Servicing and Maintenance of this Instruments/Equipment.
3. Proficiency in this area will widen the knowledge and skill of Diploma Holders in the field of Biomedical Instrumentation.

DETAILED SYLLABUS

List of Experiments:

1. Construction and Testing of Differential amplifier.
2. Construction and Testing of Instrumentation amplifier.
3. Measurement of pH of given solution.
4. Measurement of Blood pressure.
5. Measurement of ECG waveform.
6. Construction and verification of pacemaker circuit.
7. Construction and testing of high gain amplifier.
8. Measurement of Body and Skin temperature.
9. Study, handle and use the following Instruments/Equipments:
    a. Cardiac monitor.
    b. ECG stimulator.
    c. Muscle stimulator.
    d. Vascular Doppler recorder.
    e. Pressure plethysmograph.
    f. Skin sympathetic response meter.

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	Circuit Diagram / Connection Diagram / Block Diagram	**35**
2	Connections and Proceeding the Experiment	**35**
3	Reading/Calculation/Graph/Result	**25**
4	Viva Voce	**05**
	Total	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	pH meter and conductivity meter	1
2	Photo transducer for pulse measurement	1
3	Sphygmomanometer and Stethoscope	1
4	Blood flow measurement system	1
5	Multi parameter (ECG, EMG, EEG) Simulator	1
6	GSR measurement setup.	1
7	Function generator	8
8	DSO	8
9	Regulated Power supplies	8
10	Bread boards	8

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code :4030626

Semester : VI

Subject title : COMPUTER HARDWARE AND NETWORKING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 16 Weeks

Subject	Instructions		Examination			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
COMPUTER HARDWARE AND NETWORK PRACTICAL	6	96	25	100*	100	3Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

The course aims at making the students familiar with various parts of computers and laptops and how to assemble them and the different types of peripherals desired. In addition, the course will provide the students with necessary knowledge and skills in computer and laptop software installation and maintenance and to make him diagnose the software faults. This subject also gives the knowledge and competency to diagnose the problems in computer hardware and peripherals and also gives the knowledge for trouble shooting for systematic repair and maintenance of computers and laptops.

OBJECTIVES

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

- Know the various indicators, switches and connectors used in Computers.
- Familiarize the layout of SMPS, motherboard and various Disk Drives.
- Configure Bios set up options.
- Install various secondary storage devices with memory partition and formatting.
- Know the various types of printer installation and to handle the troubleshooting
- Assemble PC system and checking the working condition.
- Installation of Dual OS in a system.
- Identify the problems in Computer systems, software installation and rectification
- Assembling and disassembling of Laptop to identify the parts and to install OS and configure it.
- Enable to perform different cabling in a network.
- Configure Internet connection and use utilities to debug the network issues.
- Configure router for any topology
- Install and configure Windows 2008 / 2013 Server
- Design Windows server Active directory Services.
- Install and configure server hardware devices.

DETAILED SYLLABUS

PART A - COMPUTER SERVICING AND NETWORKPRACTICAL	
1	Identification of system layout (Study Exercise) a) Front panel indicators & switches and front side & rear side connectors. b) Familiarize the computer system Layout: Marking positions of SMPS, Motherboard, HDD, DVD and add on cards. c) Configure bios setup program and troubleshoot the typical problems using BIOS utility.
2	HARD DISK a) Install Hard Disk. b) Configure CMOS-Setup. c) Partition and Format Hard Disk. d) Identify Master /Slave / IDE Devices. e) Practice with scan disk, disk cleanup, disk De-fragmentation, Virus Detecting and Rectifying Software.
3	a) Install and Configure a DVD Writer & Blu-ray Disc Writer. b) Recording a Blank DVD & Blu-ray Disc.
4	Assemble a system with add on cards and check the working condition of the system and install Dual OS.
5	Identification of mobile phone components (Study Exercise) a) Basic mobile phone components. b) Familiarizing the basic circuit board components: Marking position of different IC and Switches in the Network and Power sections of the PCB.
6	Flashing, Unlocking and Formatting memory cards in Mobile phones.
7	Do the following cabling works in a network a) Cable Crimpling b) Standard Cabling c) Cross Cabling d) I/O Connector Crimping e) Testing the Crimped cable using a Cable tester
8	a) Configure Host IP, Subnet Mask and Default Gateway in a system in LAN(TCP/IP Configuration). b) Configure Internet connection and use IPCONFIG, PING / Tracert and Net stat utilities to Debug the Network issues.
9	Transfer files between systems in LAN using FTP Configuration. Install a printer in LAN and share it in the network.

PART B – SYSTEM ADMINISTRATION PRACTICAL	
10	Installation of Windows 2008 / 2013 Server.
11	Installation and configuration of DHCP Server.
12	Installation and configuration of Mail Server.
13	a) Installation of Red Hat Linux using Graphical mode. b) Installation of Red Hat Linux using VMware.
14	a) Creating a user in Linux Server and assigning rights. b) Configuring and troubleshooting.
15	a) Configuring and troubleshooting of /etc/grub.conf b) Configuring and trouble shooting of /etc/passwd

Note:

The students must and should install software's. After the demonstration, the same is uninstalled. Each batch has to learn to install and use the tools.

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1	Procedure Writing – One Question from PART – A	**10**
2	Procedure Writing – One Question from PART - B	**15**
3	Executing Exercise (PART – A)	**10**
4	Executing Exercise (PART – B)	**20**
5	Result (PART – A)	**5**
6	Result (PART – B)	**5**
7	Demonstration of mini project	**5**
8	VIVA – VOCE	**5**
	TOTAL	**75**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

Hardware Requirements:	
Desktop Systems	30 Nos
Hard disk drive	06 Nos
DVD, Blu-ray Drive	06 Nos
Blank DVD , Blu-ray Disc	20 Nos
Head cleaning CD	
Dot matrix Printer	02 Nos
Laser Printer	02 Nos
Server	01 Nos
Mobile phones	06 Nos
Network Requirements:	
Crimping Tool	06 Nos
Screwdriver set	06 Nos
Network Cables	
Modem	02 Nos
Hub	01 No
Router	01 No
Switch	02 Nos
Software Requirements:	
Windows OS	
Windows Server 2008 / 2013 and LINUX.	
Antivirus software.	
DVD and Blu-ray Burning S/W.	
Mobile Phone Flashing S/W	

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1040: Electronics and Communication Engineering

Subject Code : 4040660

Semester : VI

Subject Title : Project Work & Internship

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16

Subject	Instruction		Examination		
	Hours/ Week	Hours/ Semester	Assessment Marks		
			Internal	Board Exam	Total
PROJECT WORK & INTERNSHIP	**6**	**96**	**25**	**100***	**100**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Minimum Marks for Pass is 50 out of which minimum 50 marks should be obtained out of 100 marks in the Board Examination alone.

OBJECTIVES:

- The project work and internship is aimed to assemble and test a photo type model of any one item/gadget.
- Real time application problems if any may be identified from any industry and may be chosen.
- The knowledge and the skill so far acquired may be made use of.
- The team spirit may be motivated.
- The entrepreneurship ideas may be motivated by conducting a career guidance programme.
- Learn and understand the gap between the technical knowledge acquired through curriculum and the actual industrial need through internship .

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
Demonstration/Presentation	**25**
Report	**25**
Viva Voce	**30**
Internship report	**20**
Total	**100**

List of Equivalent Subjects for M - Scheme to N – Scheme

M - SCHEME		N – SCHEME	
III SEMESTER			
Subject Code	Subject Name	Subject Code	Subject Name
34031	Electronic Devices and Circuits	4040310	Electronic Devices and Circuits
33031	Electrical Circuit Theory	4030320	Electrical Circuit Theory
33032	Electrical Machines-I	4030330	Electrical Machines -I
34034	Electronic Devices and Circuits Practical	4040340	Electronic Devices and Circuits Practical
33034	Electrical Circuits and Machines Practical	4030350	Electrical Circuits and Machines Practical
33036	Electrical Work Shop Practical	4030360	Electrical Workshop Practical
33064	Wiring and Winding Practical	4030370	Wiring & Winding Practical
IV SEMESTER			
33041	Electrical Machines – II	4030410	Electrical Machines -II
33042	Measurements and Instruments	4030420	Measurements, Instruments and Transducers
33044	Transducers and Signal Conditioners	4030320	Measurements, Instruments and Transducers
34043	Digital Electronics	4040430	Analog and Digital Electronics
		4000440	E-Vehicle Technology and Policy
33045	Electrical Machines and Instrumentation Practical	4030450	Electrical Machines and Instrumentation Practical
34046	Integrated Circuits Practical	4040460	Analog and Digital Electronics Practical
33065	Electrical Circuits Simulation Practical	4030470	Electrical Circuits and Simulation Practical

V SEMESTER			
33051	Generation Transmission and Switchgear	4030510	Generation Transmission and Switchgear
34052	Micro Controller	4040520	Micro Controller and its Applications
33055	Computer Aided Electrical Drawing Practical	4030540	Computer Aided Electrical Drawing Practical
33071	Control of Electrical Machines	4030511	Control of Electrical Machines
33072	Programmable Logic Controller	4030512	Programmable Logic Controllers
		4030513	Renewable Energy Sources
33074	Control of Electrical Machines Practical	4030514	Control of Electrical Machines Practical
33075	Programmable Logic Controller Practical	4030515	Programmable Logic Controller Practical
		4030516	Renewable Energy Sources Practical
34056	Micro Controller Practical	4040550	Microcontroller and its ApplicationsPractical
		4040570	Entrepreneurship and Startups
VI SEMESTER			
33061	Distribution and Utilization	4030610	Distribution and Utilization
		4030630	Energy Conservation and Audit
33053	Electrical Estimation and Energy Auditing	4030640	Electrical Estimation and Costing Practical
33081	Power Electronics	4030621	Power Electronics
34082	Bio-Medical Instrumentation	4030622	Bio-Medical Instrumentation
34682	Computer Hardware and Networks	4030623	Computer Hardware and Networks
33084	Power Electronics Practical	4030624	Power Electronics Practical
33085	Bio-Medical Instrumentation Practical	4030625	Bio-Medical Instrumentation Practical
34684	Computer Hardware and Networks Practical	4030626	Computer Hardware and Networks Practical
33067	Project Work	4020660	Project Work and Internship