DIPLOMA IN ENGINEERING AND TECHNOLOGY

(2049 & 2149)

DEPARTMENT OF ROBOTICS AND AUTOMATION ENGINEERING

SEMESTER PATTERN

N – SCHEME

IMPLEMENTED FROM 2020 - 2021

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICALEDUCATION

CHENNAI-600 025, TAMIL NADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

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

N SCHEME

(Implemented from the Academic year 2020 - 2021 onwards)

Chairperson

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

Director, Directorate of Technical Education, Guindy, Chennai.

Coordinator

Tmt. J Rama

Principal, Government Polytechnic College

R K Nagar, Chennai – 81. Number 9444748513

Diploma in Robotics and Automation (2049 / 2149)			
Convener **Thiru R Kanagaraj** Principal, Government Polytechnic College Purasaiwalkam, Chennai – 07			
Members			
1.	**Dr.SreeKumar M** Dean (Faculty Affairs) Design & Manufacturing (IIT DM) Kanchipuram, Chennai. Mobile: 9444724955	5.	**Mr Shivashankaran** Senior Manager - Automation Mitsubishi India Electric Pvt Ltd Chennai Mobile: 9840015891
2.	**Dr.Sundaram M** Associate Professor – EEE PSG College of Technology, Coimbatore	6.	**Mrs.MangalamJayashree** Sr.Lecturer / Mechactronics Government Polytechnic College Purasawalkam, Chennai – 07
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GOVERNMENT OF TAMILNADU

DIPLOMA COURSES IN ENGINEERING / TECHNOLOGY

(SEMESTER SYSTEM)

(Implemented from 2020 - 2021)

N – SCHEME

R E G U L AT 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 4th and/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-week duration of study with 35 hrs. / Week for Regular Diploma Courses and 18 hrs. / Week for Part-Time Diploma Courses.***

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 year onwards.

2. Condition for Admission:

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

The S.S.L.C Examination of the Board of Secondary Education, 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 certain minimum requirements, which may be prescribed from time to time.

3. Admission to Second year (Lateral Entry):

A pass in HSC (academic) or (vocational) courses mentioned in the Higher Secondary Schools in 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.

S. 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	Maths / Physics / Chemistry	Related Vocational Subjects Theory& Practical	2 years course to be passed with appropriate Trade
2.	Diploma Course in Commercial 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 / equivalent subjects prescribed along with Practical's 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 Commercial 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 are as given below:

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

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 to time, 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:

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

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

<u>i) Subject Attendance</u> **5 Marks**

(Award of marks for subject attendance to each subject Theory/Practical will be as per the range given below)

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

<u>ii) Test #</u> **10 Marks**

2 Tests each of 2 hours' duration for a total of 50 marks are to be conducted. Average of the 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 units and 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 Hrs
Test II	Unit – III & IV	End of 12th week	50	2 Hrs
Test III	**Model Examination:** Covering all the 5 Units. (Board Examinations-question paper-pattern).	End of 16th week	100	3 Hrs

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:	7 Questions × 2 marks	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 the average 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. (2 ½ 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.

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

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

a) Attendance : **5 Marks**

(Award of marks same as theory subjects)

b) Procedure/ observation and tabulation/
Other Practical Related Work : **10 Marks**

c) Record writing : **10 Marks**

TOTAL : **25 Marks**

- *All the Experiments/Exercises indicated in the syllabus should be completed and the same to be given for final Board examinations.*
- The observation note book / 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 have to submit the duly signed bonafide record note book/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 Log Book 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 Log Book 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 the Communication skill and ICT skill of students.

As per the recommendation of MHRD and under Fit India scheme, the Physical education 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 have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester. 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 Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to 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 a minimum of 4*0 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 2023 onwards (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 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 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 Time Table:

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

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Board Examination-Question Paper Pattern

Time: 3 Hrs. Max.Marks:100

PART - A Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C Five questions will be asked Either or type. One question from every unit. Answer either A or B. Each question carries 15 marks.A and B have subdivisions. (7 + 8)

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	10 X 2 = 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X15 = 75 Marks
TOTAL	100 Marks

Note: Board Examinations will be conducted for 100 Marks and converted to 75 Marks.

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ANNEXURE – I

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ROBOTICS AND AUTOMATION (FULL TIME) (2049) SYLLABUS

N SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

CURRICULUM OUTLINE

III Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4040310	Electronic Devices and Circuits$	5			5
4047320	Electrical Circuits, Machines and Drives#	5	-	-	5
4049330	Manufacturing Technology	5	-	-	5
4049340	Machine Element Design	5			5
4040340	Electronic Devices and Circuits Practical$	-	-	4	4
4047350	Electrical Circuits and Machines Practical#		-	4	4
4049370	Production Technology Practical	-	-	4	4
		20	**-**	**12**	**32**
Extra / Co-Curricular Activities					
	Library	**-**	**-**	**-**	**1**
	Physical Education	**-**	**-**	**-**	**2**
TOTAL					**35**

 # - Common with Mechatronics Engineering, $ - Common with ECE

IV Semester

Subject Code	Subject	Theory hours	Drawing hours	Practical hours	Total hours
4040430	Analog and Digital Electronics$	4	-	-	4
4049420	Measurements and Instrumentation	4	-	-	4
4049430	Fundamentals of Robotics	5			5
4049440	Fluid Power Automation	5	-	-	5
4049450	Programming in C Practical	-	-	5	5
4049460	Fluid Power Automation Practical	-	-	4	4
4040460	Analog and Digital Electronics Practical$	-	-	5	5
		18	**-**	**14**	**32**
Extra / Co-Curricular Activities					
	Library	**-**	**-**	**-**	**1**
	Physical Education	**-**	**-**	**-**	**2**
TOTAL					**35**

$ - Common with ECE

V Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4049510	PLC and HMI	5	-	-	5
4049520	Computer Integrated Manufacturing	5	-	-	5
4049530	Microcontrollers	5	-	-	5
4049540	Robotics Practical			4	4
4049550	PLC and HMI Practical	-	-	5	5
4049560	Microcontroller Practical	-	-	4	4
4040570	Entrepreneurship and Start-up @	-	-	4	4
		15	**-**	**17**	**32**
Extra / Co-Curricular Activities					
	Library	**-**	**-**	**-**	**1**
	Physical Education	**-**	**-**	**-**	**2**
TOTAL					**35**
TOTAL		**17**	**-**	**18**	**35**

 # - Common with DMTE, @ - Common to all branches

VI Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4020610	Industrial Engineering and Management **&**	5	-	-	5
4049620	Industrial Robotics and Material Handling Systems	5	-	-	5
4049630	Advanced Automation	5	-	-	5
4049640	CIM Practical	-	-	5	5
4049650	Industrial Robotics Practical	-	-	4	4
4049660	IIOT Practical	-	-	4	4
4049670	Project Work and Internship	-	-	4	4
		15	**-**	**17**	**32**
Extra / Co-Curricular Activities					
	Library	**-**	**-**	**-**	**1**
	Physical Education	**-**	**-**	**-**	**2**
TOTAL					**35**

& - Common with DME

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ROBOTICS AND AUTOMATION (FULL TIME) (2049)

N SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

SCHEME OF EXAMINATION

III Semester

Subject Code	SUBJECT	Examination Marks			Minimum for Pass	Duration of Exam Hours
		Internal Assessment marks	Board Exam Marks	Total Marks		
4040310	Electronic Devices and Circuits$	**25**	**100***	**100**	**40**	**3**
4047320	Electrical Circuits, Machines and Drives#	**25**	**100***	**100**	**40**	**3**
4049330	ProductionTechnology	**25**	**100***	**100**	**40**	**3**
4049340	Machine Element Design	**25**	**100***	**100**	**50**	**3**
4040340	Electronic Devices and Circuits Practical$	**25**	**100***	**100**	**50**	**3**
4047350	Electrical Circuits and Machines Practical#	**25**	**100***	**100**	**50**	**3**
4049370	Production Technology Practical	**25**	**100***	**100**	**50**	**3**
Total		**175**	**700**	**700**		

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

IV Semester

Subject Code	SUBJECT	Examination Marks			Minimum for Pass	Duration of Exam Hours
		Internal Assessment marks	Board Exam Marks	Total Marks		
4040430	Analog and Digital Electronics$	**25**	**100***	**100**	**40**	**3**
4049420	Measurements and Instrumentation	**25**	**100***	**100**	**40**	**3**
4049430	Fundamentals of Robotics	**25**	**100***	**100**	**40**	**3**
4049440	Fluid Power Automation	**25**	**100***	**100**	**40**	**3**
4049450	Programming in C Practical	**25**	**100***	**100**	**50**	**3**
4049460	Fluid Power Automation Practical	**25**	**100***	**100**	**50**	**3**
4040460	Analog and Digital Electronics Practical$	**25**	**100***	**100**	**50**	**3**
Total		**175**	**700**	**700**		

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

V Semester

Subject Code	SUBJECT	Examination Marks			Minimum for Pass	Duration of Exam Hours
		Internal Assessment marks	Board Exam Marks	Total Marks		
4049510	PLC and HMI	**25**	**100***	**100**	**40**	**3**
4049520	Computer Integrated Manufacturing	**25**	**100***	**100**	**40**	**3**
4049530	Microcontrollers	**25**	**100***	**100**	**40**	**3**
4049540	Robotics Practical	**25**	**100***	**100**	**50**	**3**
4049550	PLC and HMI Practical	**25**	**100***	**100**	**50**	**3**
4049560	Microcontroller Practical	**25**	**100***	**100**	**50**	**3**
4040570	Entrepreneurship and Start-up @	**25**	**100***	**100**	**50**	**3**
Total		**175**	**700**	**700**		

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

VI Semester

Subject Code	SUBJECT	Examination Marks			Minimum for Pass	Duration of Exam Hours
		Internal Assessment marks	Board Exam Marks	Total Marks		
4020610	Industrial Engineering and Management **&**	**25**	**100***	**100**	**40**	**3**
4049620	Industrial Robotics and Material Handling Systems	**25**	**100***	**100**	**40**	**3**
4049630	Advanced Automation	**25**	**100***	**100**	**40**	**3**
4049640	CIM Practical	**25**	**100***	**100**	**50**	**3**
4049650	Industrial Robotics Practical	**25**	**100***	**100**	**50**	**3**
4049660	IIOT Practical	**25**	**100***	**100**	**50**	**3**
4049670	Project Work and Internship	**25**	**100***	**100**	**50**	**3**
Total		**175**	**700**	**700**		

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

List of Equivalent Subjectsfor M- Scheme to N– Scheme

III Semester With Effect from Oct ‘21

M Scheme		N Scheme	
34031	Electronic Devices and Circuits	4040310	Electronic Devices and Circuits
34232	Electrical Circuits and Machines	4047320	Electrical circuit, Machines and Drives
34933	Production Technology	4049330	Production Technology
34034	Electronic devices and Circuits Practical	4040340	Electronic Devices and Circuits Practical
34735	Electrical Circuits and Machines Practical	4047350	Electrical Circuits and Machines and Drives Practical
34756	Programming in C Practical	4049450	Programming in C Practical
34937	Production Technology Practical	4049370	Production Technology Practical

IV Semester With Effect from Apr ‘22

M Scheme		N Scheme	
34941	Fluid Power Automation	4049440	Fluid Power Automation
34942	Machine Element Design	4049340	Machine Element Design(with effect from Oct ’22)
34043	Digital Electronics	4040430	Analog and Digital Electronics
33044	Transducers and Signal Conditioners	4049420	Measurements and Instrumentation
32034	Computer Applications and CAD Practical	No Equivalent	
34046	Integrated Circuits Practical	4040460	Analog and Digital Electronics Practical
30002	Life and Employability skill Practical	-----	**No Equivalent**

V Semester With Effect from Oct '22

M Scheme		N Scheme	
32061	Industrial Engineering and Management	4020610	Industrial Engineering and Management
34752	Microcontroller and PIC	4049530	Microcontrollers
34953	Computer Integrated Manufacturing	4049520	Computer Integrated Manufacturing
34954	Fundamentals of Robotics	4049430	Fundamentals of Robotics
34955	Fluid Power Automation Practical	4049460	Fluid Power Automation Practical
34956	Microcontroller and PIC Practical	4049560	Microcontroller Practical
34957	Robotics Practical	4049540	Robotics Practical

VI SEMESTER – With Effect from Apr '23

M Scheme		N Scheme	
34961	PLC & HMI Programming	4049510	PLC and HMI
34962	Industrial Robotics and Material Handling Systems	4049620	Industrial Robotics and Material Handling Systems
34963	Advanced Automation	4049630	Advanced Automation
34964	Industrial Robotics Practical	4049650	Industrial Robotics Practical
34965	CIM Practical	4049640	CIM Practical
34966	PLC & HMI Practical	4049550	PLC and HMI Practical
34967	Project Work	**No Equivalent**	

DIPLOMA IN ROBOTICS AND AUTOMATION (SANDWICH)

CODE NO: 2149

N - SCHEME

2020- 2021

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

ANNEXURE – I

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ROBOTICS AND AUTOMATION (SANDWICH) (2149) SYLLABUS

N SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

CURRICULUM OUTLINE

III Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4040310	Electronic Devices and Circuits$	4			4
4047310	Electrical Circuits, Machines and Drives#	4	-	-	4
4049310	Production Technology	4	-	-	4
4049320	Machine Element Design	4			4
4040340	Electronic Devices and Circuits Practical$	-	-	4	4
4047350	Electrical Circuits and Machines Practical#		-	4	4
4049370	Production Technology Practical	-	-	4	4
4049450	Programming in C Practical			4	4
		16	**-**	**16**	**32**
Extra / Co-Curricular Activities					
	Library	**-**	**-**	**-**	**1**
	Physical Education	**-**	**-**	**-**	**2**
TOTAL					**35**

 # - Common with Mechatronics Engineering, $ - Common with DECE

IV Semester

Subject Code	Subject	Theory hours	Drawing hours	Practical hours	Total hours
4040430	Analog and Digital Electronics$	4	-	-	4
4040460	Analog and Digital Electronics Practical$	-	-	3	3
4049910	Industrial Training – I	-	-	-	-
		-	**-**	**-**	**-**
Extra / Co-Curricular Activities					
	Library	**-**	**-**	**-**	**1**
TOTAL					**7**

$ - Common with DECE

V Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4049420	Measurements and Instrumentation	4			4
4049430	Fundamentals of Robotics	4	-	-	4
4049440	Fluid Power Automation	4			4
4049510	PLC & HMI	4	-	-	4
4049520	Computer Integrated Manufacturing	4	-	-	4
4049450	Fluid Power Automation Practical	-	-	4	4
4049540	Robotics Practical	-	-	4	4
4049550	PLC & HMI Practical	-	-	4	4
		20	**-**	**12**	**32**
Extra / Co-Curricular Activities					
	Library	**-**	**-**	**-**	**1**
	Physical Education	**-**	**-**	**-**	**2**
TOTAL					**35**
TOTAL		**17**	**-**	**18**	**35**

VI Semester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4049530	Microcontrollers	4	-	-	4
4040610	Industrial Engineering and Management **&**	4	-	-	4
4049620	Industrial Robotics and Material Handling Systems	4	-	-	4
4049630	Advanced Automation	4	-	-	4
4049560	Microcontroller Practical			4	4
4049640	CIM Practical	-	-	4	4
4049650	Industrial Robotics Practical	-	-	4	4
4049660	IIOT Practical	-	-	4	4
		16	**-**	**16**	**32**
Extra / Co-Curricular Activities					
	Library	**-**	**-**	**-**	**1**
	Physical Education	**-**	**-**	**-**	**2**
TOTAL					**35**

& - Common with DME

VII Semester

Subject Code	Subject	Theory hours	Drawing hours	Practical hours	Total hours
4040570	Entrepreneurship and Startups @	-	-	3	3
4049710	Project Work	-	-	4	4
4049920	Industrial Training – II	-	-	-	-
		-	**-**	**-**	**-**
Extra / Co-Curricular Activities					
	Library	**-**	**-**	**-**	**1**
TOTAL					**7**

@ - Common to all branches

ANNEXURE – II

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ROBOTICS AND AUTOMATION (SANDWICH) (2149)

N SCHEME

(To be implemented for the students admitted from the year 2020-21 onwards)

SCHEME OF EXAMINATION

III Semester

Subject Code	SUBJECT	Examination Marks			Minimum for Pass	Duration of Exam Hours
		Internal Assessment marks	Board Exam Marks	Total Marks		
4040310	Electronic Devices and Circuits$	**25**	**100***	**100**	**40**	**3**
4047310	Electrical Circuits, Machines and Drives#	**25**	**100***	**100**	**40**	**3**
4049310	Production Technology	**25**	**100***	**100**	**40**	**3**
4049320	Machine Element Design	**25**	**100***	**100**	**40**	**3**
4040340	Electronic Devices and Circuits Practical$	**25**	**100***	**100**	**50**	**3**
4047350	Electrical Circuits and Machines Practical#	**25**	**100***	**100**	**50**	**3**
4049370	Production Technology Practical	**25**	**100***	**100**	**50**	**3**
4049450	Programming in C Practical	**25**	**100***	**100**	**50**	**3**
Total		**200**	**800**	**800**		

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

IV Semester

Subject Code	SUBJECT	Examination Marks			Minimum for Pass	Duration of Exam Hours
		Internal Assessment marks	Board Exam Marks	Total Marks		
4040430	Analog and Digital Electronics $	**25**	**100***	**100**	**40**	**3**
4040460	Analog and Digital Electronics Practical $	**25**	**100***	**100**	**50**	**3**
4049910	Industrial Training – I	**25**	**100***	**100**	**50**	**3**
Total		**75**	**300**	**300**		

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

V Semester

Subject Code	SUBJECT	Examination Marks			Minimum for Pass	Duration of Exam Hours
		Internal Assessment marks	Board Exam Marks	Total Marks		
4049420	Measurements and Instrumentation	**25**	**100***	**100**	**40**	**3**
4049430	Fundamentals of Robotics	**25**	**100***	**100**	**40**	**3**
4049440	Fluid Power Automation	**25**	**100***	**100**	**40**	**3**
4049510	PLC & HMI	**25**	**100***	**100**	**40**	**3**
4049520	Computer IntegratedManufacturing	**25**	**100***	**100**	**50**	**3**
4049450	Fluid Power Automation Practical	**25**	**100***	**100**	**50**	**3**
4049540	Robotics Practical	**25**	**100***	**100**	**50**	**3**
4049550	PLC & HMI Practical	**25**	**100***	**100**	**50**	**3**
Total		**200**	**800**	**800**		

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

VI Semester

Subject Code	SUBJECT	Examination Marks			Minimum for Pass	Duration of Exam Hours
		Internal Assessment marks	Board Exam Marks	Total Marks		
4049530	Microcontrollers	**25**	**100***	**100**	**40**	**3**
4040610	Industrial Engineering and Management **&**	**25**	**100***	**100**	**40**	**3**
4049620	Industrial Robotics and Material Handling Systems	**25**	**100***	**100**	**40**	**3**
4049630	Advanced Automation	**25**	**100***	**100**	**40**	**3**
4049560	Microcontroller Practical	**25**	**100***	**100**	**50**	**3**
4049640	CIM Practical	**25**	**100***	**100**	**50**	**3**
4049650	Industrial Robotics Practical	**25**	**100***	**100**	**50**	**3**
4049660	IIOT Practical	**25**	**100***	**100**	**50**	**3**
Total		**200**	**800**	**800**		

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

VII Semester

Subject Code	SUBJECT	Examination Marks			Minimum for Pass	Duration of Exam Hours
		Internal Assessmlent marks	Board Exam Marks	Total Marks		
4040570	Entrepreneurship and Startups @	**25**	**100***	**100**	**50**	**3**
4049710	Project Work	**25**	**100***	**100**	**50**	**3**
4049920	Industrial Training – II	**25**	**100***	**100**	**50**	**3**
Total		**50**	**200**	**200**		

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

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

III Semester With Effect from Oct '21

M Scheme		N Scheme	
34031	Electronic Devices and Circuits	4040310	Electronic Devices and Circuits
34232	Electrical Circuits and Machines	4047320	Electrical circuit, Machines and Drives
34942	Machine Element Design	4049320	Machine Element Design
34933	Production Technology	4049330	Production Technology
34034	Electronic devices and Circuits Practical	4040340	Electronic Devices and Circuits Practical
34735	Electrical Circuits and Machines Practical	4047350	Electrical Circuits and Machines and Drives Practical
34756	Programming in C Practical	4049450	Programming in C Practical
34937	Production Technology Practical	4049370	Production Technology Practical

IV Semester With Effect from Apr '22

M Scheme		N Scheme	
32034	Computer Applications and CAD Practical	No Equivalent	
30002	Life and Employability skill Practical	**----**	**No Equivalent**
34991	Industrial Training – I	4049910	Industrial Training – I

V Semester With Effect from Oct '22

M Scheme		N Scheme	
34941	Fluid Power Automation	4020610	Industrial Engineering and Management
34752	Microcontroller and PIC	4049530	Microcontrollers
34043	Digital Electronics	4040430	Analog and Digital Electronics
33044	Transducers and Signal Conditioners	4049420	Measurements and Instrumentation
34954	Fundamentals of Robotics	4049430	Fundamentals of Robotics
34955	Fluid Power Automation Practical	4049460	Fluid Power Automation Practical
34956	Microcontroller and PIC Practical	4049560	Microcontroller Practical
34046	Integrated Circuits Practical	4040460	Analog and Digital Electronics Practical
34957	Robotics Practical	4049540	Robotics Practical

VI SEMESTER – With Effect from Apr '23

M Scheme		N Scheme	
34961	PLC & HMI Programming	4049510	PLC and HMI
32061	Industrial Engineering and Management	4020610	Industrial Engineering and Management
34962	Industrial Robotics and Material Handling Systems	4049620	Industrial Robotics and Material Handling Systems
34953	Computer Integrated Manufacturing	4049520	Computer Integrated Manufacturing
34963	Advanced Automation	4049630	Advanced Automation
34964	Industrial Robotics Practical	4049650	Industrial Robotics Practical
34965	CIM Practical	4049640	CIM Practical
34966	PLC & HMI Practical	4049550	PLC and HMI Practical

VII SEMESTER – With Effect from Oct '23

M Scheme		N Scheme	
34967	Project Work	No Equivalent	
34992	Industrial Training – II	4049920	Industrial Training – II

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

III SEMESTER

2020-21 onwards

ELECTRONIC DEVICES AND CIRCUITS

(Common with Electronics and Communication Engineering)

CURRICULUM DEVELOPMENT CENTRE

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 : Diploma in Robotics and Automation

Subject Code : 4040310

Semester : III Semester

Subject title : **ELECTRONIC DEVICES AND CIRCUITS**

TEACHINGAND 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

4040310 ELECTRONIC DEVICES AND CIRCUITS

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. **1.3: OPTO-ELECTRONIC DEVICES** Definition - Types - Symbol, Working , Characteristics and Applications of LED, 7 Segment LED - Photo diode, Photo	**5** **5** **4**
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 A mplifier 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)** C onstruction- Equivalent circuit-Operation-Characteristics- UJTasa 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** **Transistoroscillators**–Conditionsforoscillation(Barkhausencriterion)-Classifications– Hartley Oscillator– Colpitts Oscillator – RC Phaseshift oscillator	**6** **6** **4**
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**

Reference Books:

1. Electronics Devices & Circuits by Salivahanan S,N.Suresh Kumar, A.Vallavaraj, Tata McGraw Publication 3rd Edition 2016
2. Electronics Devices and circuit theory by Boyestad & Nashelsky, PHI , NewDelhi 2009
3. Electronic Principles by Malvino,-Tata McGraw Hill Publication 2010.
4. ElectronicsDevices&CircuitsbyJacobMillmanandHalkias3rd Edition 2010, Tata McGraw– Hill publication
5. Optical Fiber Communication by GerdKeiser 5th Edition, Tata McGraw– Hill .

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

III SEMESTER

2020-21 onwards

ELECTRICAL CIRCUITS, MACHINES AND DRIVES

(Common with Mechatronics Engineering)

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation
Subject Code : 4047320
Semester : III Semester
Subject Title : **Electrical Circuits, Machines and Drives**

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	
Electrical Circuits, Machines and Drives	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	ELECTRICAL SAFETY & DC CIRCUITS	15
II	AC CIRCUITS AND DC MACHINES	15
III	THREE PHASE SUPPLY AND TRANSFORMER	15
IV	AC MACHINES	14
V	SPECIAL MACHINES & DRIVES	14
Test & Model Exam		7
Total		**80**

RATIONALE:

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

OBJECTIVES:

- Appreciate the safety practices followed in Electrical system.
- Define voltage, current, resistance, resistivity, power, energy and their units.
- State and explain ohm's law and Kirchoff's law and solve simple problems
- Derive equivalent resistance of series and parallel circuits
- State and explain super position theorem, and maximum power transfer theorem and solve problems in theorems
- Explain constructional details of dc machines
- Define the various parameters of single phase supply system
- Derive the impendance, current and voltage of RL, RC & RLC series circuits and also solve the simple problem
- Explain the Explain three phase power measurement by two wattmeter method
- Explain the construction, working and starting methods of single phase, three phase induction motor and Alternator
- Explain the principle and working of different types of induction motor
- Explain the principle and working of transformer
- Compare the use of servo motors and stepper motors in electrical driving system

4047320 ELECTRICAL CIRCUITS, MACHINES & DRIVES

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**ELECTRICAL SAFTEY AND DC CIRCUITS** **Chapter: 1.1: Electrical Safety** Importance of earthing - Electric shock - First aid - Precautions - Causes of accident and their preventive measures **Chapter: 1.2: DC Circuits** Concept of electrical quantities – Voltage – current – resistance – power – energy – ohm's law – Resistances in series – Resistances in parallel – series parallel circuits – Kirchhoff's laws - Super position and maximum power transfer theorems – Statement and explanations – Simple problems (Using Series, Parallel, Ohms Law, KCL& KVL for maximum three loops, Super position and maximum power transfer theorem)	3 12
II	**AC CIRCUITS & DC MACHINES** **Chapter: 2.1: Single phase AC Circuits** AC fundamentals – AC waveform – sinusoidal and non-sinusoidal – period – frequency – cycle – amplitude – phase – peak value – average value – RMS value (effective value) – form factor – AC Through pure resistor, inductor and Capacitor – Concept of impedance – Capacitors in series and parallel – simple problems. Power in AC circuits – power factor– RL, RC and RLC series – Simple problems (RL,RC (Maximum two branch circuit), RLC Series) **Chapter: 2.2: DC Machines** DC generators – construction, principle of operation, types and application - DC motors: - construction, principle of operation, types and application - speed control of DC motor-applications - Necessity of starters: Three point, four point starters	8 7
III	**THREE PHASE AC CIRCUITS & TRANSFORMER** **Chapter: 3.1: Three Phase AC Circuits** Concept of 3 phase supply – line and phase voltage and current in star	8

	and delta connected circuits – three phase power – Measurement of three phase power by two watt meter method – advantages of three phase over single phase system **Chapter: 3.2: Transformers** Transformer – Ideal transformer – principle of working – constructional details – emf equation – turns ratio – core loss – copper loss – efficiency – SC and OC tests – Transformer on No load – Transformer on load – All-day efficiency - Auto transformer – construction and working – applications	7
IV	**AC MACHINES** **Chapter: 4.1: Alternator** 3 phase alternator – construction and working – relation between speed and frequency **Chapter: 4.2: Three phase Induction motor** Three phase induction motors – Squirrel cage and slip ring Induction motors (construction and working principle only) – methods of starting of 3 phase induction motor - DOL and star/delta starter – slip – speed control of 3Φ Induction motor **Chapter: 4.3: Single phase Induction motor** Single phase induction motor – principle of operation – Types – capacitor start motors – Applications	4 6 4
V	**SPECIAL MACHINES & DRIVES** **Chapter: 5.1: Special Machines** PMDC, Stepper motor- construction and working principle and applications - Servo motor – types: brushless servo motor, permanent magnet servo motor construction and applications **Chapter: 5.2: Industrial drives** Types of drives - Group drive, Individual drive, Multi motor drive - Block diagram of Variable frequency drive - Stepper motor drive - Single stepping and half stepping - Servo drives	7 7

Reference Books

1. Electric Circuit Theory Dr.M.Arumugam & Dr.N.Premkumaran, Khanna Publishers, New Delhi
2. A text book of Electrical Technology, Vol. I & II, Theraja. B.L., S.Chand & Co
3. Electrical Technology, Edward Hughes Addision – Wesley International Student Edition
4. Elements of Electrical Engineering, Louis M.M. , Khanna Publishers
5. Elementary of Electrical Engineering, Gupta M.L. ,S.K.Kataria & Sons,
6. Control of Machines - S.K Bhattacharya, Brijinder Singh – New Age Publishers, Second Edition- Reprint 2010

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

III SEMESTER

2020-21 onwards

PRODUCTION TECHNOLOGY

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation

Subject Code : 4049330

Semester : III Semester

Subject Title : **PRODUCTION TECHNOLOGY**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
PRODUCTION TECHNOLOGY	**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	TIME (HRS)
I	Lathe	15
II	Drilling and Boring Machines	15
III	Milling Machines	15
IV	Surface Finishing Processes	14
V	Fundamentals of Metrology	14
Tests and Model Exam		**7**
Total		**80**

RATIONALE:

Production the major and the most important aspects in industrial needs utmost care and attention. Knowledge about the various processes and allied areas will be great

use to the personnel involved in production. This will provide the students an opportunity to skill themselves for the industrial scenario.

OBJECTIVES:

- Knowledge about the lathe and its working parts.
- Describe the functioning of semi-automatic lathe
- Study about the drilling and boring processes
- Study about the Milling and gear generating processes
- Study the milling procedure for spur and helical gears
- Study about grinding, Lapping and Honing processes
- Study about Metrology and measuring instruments

Detailed Syllabus

Contents: Theory

Unit	Name of the Topic	HRS
I	**UNIT – I LATHE** **Lathe:** Introduction - specifications – simple sketch – principal parts – head stock – back geared type – all geared type – feed mechanism - tumbler gear mechanism – quick change gear box – apron mechanism – work holding device – three jaw chuck – four jaw chuck – centres - faceplate – mandrel – steady rest – follower rest – machining operations done on lathe – straight turning – step turning - taper turning methods: form tool – tailstock set over method – compound rest method – taper turning attachment – knurling - Thread cutting – Facing – Boring – chamfering –grooving – parting-off – eccentric turning – cutting speed – feed - depth of cut - metal removal rate.	15
II	**UNIT II – DRILLING AND BORING MACHINES** **Drilling Machines:** Drills – Flat drills – Twist drills – Types of drilling machines – Bench type – Floor type – Radial type – Gang drill – Multi spindle type – principle of operation in drilling – speeds and feeds for various materials- drilling holes – methods of holding drill – drill chucks – sockets and sleeve – drilling operation – reaming – counter sinking – counter boring – spot facing – tapping – deep hole	15

	drilling. **Boring Machines:** Boring machines – Horizontal and vertical types – Fine boring machines – Boring tools **Cutting tool materials:** High Carbon steel – High speed steel – satellites – cemented carbides – ceramics – composition and applications	
III	**UNIT-III MILLING MACHINES** **Milling Machines:** Types – column and knee type – plain – Universal milling machine – Vertical milling machine – specification of milling machines – principle of operation – work and tool holding devices – arbour – stub arbour – spring collets – adapter- Milling cutters – cylindrical milling cutter – slitting saw- side milling cutter – angle milling cutter - T Slot milling cutter – wood ruff key cutter – fly cutter. Milling processes – Conventional milling – Climb milling – Milling operations – straddle milling – Gang milling – Indexing, Methods of Indexing – vertical milling attachment- Manufacturing of spur and Helical milling	15
IV	**UNIT-IV SURFACE FINISHING PROCESSES** Grinding Machines: Types and classification-specifications-rough grinding – pedestal grinders- portable grinders- belt grinders- precision grinding cylindrical grinder- centreless grinders – surface grinder- tool and cutter grinder - planetary grinders-principles of operations-grinding wheel abrasives- natural and artificial diamond wheels -mounting of grinding wheel - Dressing and Truing of Wheels-Balancing of grinding wheels.	14
V	**UNIT- V FUNDAMENTALS OF METROLGY** Introduction – Metrology – Inspection – Accuracy – Precision – Tolerance – Surface finish – Quality – Reliability – Inter-changeability – Optical Fundamentals – Optical instruments – Principle of operation – Interference band - Measurement of Length – Classification of Measuring instruments – Radius measurement –	14

	Measurement of angles – Sine bar and Slip gauges, Sine bar & Sprit level, Angle Gauges – Measurement of tapers – Vernier bevel protractor, tool room microscope, Auto-Collimeter, External taper – Ring gauges measurement by balls and slip gauges – Ring gauge measurement by unequal balls - Screw threads inspection – Elements of thread – gauging of screw thread – thread gauges – Measurement of individual elements of a screw thread (two / Three wires) – Measurement of external threads.	
	Test & Model Exam	7

Text Books:

1. Elements of workshop Technology Volume I & II – HajraChowdry&Bhattacharaya - IIth Edition - Media Promoters & Publishers Pvt. Ltd.,
2. Introduction of basic manufacturing processes and workshop technology – Rajendersingh – New age International (P) Ltd. Publishers,

Reference Books

1. Production Technology – HMT - Edn. 18 - published by Tata McGraw Hill
2. Production Technology - P. C. SHARMA - Edn. X - S.Chand& Co. Ltd., Ram Nagar, New Delhi 110 055 – 2006.
3. Manufacturing process – Begeman – 8th Edition -McGraw Hill, New Delhi 2017.

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

III SEMESTER

2020-21 onwards

MACHINE ELEMENTS DESIGN

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049340

Semester : IV Semester

Subject Title : **Machine Elements Design**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
MACHINE ELEMENTS DESIGN	**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	TIME (HRS)
I	Statics of Particles	15
II	Stress and Strain	15
III	Belt Drives and Gear drives	14
IV	Friction and Bearings	14
V	Torsion and Springs	15
Tests and Model Exam		**7**
Total		**80**

RATIONALE:

Day by day, Engineering and Technology experience tremendously growth. Design plays an important role in developing engineering and technology. Mechanical

Engineering is a backbone for Robotics and Automation. This Fundamentals of Mechanical Engineering deals with generally with the material properties, behaviour of materials when they are subjected to action of forces. Evaluations derived from these basic fields provide tools for investigation of mechanical structure.

OBJECTIVES

- Define various support reactions and equilibrium
- Calculate the deformation of materials, which are subjected to axial load and shear
- Calculate the power transmission through belt drives and gear drives
- Study the various types of bearings and their applications
- Calculate the power transmission through solid and Hollow shafts

Detailed Syllabus

Contents: Theory

Unit	Name of the topic	Hrs
I	**UNIT – I STATICS OF PARTICLES** Introduction – Force - effects of a force - system of forces – resultantof force - Principle of transmissibility - parallelogram law of forces -triangular law - resultant of several forces acting on a particle -polygon law - resolution of a force into rectangular components –resultant of a system of forces acting on a particle using rectangularcomponents - equilibrium of particles. External and internal forces - moment of a force - Varignon's theorem- moment of a couple - equivalent couples - addition of couples -resolution of a force into a force and a couple - Free body diagram -Necessary and sufficient conditions for the equilibrium of rigid bodiesin two dimension - Support reaction - types of support - removal oftwo dimensional supports - Simple problems only.	15
II	**UNIT II – STRESS AND STRAIN** **Mechanical properties of materials:** Engineering materials – Ferrous and non-ferrous materials **-** Definition of mechanicalproperties - Fatigue,fatigue strength, creep –	15

	temperature creep – cyclic loading andrepeated loading – endurance limit. **Simple stresses and strains:** Definition – Load, stress and strain – Classification of force systems – tensile, compressive and shear forcesystems – Behaviour of mild steel in tension up to rupture – Stress –Strain diagram – limit of proportionality – elastic limit – yield stress –breaking stress – Ultimate stress – percentage of elongation andpercentage reduction in area – Hooke's law – Definition – Young'smodulus - working stress, factor of safety, load factor, shear stressand shear strain - modulus of rigidity. Linear strain – Deformation dueto tension and compressive force – Simple problems in tension,compression and shear force.Definition – Lateral strain – Poisson's ratio – volumetric strain – bulkmodulus – volumetric strain of rectangular and circular bars –problems connecting linear, lateral and volumetric deformation –Elastic constants and their relationship - Problems on elasticconstants - Definition – Composite bar – Composite barssubjected to tension and compression – Simple problems	
III	**UNIT-III BELT DRIVES AND GEAR DRIVES** **Gear Drives** Introduction – Classification of gears – Nomenclature of a gear – Application of spur, Helical and Bevel Gears, Worm and worm wheel, rack and pinion – Velocity of a gear drive – merits and demerits of gear drive – Problems on simple gear train and power transmitted by gear **Belt drives** Belt drives – Types – Open Belt drive – Cross belt drive – Flat belt drive – V belt drives – Problems on power transmissions	14
IV	**UNIT-IV FRICTION AND BEARINGS** **FRICTION:** Introduction - Definition - Force of friction - Limiting friction – Staticfriction - Dynamic friction - Angle of friction - co-efficient of	14

	friction -Laws of static and dynamic friction. **BEARINGS:** Introduction- Types of bearings. Ball bearing - angular contact, axial, deep groove. Roller bearing-cylindrical, spherical, tapered, needle. Applications of bearings - Loads acting on bearing-Selection of bearings-Lubrication of bearings-Specification of bearings.	
V	**UNIT- V TORSION AND SPRINGS** Theory of torsion – Assumptions – torsion equation –strength of solid and hollow shafts – power transmitted – Definition –Polar modulus – Torsional rigidity – strength and stiffness of shafts – comparison of hollow and solid shafts in weight and strengthconsiderations – Advantages of hollow shafts over solid shafts – Problems.Types of springs – Laminated and coiled springs and applications – Types of coiled springs – Difference between open and closely coiledhelical springs – closely coiled helical spring subjected to an axialload – problems to determine shear stress, deflection, stiffness andresilience of closed coiled helical springs	15
	Test& Model Exam	7

Text Books:

1. Strength of Materials, S. Ramamrutham, 18thEdn 2017, DhanpatRai Pub. Co.
2. Strength of Materials, R. S. Khurmi, S.Chand& Co., Ram Nagar, New Delhi.
3. Rattan.S.S, ―Theory of Machines‖, Tata McGraw -Hill Publishers, New Delhi 2018.

Reference Books

1. Engineering mechanics, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 5th Edition, 2017
2. Thomas Bevan, ―Theory of Machines‖, CBS Publishers and Distributors, 6th Edition, 2017.
3. Strength of materials, S.S.Rattan, Tata Mcgraw hill, New Delhi,2018,

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

III SEMESTER

2020-21 onwards

ELECTRONIC DEVICES AND CIRCUITS PRACTICAL

(Common with Electronics and Communication Engineering)

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE III

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 : Diploma in Robotics and Automation

Subject code : 4040340

Semester : III

Subject title : **ELECTRONIC DEVICES AND CIRCUITS PRACTICAL**

TEACHING AND SCHEME OFEXAMINATION:

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&DDepartment 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 experience 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

4040340 ELECTRONIC DEVICES AND CIRCUITS PRACTICAL

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 AstableMultivibrator
12. Construct a circuit totest the negative resistance Characteristics of UJT.

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

CIRCUIT DIAGRAM	:	25
CONNECTION	:	25
EXECUTION & HANDLING OF EQUIPMENT	:	25
OUTPUT / RESULT	:	15
VIVA – VOCE	:	10
TOTAL	:	100

LIST OF EQUIPMENTS

S.NO	Name of the Equipments	Range	Required Nos.
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

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

III SEMESTER

2020-21 onwards

ELECTRICAL CIRCUITS, MACHINES AND DRIVES PRACTICAL

(Common with Mechatronics Engineering)

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE III

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 : Diploma in Robotics and Automation Engineering

Subject Code : 4047350

Semester : III Semester

Subject Title : **Electrical Circuits, Machines & Drives 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, Machines & Drives 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, practical subjects are introduced for every corresponding theory subject. This practical supports the aim and objective of Electrical Machines and Electrical Circuit.

OBJECTIVES:

- Verify Basic Electrical circuits laws & Theorems - KCL, KVL super position theorem and power transfer theorem
- Conduct load test on single phase transformer

- Conduct Load test and No Load test on DC generator
- Test the speed control methods of DC and AC motor
- Explore the performance of ELCB, MCB.
- Identify the drive circuit for special motors
- Test the speed control circuit of the Electric motors

4047350 ELECTRICAL CIRCUITS, MACHINES AND DRIVES PRACTICAL

DETAILED SYLLABUS

Contents: **Practical**

LIST OF EXPERIMENTS

1. Verify Kirchhoff's current Law and Voltage Law
2. Test and Verify Maximum Power Transfer theorem
3. Test and verify Super position theorem
4. Testing of DC starters – 3 point and 4-point starter
5. Load test on DC shunt motor
6. Speed control of DC motor using DIAC and TRIAC
7. Testing of AC starters - DOL, star - Delta starter
8. Speed control of AC motor using DIAC and TRIAC
9. Testing of relays, contactors, push buttons, MCB & ELCB
10. Predetermine the efficiency by open circuit and short circuit test on single phase transformer
11. Conduct Load test on Single phase transformer
12. Testing of Stepper motor drive

Details of Mark Allocation

Sl. No	Name of the Activity	Mark Allocation
1.	Circuit Diagram	25
2.	Connection & Procedure	30
3.	Reading, Calculation & Graphs	25
4.	Result	10
5.	Viva Voce	10
Total		**100**

Equipment Requirements

Sl. No	Name of the Equipment	Range / Specification	Required Quantity
1.	Dual power supply	0-30 V	5 No's
2.	Single phase Transformer	1 KVA, 250V	2 No's
3.	DC Shunt Motor with Loading arrangement	3/5 KW, 220 V DC	1 No
4.	Three Phase Squirrel Cage Induction Motor with loading arrangement	1/3/5 Hp	1 No
5.	Stepper motor Control Kit	-	1 No
6.	DC motor Speed control Kit	-	1 No
7.	AC Motor Speed control Kit	-	1 No
8.	DOL Starter	5Hp, 415 V	1 No
9.	Star Delta Starter	20A,600V	1 No
10.	Variac (Autotransformer)	0 – 250 V	1 No
11.	Three point Starter	20 A, 220 V	1 No
12.	Four Point Starter	20 A, 220 V	1 No
13.	MCB – Single & Three Pole	20 A	Each 1 No
14.	ELCB	2 Pole, 20 A	1 No
15.	DC Ammeter	Different ranges	10 No's
16.	DC Voltmeter	Different ranges	10 No's
17.	AC Ammeter	Different ranges	10 No's
18.	Tachometer	0-1000rpm	1 No
19.	Resistive Load Bank	1 KW	1 No

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

III SEMESTER

2020-21 onwards

PRODUCTION TECHNOLOGY PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049370

Semester : III Semester

Subject Title : **Production Technology Practical**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
Production Technology Practical	**4**	**64**	**25**	**100***	**100**	**3 Hrs**

RATIONALE:

Production Technology is the major and the most important aspects in manufacturing industries which needs utmost care and attention. Knowledge and skill about the various processes and allied areas will be great use to the personnel involved in production. This will provide the students an opportunity to skill themselves for the industrial scenario.

OBJECTIVES:

- Identify the parts of lathe, Milling, Drilling and Grinding Machines
- Identify the work holding and Tool Holding devices used in Lathe, Drilling, Milling and Grinding machines
- Set the tools for various operations
- Machine the component as per the drawings
- Prepare a record of work for all the exercises

4049370 - Production Technology Practical

Detailed Syllabus

Contents: Practical

LIST OF EXPERIMENTS

Lathe Exercise

1. Plain Turning
2. Step Turning
3. Step and Taper Turning
4. Knurling and Thread cutting

Drilling Exercise

1. Drilling and Tapping
2. Drilling and Counter Boring
3. Drilling and Counter sinking
4. Drilling and Reaming

Milling Exercise

1. Plain Milling
2. Spur Gear Milling

Cylindrical Grinding Exercise

1. Shaft Grinding
2. Plug Gauge grinding

Surface Grinding Exercise

1. Square surface grinding

BOARD EXAMINATION

Note: Any one question will be asked for the board examination from the questions listed below.

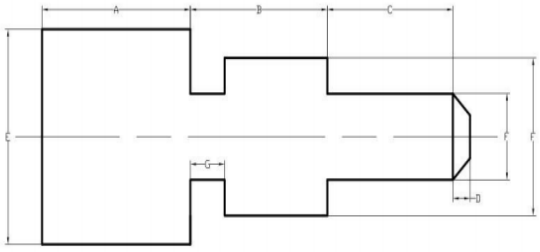
DETAILED ALLOCATION OF MARKS

A. Lathe or Milling	**-**	**45 Marks**
Procedure	-	15 Marks
Machining	-	20 Marks
Finishing	-	10 Marks
B. Drilling or Grinding	**-**	**45 Marks**
Procedure	-	15 Marks
Machining	-	20 Marks
Finishing	-	10 Marks
C. Viva Voce	**-**	**10 Marks**
Total	**-**	**100 Marks**

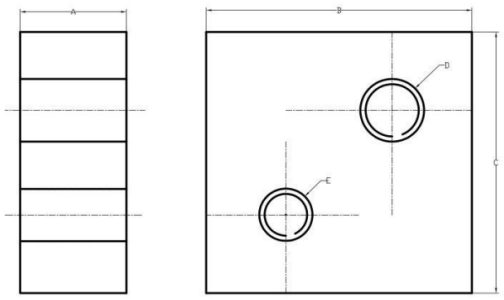
Board Examination-Question Paper Pattern

Answer any ONE Questions (2x45=90 marks)

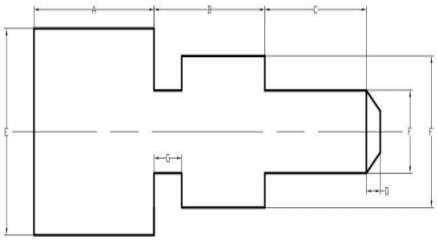
1 A. Write the tools required and step by step procedure to make the Plain Turning using a lathe. (45)



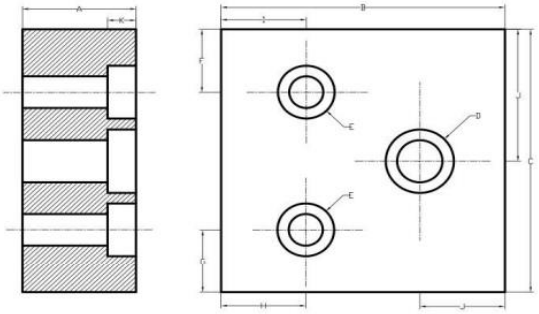
B. Write the tools required and step by step procedure to make the Drilling and Tapping using a drilling machine. (45)



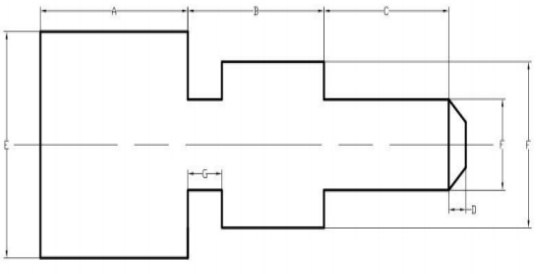
2 A Write the tools required and step by step procedure to make the Step Turning using a lathe. (45)



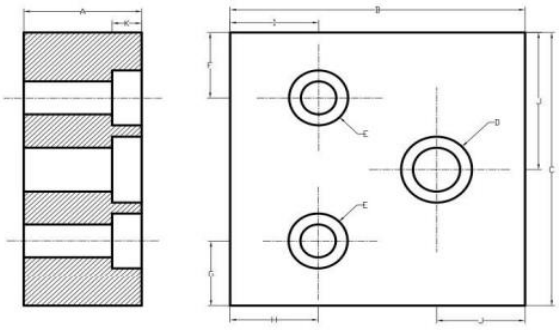
B. Write the tools required and step by step procedure to make the Drilling and Counter Boring using a drilling machine. (45)



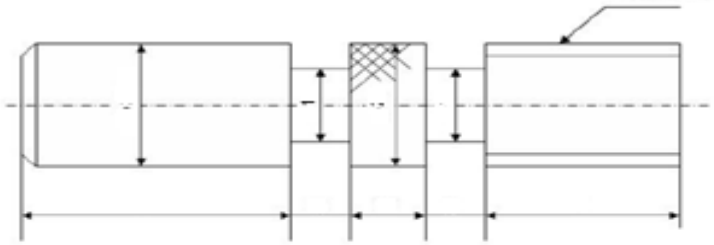
3 A Write the tools required and step by step procedure to make the Step and Taper Turning using a lathe. (45)



B. Write the tools required and step by step procedure to make the Drilling and Counter sinking using a drilling machine. (45)

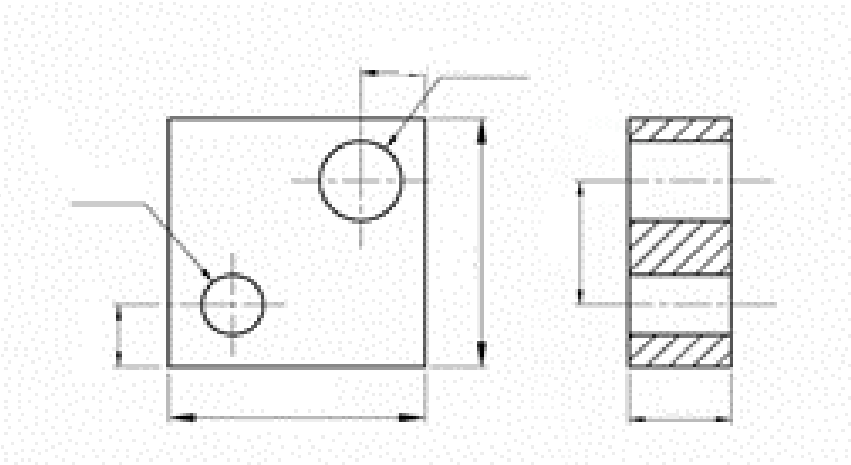


4 A Write the tools required and step by step procedure to make the Knurling and Thread cutting using a lathe. (45)

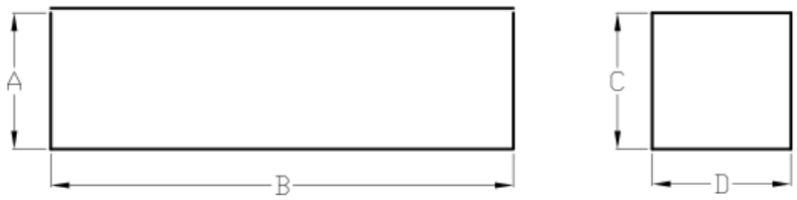


THREAD CUTTING AND KNURLING

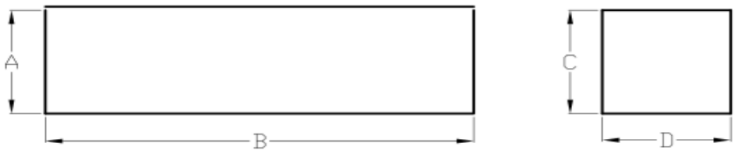
B. Write the tools required and step by step procedure to make the Drilling and Reaming using a drilling machine. (45)



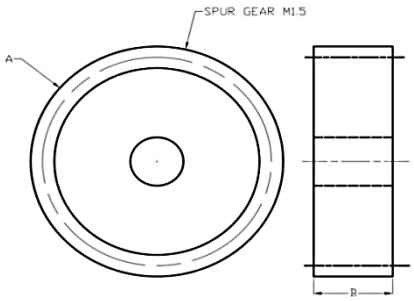
5 A Write the step by procedure to make the following plain Milling using milling Machine. (45)



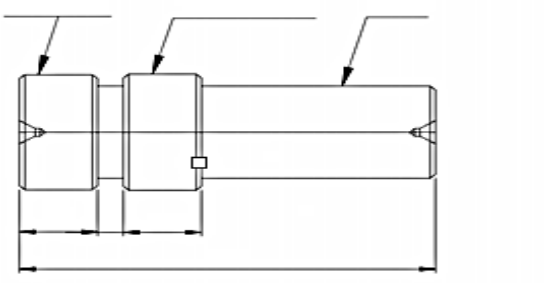
B. Write the step by step procedure to make the following Square surface grinding using surface grinding machine



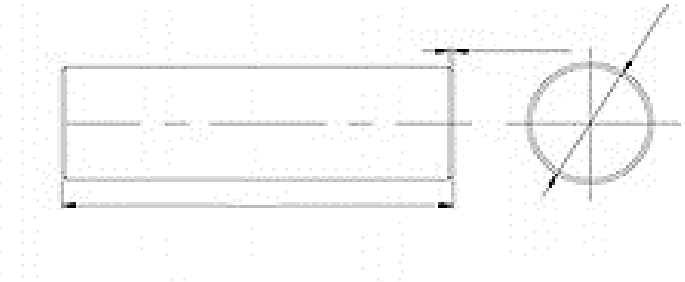
6. A Write the step by procedure to make the following Spur Gear Milling using milling.Machine by Differential Indexing (45)



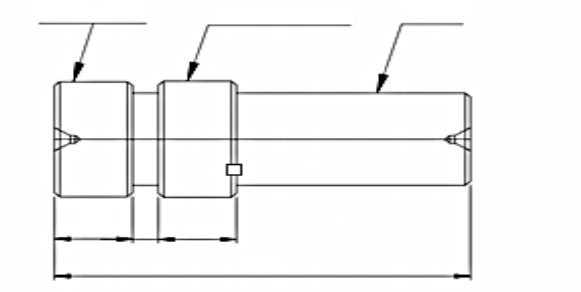
B. Write the tools required and step by step procedure to make the Shaft Grinding using a Cylindrical Grinding machine. (45)



7. A. Write the tools required and step by step procedure to make the Plain Turning using a lathe. (45)



B. Write the tools required and step by step procedure to make the Plug Gauge Grinding using a Cylindrical Grinding machine. (45)



LIST OF EQUIPMENT

S No	Name of the Equipment / Machinery	No of Quantity
1	Lathe	10
2	Milling Machine	3
3	Cylindrical Grinding Machine	1
4	Surface Grinding Machine	1
5	Drilling Machine	3

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

IV SEMESTER

2020-21 onwards

ANALOG AND DIGITAL ELECTRONICS

(Common with Electronics and Communication Engineering)

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4040430

Semester : IV Semester

Subject Title : **Analog and Digital Electronics**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		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	TIME (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

4040430 – ANALOG AND DIGITAL ELECTRONICS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	HRS
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	10
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:IC555 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	13

	Regulators: 79XX and General purpose IC Voltage Regulators using LM 723.	
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	10
IV	**COMBINATIONAL ANDSEQUENTIALLOGIC 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	12

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.	12
	Test &Model Exam	7

Reference books:

1. Albert Paul Malvino and Donold P. Leach – Digital Principles and Applications
2. Roger L. Tokheim Macmillan – Digital Electronics – McGraw – Hill –1994.
3. William H.Goth Mann – Digital Electronics – An introduction to theoryand practice – PHI 1998.
4. Linear integrated circuits by B.Suseela &T.R.Ganeshbabu -Scitech publications-2018
5. Integrated circuits by K.R.Botkar-Khanna publisher's-1996.
6. D.Roychoudhury & Shail. B.Jain- Linear Integrated Circuits -New age International publishers - II Edition -2004.

7.R.P.Jain – Modern Digital Electronics – TMH 2003.

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

IV SEMESTER

2020-21 onwards

MEASUREMENTS AND INSTRUMENTATION

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code :4049420

Semester : IV Semester

Subject Title : **Measurements and Instrumentation**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
Measurements And Instrumentation	**4**	**64**	**25**	**100***	**100**	**3 Hrs**

Topics and allocation of hours:

UNIT	TOPIC	TIME (HRS)
I	Introduction to Measurement System, Electrical Measurements	12
II	Strain, Force and Displacement Measurement	11
III	Pressure, Level and Flow Measurement	12
IV	Temperature and Level Measurement	11
V	Transmitters and Data Acquisition System	11
Tests and Model Exam		**7**
Total		**64**

RATIONALE

Sound knowledge about various measurement techniques used in industries is essential for the student of automation engineering. This subject provides the knowledge of measurement of strain, displacement, force, temperature using various types of transducers/transmitters and related circuits.

Sensors and transducers are used in automation in construction, domestic appliances industries, transport, space exploration, defence equipment, health services and other applications. Transducers have achieved substantial accuracy and control in Industrial automation; Transducers lie at the heart of instrumentation. Hence it becomes imperative to study about the principles and applications of various types of transducers in a single volume in Diploma level.

OBJECTIVES

- To learn about fundamentals of measurement system.
- To acquire adequate knowledge about electrical measurements.
- To understand the necessity and advantages of transducer.
- To learn about different types of transducers.
- To learn the operation and applications of capacitive and inductive transducer.
- To learn about various active transducers and their applications.
- To understand the concept of Data acquisition system.
- To know the concept of signal conditioning.

Detailed Syllabus

Content: Theory

Unit	Name of the Topics	HRS
I	**INTRODUCTION TO MEASUREMENT SYSTEM, ELECTRICAL MEASUREMENTS** Functional elements of an instrument - Units and Standards - Static characteristics - accuracy, precision, sensitivity, linearity, Reproducibility, Repeatability - Dynamic characteristics – Dynamic error, speed of response, measurement lag, settling time - Introduction to transducer - Classification of transducers – Selection of transducers. Electrical Measurements: Analog vs Digital Instruments – Operating Forces – Deflecting force, controlling force, damping force – PMMC and	12

	Moving iron instrument – Dynamometer – Measurement of Resistance and Impedance – Wheatstone bridge, Kelvin bridge, Schering bridge – Digital voltmeter - Multimeter	
II	**STRAIN, FORCE AND DISPLACEMENT MEASUREMENT** **Strain:**Types of strain gauges – Theory of operation of resistive strain gauge – Electrical strain gauges – Application of strain gauges. **Force:** Types of load cells – Hydraulic load cell - Pneumatic load cell – Piezoelectric load cell **Displacement:** LVDT - Capacitive transducer – Inductive transducer – Shaft encoders - Speed Measurement: AC and DC tachogenerators	11
III	**PRESSURE AND FLOW MEASUREMENT** **Pressure:** Units and scale of pressure – Type of manometers - U tube manometer – Elastic pressure gauges – Bourdon tube – Bellows – Diaphragm type - Electrical methods – Piezo electric transducers – LVDT for pressure measurement – Vacuum Measurement – Pirani Gauge – ionization gauge. **Flow:** Differential pressure meter: Orifice plate, Venturi tube – Turbine flow meter – Electromagnetic flow meter – Hot wire anemometer - Ultrasonic flow meter	12
IV	**TEMPERATURE AND LEVEL MEASUREMENT** Units and Standards of temperature – Filled in system thermometer – Bimetallic thermometers – Thermocouple – Principle of operation, Types – Signal conditioning of thermocouple - RTD – Thermistor – High temperature measurement: Total radiation pyrometer, Optical pyrometer. Level: Types of level measurement – Float gauges – Electrical methods: Resistive type, Capacitive type, Inductance type, Ultrasonic type and Radiation method.	11
V	**TRANSMITTERS AND DATA ACQUISITION SYSTEM** Pneumatic transmitter – Electronic transmitter – Operation – 2 wire and 4 wire transmitter – Smart transmitters – Application: Operation of Pressure transmitter, Temperature transmitter. Components of analog data acquisition system – Digital data acquisition system, Signal conditioning circuit – Signal converters, recorders,	11

	Display devices.	
	Test &Model Exam	7

TEXT BOOK

S.No	Title	Author	Publishers
1.	Transducers and Instrumentation	DVS Murty	PHI 2009

REFERENCE BOOK

S.No	Title	Author	Publishers
1.	Sensor and Transducers	D. Patranabis	PHI 2011
2.	A Course in Electrical and Electronics Measurements and Instrumentation.	1.A.K. Sawhney 2.Puneet Sawhney	DhanpatRai& Co (P) Ltd., New Delhi 1993
3.	Measurement and Instrumentation	Arun. K	PHI 2010
4.	Operational Amplifiers and Linear Integrated Circuits	1.Robert F. Coughlin 2.Frederick F. Driscoll	PHI 1992
5.	Op. amp & Linear Integrated Circuits	Ramakant. A. Gayakwad	PHI 1992

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

IV SEMESTER

2020-21 onwards

FUNDAMENTALS OF ROBOTICS

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049430

Semester : IV Semester

Subject Title : **FUNDAMENTALS OF ROBOTICS**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
FUNDAMENTALS OF ROBOTICS	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

Topics and allocation of hours:

Unit No	Topics	Hours
I	Introduction to Robotics Systems	14
II	Robot Kinematics and Sensor	15
III	End Effectors	14
IV	Drives and Control System For Robotics	15
V	Robot Programming	15
	Test and Model Exam	7
	Total	**80**

RATIONALE:

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

OBJECTIVES:

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

Detailed Syllabus

Contents: Theory

UNIT	NAME OF THE TOPIC	HOURS
I	**FUNDAMENTAL OF ROBOTIC SYSTEMS** Introduction –Definition – History - Law of robotics, Terminology of Robotics – Robot Anatomy – Robot joints and links – Types of joints - Joint Configuration of robots/Coordinate systems – Joint notation scheme – Wrist Configuration - Pitch, Yaw, Roll – End Effector - Types of robots - Specifications of Robot – Robot Classifications- Architecture of robotic systems	14
II	**ROBOT KINEMATICS AND SENSORS** Forward kinematics, Inverse kinematics and differences – Forward kinematics and Reverse kinematics of manipulators with Two and Three degrees of freedom – Deviations. – Robot dynamics – Static analysis. Sensors in robot – Position sensor (Piezo electric sensor) - Touch sensors (Binary sensor) -Tactile sensor – Proximity and Range sensors – Robotic vision sensor-Wrist force sensor-Light sensors, Pressure sensors.	15
III	**END EFFECTORS** Mechanical grippers-Slider crank mechanism, Screw type, Rotaryactuators, cam type-Magnetic grippers-Vacuum grippers – Pneumatic grippers-Gripper force analysis-Gripper design- Selection	14

	and design considerations.	
IV	**DRIVES AND CONTROL SYSTEM FOR ROBOTICS** Objectives, open loop control, closed loop control with velocity and position feedback , robot path control – point to point – continuous path control – sensor based path control, Types of drive system, Functions of Drive system, Hydraulic drives, Pneumatic drives, Electrical drives, Servo drive.	**15**
V	**ROBOT PROGRAMMING** Basic robot languages – generating of robot programming languages – On-Line & Off-Line programming - robot language structure – Teach Pendant Programming, Lead through programming, Robot programming Languages –VAL Language – Motion Commands, Sensor Commands, End effecter commands, and Simple programs-(Robot welding application using VAL Language, Introduction to Artificial intelligence.	**15**
	TEST & REVISION	**7**

TEXT BOOKS

1. Mikell P Groover& Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, “Industrial Robotics Technology Programming and Applications”, McGraw Hill, 2012.
2. R.K.Mittal, I.J.Nagrath, Robotics and controls, Tata Mcgraw Hill Education Pvt.
3. Janaki Raman. P.A, “Robotics and Image Processing an Introduction”, Tata McGraw Hill Publishing company Ltd., 1995.

REFERENCES

1. Deb. S.R, “Robotics Technology and flexible automation”, Tata McGraw-Hill Education, 2009.
2. Richard D. Klafter, Thomas. A, ChriElewski, Michael Negin, “Robotics Engineering an Integrated Approach”, Phi Learning., 2009.
3. Francis N. Nagy, AndrasSiegler, “Engineering Foundation of Robotics”, Prentice Hall Inc., 1987.
4. Carl D. Crane and Joseph Duffy, “Kinematic Analysis of Robot manipulators”, Cambridge University Press, 2008.

5. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”, McGraw Hill Book co, 1987.
6. Craig. J. J. “Introduction to Robotics Mechanics and Control”, Addison- Wesley, 1999.
7. Ray Asfahl. C., “Robots and Manufacturing Automation”, John Wiley & Sons

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

IV SEMESTER

2020-21 onwards

FLUID POWER AUTOMATION

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049440

Semester : IV Semester

Subject Title : **FLUID POWER AUTOMATION**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
FLUID POWER AUTOMATION	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

Topics and allocation of hours:

UNIT	TOPIC	TIME (HRS)
I	Introduction to Fluid Power Automation	16
II	Hydraulic Pumps and Actuators	15
III	Control Components and Hydraulic circuit design	15
IV	Pneumatic System	13
V	Electrical control: Components and Circuits	14
Tests and Model Exam		**7**
Total		**80**

Objectives:

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

- Understand the different types of automation
- Differentiate between Manual and Electrical Hardwire control

- Explain the PID, servo and stepper control system
- Understand the need of the switches
- Explain the working and operations of different types of electrical Relay and Timers
- Develop simple control circuit with preventive interlock
- Understand the need of Pneumatic system
- Explain the working principles of Pneumatic components
- Understand the need of Hydraulic system
- Explain the working principles of Hydraulic components
- Develop Electrical control circuit for three phase cage induction motor
- Develop Pneumatic control circuit for industrial application
- Develop Hydraulic control circuit for industrial applications

Detailed Syllabus

Contents: Theory

Unit	Name of the topic	Hrs
I	**Introduction to Fluid Power Automation:** Fluid Power System: Definition, Types, Application and Advantages of Fluid Power, Basic concept of Pascal's Law, Comparison of Hydraulics and Pneumatics, Properties of fluids (Density, Specific Gravity, Specific Weight, Viscosity, Kinematic Viscosity, Bulk Modulus, Pour Point, Demulsibility, Oxidation Resistance) Introduction to Automation –Definition - Need for Automation –Block diagram of Automation System –Elements of an Automated System – Functions of Automation – Levels of Automation – Types of Production System (Continuous flow process, Mass Manufacturing, Batch production, Job Shop Production) - Types of Automation (Fixed Automation, Programmable Automation, Flexible Automation, Integrated Automation) – Benefits and Impact of Automation in Manufacturing and Process Industries – Industrial Control Systems (Continuous, Discrete, Sequential logic, Supervisory) -Control system (P, PI,PID Control, Servo control, Stepper control)	16

II	**Hydraulic Pumps and Actuators:** **Pumps:** Classification of pumps – Principle of Positive displacement pumps – Construction and Working of Gear pumps, Vane pumps and Axial Piston pump – Pump Performance Characteristics – Pump selection factors – Accumulator and Types – Gas loaded accumulator – Pressure intensifier **Actuators:** Classification of actuators – Linear actuator: Definition and Types – Single acting cylinder – Double acting cylinder – Telescopic cylinder – Tandem cylinder. **Rotary actuators**: Definition and Types – Gear motor, Piston motor – Two vane semi rotary actuator – Rack and Pinion semi rotary actuator. ISO symbols of hydraulic pumps and actuators.	15
III	**Hydraulic Control Components and Hydraulic circuit design** Control Valves: Classification of valves – Poppet vs Sliding Spool Vs Rotary Spool Valves DCV: Two-way valve – Three-way valve – Four-way valve – Check valve – Valve actuation types. FCV: Needle valve – Pressure compensated flow control valve PCV: Pressure relief valve – Pressure sequence valve Hydraulic Circuit Design: Control of single acting cylinder – Control of double acting cylinder – Counterbalance circuit – Pressure sequence circuit – Hydraulic regenerative circuit – Pressure intensification circuit.	15
IV	**Pneumatic System** Pneumatic system: Basic principle and its structure - Compressor Types – Two stage piston Compressor – Screw compressor – Air treatment – FRL unit – 5/2 DCV – Double pilot dcv - Quick exhaust valve – Shuttle valve – One way FCV – Time delay valve - Pneumatic double acting cylinder – Air motor. Pneumatic Circuits: Direct and Indirect actuation of cylinders – Use of shuttle valve and quick exhaust valve - Speed control circuit (Meter – in & Meter – out)	13
V	**Electrical control: Components and Circuits** Switches – Push button, selector, drum, limit, pressure, temperature(Thermostat), float, zero speed and proximity switches. Relays –DC relay, latching relay - Over current relay –Timer –Electronic timer. Solenoid operated dcv, Electrohydraulic Servo and proportional valves -	14

	Solenoid type contactor (Air break contactor), Solid state relay. **Control Circuits**: AC motor starter – DOL - Interlocking of drives – Indirect actuation of cylinders using relay – Logic control circuit for pneumatics/hydraulics (AND/OR) – Industrial applications: Furnace door control, Package lifting device (Both Pneumatic Control)	
	Test and Revision Class	7

Text Book:

1. Industrial Hydraulics –Third Edition John J.Pippenger Tyler, G.Hicks. Mc.Graw-Hill Book Company.
2. Introduction to Fluid Power--James L. Johnson. -Delmar Thomson Learning Inc.
3. Control of Electrical Machines. S.K. Bhattacharya New Age International Publishers, New Delhi

Reference Books:

1. Hydraulics and Pneumatics - (HB) Adrewparr –Jaico Publishing House.
2. Pneumatic and Hydraulic Systems - Bolton W. Butterworth-Heinemann-1987
3. Industrial motor control. Stephen Herman 6th Edition, Cengage Learning.

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

IV SEMESTER

2020-21 onwards

PROGRAMMING IN C PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049450

Semester : IV Semester

Subject Title : Programming in C Practical

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
Programming in C Practical	**5**	**90**	**25**	**100***	**100**	**3 Hrs**

OBJECTIVES:

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

- Analyse the given problem
- Think the logic to solve the problem
- Develop programs using input and output operations, functions with decision making statements.
- Proficient to Write programs using array, string, pointers

THEORY:

Keywords, Constants, Variables and Datatypes:

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

Operations and Expressions:

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

I/O Statements:

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

Functions:

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

Decision Making, Branching, Looping and Arrays

Introduction:

Simple if statement.

Decision Making & Branching:

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

Looping:

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

Arrays:

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

Character String and Functions

Character Strings:

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

User Defined Functions:

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

Structures & Unions:

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

Pointers and File Management

Macro Substitution; File Inclusion; Compiler Controlled Directives.

Pointers

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

List of Exercises:

1. Program to calculate simple and compound interest.
2. Solution of a Quadratic Equation.
3. Program for Pay bill calculation.
4. Program to compute sum of series using While loop.
5. Printing of multiplication table using Do…While loop.
6. Program to find whether the given number is a positive number, negative number or zero.
7. Program to sort a list of numbers
8. Program to sort the strings.
9. Preparation of the rank list of a class of students.
10. Program to implement Matrix addition.
11. Program to implement Matrix Multiplication.
12. Program to implement Fibonacci series.
13. Program to find factorial of given N numbers without recursion.
14. Program to find factorial of given N numbers with recursion.

HARDWARE REQUIRMENT

Desktop Computer / Laptop	- 30 No’s
Laser Printer	- 1 No

SOFTWARE REQUIREMENT

C Compiler and Editor	- Any Free Version

BOARD EXAMINATION

Note: Any one question will be asked for board practical exam from the questions listed below.

DETAILLED ALLOCATION OF MARKS

Writing Program	-	40 Marks
Execution	-	40 Marks
Result	-	10 Marks
Viva voce	-	10 Marks
Total	-	100 Marks

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

IV SEMESTER

2020-21 onwards

FLUID POWER AUTOMATION PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049460

Semester : IV Semester

Subject Title : **Fluid Power Automation Practical**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
Fluid Power Automation Practical	**4**	**64**	**25**	**100***	**100**	**3 Hrs**

RATIONALE

Various control operations are to be performed on the hydraulic, pneumatic and electrical actuators to suits the industrial requirements. Maintenance technicians are mainly employed to look after the process automation. To make our students employable, they have to be trained in using various control components and circuits. This subject fulfils that requirement.

OBJECTIVES

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

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

- Trouble shoots in pneumatic and hydraulic circuits
- Make use of various types of control circuit elements like industrial switches, relays, timers, solenoids, contactors and interlocking arrangement.
- Construct control circuits for ON & OFF, Remote and Preventive interlock operations.

Detailed Syllabus

Contents: Practical

LIST OF EXPERIMENTS

Part A – PNEUMATICS LAB

1. Operation of single acting and double acting cylinder.
2. Operation of a Double Acting cylinder with Quick exhaust valve.
3. Speed control of Double Acting cylinder using metering in and metering out circuit.
4. Automatic operation of Double Acting cylinder in multi cycles -Using limit switches and memory valves.
5. Automatic operation of Two Double Acting cylinder in multi cycles -Using limit switches and memory valves in the following sequence: A+B+A-B-

Part B - HYDRAULICS LAB

6. Speed control Hydraulic Motor using metering-in and metering-out control.
7. Sequential operation of Double Acting cylinders using pressure sequencing valve
8. Operation of a Double Acting cylinder using solenoid operated Directional control valve.
9. Automatic operation of Two Double Acting cylinders in multi cycles -Using solenoid valves and proximities in the following sequence: A&B+A-B-

Part C Electrical Control Lab

10. Construct and test simple ON and OFF control using single pushbutton switch.
11. Construct and test the electrical interlocking and sequence control circuit.
12. Electrical actuation of pneumatic cylinder using logical circuits (AND & OR).
13. Indirect actuation of pneumatic cylinder using relay.
14. Automatic operation of a pneumatic cylinder with time delay – Single cycle (Forward, Time Delay, Return).

BOARD EXAMINATION

Note: Any one question will be asked for board practical exam from the above exercises.

DETAILED ALLOCATION OF MARKS

Circuit Diagram	: 40 Marks
Connection and Execution	: 40 Marks
Result	: 10 Marks
Viva Voce	: 10 Marks
Total	**: 100 Marks**

LIST OF EQUIPMENTS

Sl. No	Name of the Equipment	Quantity Required
Pneumatics Lab		
1.	Basic Trainer Kit	2 No's
2.	Electro Pneumatic Trainer Kit	2 No's
Hydraulic Lab		
3	Basic Trainer Kit	2 No's
4.	Electro Hydraulic Trainer Kit	1 No
Control Circuit Component		
5.	Three Phase Induction Motor – ¼ HP , 440 V, 50Hz	4 No's
6.	Single Phase water pump motor	2 No's
7.	Sensors 1) Proximity Sensors 2) Limit Switches 3) Reed switch	 4 No's 8 No's 4 No's
8.	230 V / 440 V Contactor	10 No's
9.	230 V AC / 24 V DC External Timer	5 No's
10.	Push button (NO & NC Contact)	Each 10 No's

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II YEAR

N SCHEME

IV SEMESTER

2020-21 onwards

ANALOG AND DIGITAL ELECTRONICS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4040460

Semester : IV Semester

Subject Title : **Analog and Digital Electronics Practical**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
Fluid Power Automation Practical	**4**	**64**	**25**	**100***	**100**	**3 Hrs**

* 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 andFull 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 Astablemultivibrator using IC 555
- Design IC Voltage RegulatorPower Supplies using IC 7805, IC 7912
- Design the PCB of4- 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 andFull 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 of4- bit ripple counter using FF using Software tool Multisim / OrCAD etc

BOARD EXAMINATION

DETAILED ALLOCATION OF MARKS

CIRCUIT DIAGRAM	: 25
CONNECTION	: 30
EXECUTION & HANDLING OF EQUIPMENT	: 20
OUTPUT / RESULT	: 15
VIVA – VOCE	: 10
TOTAL	: 100

LIST OF EQUIPMENTS

S No	Name of Equipments	Range	Quantity Required
1.	DC Regulated Power Supply	(0-30)V, 1A	5
2.	IC Voltage Power Supply	(0-5)V, 1A (15-0-15)V, 1A	5 5
3	Signal Generator	1 MHz	4
4.	Dual Trace CRO	20MHz/30MHz	5
5.	Digital Trainer	-	10
6.	DC Voltmeter (Analog / Digital)	Different Ranges	5
7.	DC Ammeter (Analog/Digital)	Different Ranges	5
8.	Desktop Computer	-	5
9.	Simulation Tool	MultiSim/OrCAD	1

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

V SEMESTER

2020-21 onwards

PLC AND HMI

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049510

Semester : V Semester

Subject Title : **PLC AND HMI**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
PLC AND HMI PROGRAMMING	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

TOPICS AND ALLOCATION OF HOURS

Unit No	TOPICS	TIME (Hrs.)
1	BASICS OF PLC	14
2	PLC PROGRAMMING	15
3	ADVANCED INSTRUCTIONS	15
4	ANALOG PROGRAMMING	15
5	HMI SYSTEMS	14
	TEST & REVISION	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:

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
- 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
- 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

DETAILED SYLLABUS

Contents: Theory

UNIT	NAME OF THE TOPICS	HOURS
I	**Basics of PLC:** Definition - Overview of PLC system - Architecture of a PLC: Function of each blocks -Types of PLC - PLC modules: Discrete and Analog I/O modules - PLC advantage & disadvantage - PLC versus Computers - PLC Applications - Scan cycle - Capabilities of PLC- Selection criteria for PLC – PLC Communication with PC and software- PLC Wiring- Installation of PLC and its Modules.	14
II	**PLC Programming:** Fundamentals of logic – General PLC programming procedure - PLC programming methodologies: Ladder Diagram, Functional block diagram, Sequential function chart, Structured text, Instruction list – Bit Instructions – Instruction Addressing – PLC basic functions: Logical functions - Timers and counters – Star-Delta Starter, Direct online Starter, Traffic Lights, Tank Water Level Control, Sequential switching of motors	15
III	**Advanced Instructions:** Arithmetic functions (ADD, SUB, MUL, DIV, NEGATE)– Comparison functions (Equal, Not equal, Less Than, Greater than, Limit test) – Data transfer instructions (8-bit data, 16-bit word, Array) – Program control functions (Jump to label, Jump to subroutine, Return, Return from subroutine and Master control functions) – PID function - PTO / PWM generation – Function	15
IV	**Analog Programming:** Types of analog modules – Configure analog signals in PLC – Analog Inputs: Voltage inputs, Current inputs, Analog input scaling – Analog outputs: Voltage outputs, Current outputs, Analog output scaling/unscaling - Servo drive control – Stepper Motor Control – Design of interlocks and alarms - Implementation of hydraulic and pneumatic control using PLC (Automatic Reversal Operation) – PLC in packaging - Reaction vessel – Resistance welding	15
V	**HMI Systems:** Need for HMI in Industrial Automation - Types of HMI – Configuration of HMI – Procedure for project development -	14

	Configuration of HMI elements / objects(Defining Tags, planning graphic design, Navigation, Linking objects with tags, Tag logging) – Push buttons, Text boxes, Bar graphs, Graphics & other features – Alarm generation, Data logging, Trends generation- Interfacing with PLC.	

TEXT BOOKS:

1. W. Bolton —Programmable logic controllers‖, Elsevier Ltd, 2015.
2. Frank D Petruzella, —Programmable logic controllers‖, McGraw-Hill, 2011.

REFERENCES:

1. John R Hackworth and Fredrick D Hackworth Jr., —Programmable Logic Controllers: Programming Methods and Applications‖, Pearson Education, 2006.
2. SIMATIC Programming with STEP 7, SIEMENS Manual, 2014.

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

V SEMESTER

2020-21 onwards

COMPUTER INTEGRATED MANUFACTURING

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049520

Semester : V Semester

Subject Title : **Computer Integrated Manufacturing**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
COMPUTER INTEGRATED MANUFACTURING	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

Topics and allocation of hours:

UNIT	TOPIC	TIME (HRS)
I	Computer Aided Design	14
II	Computer Aided Manufacturing	15
III	CNC Machines	15
IV	CNC Components and Part Programming	15
V	CNC Maintenance	14
Tests and Model Exam		**7**
Total		**80**

RATIONALE:

As per the latest requirements in the Industries this enables to learn the assistance of computer in the field of design and manufacturing areas. It's able to learn the

latest manufacturing concepts of in the shop floors and manufacturing methods like RPT. They are able to know about the CNC programming techniques are included.

OBJECTIVES:

- Understand the concept and requirement of the integration of the design and manufacturing.
- Acquire knowledge about the computer assistance in the design process and analysis.
- Understand the concepts of manufacturing with computer assistance in the shop floor.
- Understand the principle of latest manufacturing machines like RPT.
- Acquire the knowledge in the material handling equipment and robot.
- Understand the Computer Integrated Manufacturing and FMS.
- Study of Concurrent Engineering and its tools and Augmented Reality.

Detailed Syllabus

Contents: Theory

UNIT	NAME OF THE TOPIC	HRS
I	**UNIT – I COMPUTER AIDED DESIGN** Introduction – CAD definition – Shigley's design process – CAD activities – benefits of CAD – CAD hardware: Input / Output devices –LED, plasma panel, mouse, digitizer, image scanner, drum plotter, flat bed plotter, laser printer - hard disks, DVD, flash memory. Types of CAD system: PC based CAD system – workstation based CAD system – graphics workstation – configuration and typical specification – CAD software packages – AutoCAM – computer networking: purposes – topology – types – OSI networking standards – protocols (description only). Geometric modelling techniques: wire frame, surface, solid modelling – graphics standards: Need– IGES – DXF. Introduction to finite element methods – procedure of finite element analysis (brief description only).	14

II	**UNIT II – COMPUTER AIDED MANUFACTURING** CAM definition – functions of CAM – benefits of CAM – integrated CAD/CAM organization – process planning – master data – structure of a typical CAPP – types of CAPP : variant type, generative type – advantages of CAPP - aggregate production planning – Master Production Schedule (MPS) – capacity planning – Materials Requirement Planning (MRP) – introduction to enterprises resources planning –Manufacturing Resources Planning (MRP-II) – just in time manufacturing philosophy – cost involved in design changes – concept of Design for Excellence (DFX) – guide lines of Design for Manufacture / Assembly (DFM/A). Product Development Cycle – sequential engineering – concurrent engineering – rapid proto typing: concept and applications – 3D printing.	15
III	**UNIT-III CNC MACHINES** Numerical control – definition – components of NC systems – development of NC – DNC – CNC and adaptive control systems – working principle of a CNC system – distinguishing features of CNC machines - advantage of CNC machines – difference between NC and CNC – types of turning centre: horizontal, vertical – types of machining centers: horizontal spindle, vertical spindle, universal machines – machine axis conventions – design considerations of NC machine tools. CNC EDM machine – Coordinate measuring machines: construction, working principles and specifications – maintenance of CNC machines.	15
IV	**UNIT-IV CNC COMPONENTS AND PART PROGRAMMING** Drives: spindle drive – hydraulic systems – direct-current motors – stepping motors – servo motors – AC drive spindles - slide ways – linear motion bearings – recirculation ball screw – ATC – tool magazine - feedback devices: encoders – linear and rotary transducers – in-process probing.	15

	NC part programming – manual programming – tape format: sequence number, preparatory functions and G codes, miscellaneous functions and M codes – CNC program procedure – coordinate system – types of motion control: point-to-point, paraxial and contouring - NC dimensioning – reference points – machine zero, work zero, tool zero and tool offsets. Part Program – tool information – speed – feed data – interpolation – macro – subroutines – canned cycles – mirror images – thread cutting – sample programs for lathe and milling – generating CNC codes from CAD models – post processing – conversational programming – APT programming.	
V	**UNIT- V MAINTENANCE OF CNC MACHINES** Introduction - Objectives – Documentation of Maintenance Program – Spare Parts – Preventive Maintenance – Periodic Inspection of Parts – Earthing - Relays – Servo motor bearings – LMguideways – motor maintenance – Replacing drive units – Replacement procedure – Replacing Battery – Replacing procedure – Replacing fuse – Servo system maintenance – spindle system maintenance - Drive unit maintenance – Lubricationsystems - Maintenance schedule – Daily – Monthly – Quarterly, Half yearly, Annually.	14
	Test & Revision	7

Text Books:

1. CAD/CAM/CIM, R.Radhakrishnan, S.Subramanian, V.Raju, 2nd, 2003, New Age International Pvt. Ltd.
2. CAD/CAM, MikellP.Groover, Emory Zimmers Jr. Indian Reprint Oct 1993, Prantice Hall of India Pvt., Ltd.
3. S.K.Sinha, NC Programming, I Edition, 2001, Galgotia Publications Pvt. Ltd.

Reference Books

1. Dr.P.N.Rao, CAD/CAM Principles and Applications, 2002, Tata McGraw Hill Publishing Company Ltd.
2. Ibrahim Zeid, Mastering CAD/CAM, Special Indian Edition 2007, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Mikell P. Groover, Automation, Production Systems, and Computer-Integrated Manufacturing, 2nd Edition, Reprint 2002, Pearson Education Asia.

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

V SEMESTER

2020-21 onwards

MICROCONTROLLERS

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049530

Semester : V Semester

Subject Title : **Microcontrollers**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
Microcontrollers	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

Topics and allocation of hours:

UNIT	TOPIC	TIME (HRS)
I	Architecture of 8051	14
II	Instruction set and Programming	14
III	I/O, Timer, Interrupt and Serial Programming	15
IV	Interfacing External Device with 8051	15
V	PIC	15
Revision, Tests and Model Exam		**7**
Total		**80**

RATIONALE:

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

OBJECTIVES:

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

Detailed Syllabus

Contents: Theory

Unit	Name of the Topics	HRS
I	**Architecture of 8051** Block diagram of Microcontroller – Comparison with Microprocessor and Microcontroller – Pin details of 8051 – ALU – Special function registers – ROM – RAM – RAM Memory Map (including registers and register banks) – Program Counter – PSW register –Stack - I/O Ports – Timer – Interrupt – Serial Port – External memory – Clock – Reset – Clock Cycle – Machine Cycle – Instruction cycle – Instruction fetching and execution – Overview of 8051 family	14
II	**Instruction Set and Programming** Assembling and running an 8051 program – Instruction set of 8051 – Data transfer instructions – Different addressing modes – Arithmetic Instructions – Signed number concepts and arithmetic operations – Logic and Compare instructions – Rotate instruction and data	14

	serialization – BCD, ASCII – Loop and jump instructions – Call instructions – Time delay routines – Program control – Assembler directives – Sample programs.	
III	**I/O, Timer, Interrupt and Serial Programming** Bit addresses for I/O and RAM – I/O programming – I/O bit manipulation programming – Programming 8051 Timers – Counter programming – Basics of Serial programming – 8051 connection to RS 232 – 8051 Serial Port Programming – 8051 interrupt – Programming Timer Interrupt – Programming external hardware interrupts – Programming the serial communication interrupt – Interrupt priority in 8051	15
IV	**Interfacing External Device with 8051** 8051 interfacing to external memory – 8051 interfacing with the 8255 – (Programs are to be written in Assembly for the following interfacing applications) Relays and Opto isolators – Sensors interfacing and signal conditioning – Parallel ADC and Serial ADC interfacing – DAC interfacing - Keyboard interfacing – Seven segment and LCD display interfacing – Stepper Motor interfacing – DC motor interfacing and PWM - RTC Interfacing-Interfacing with I^2C Bus and SPI Bus	15
V	**PIC** Over view of PIC 18 family-PIC 18 Features-PIC Architecture -WREG Register in the PIC-PIC File Register-File register and access bank in PIC 18- PIC Status Register- Program counter in the PIC-ROM memory map in the PIC18-Where the PIC wakes up when it is powered up-Placing code in Program ROM-Executing a program byte by byte-ROM Width in the PIC18-Harvard architecture in the PIC-RISC architecture in the PIC-Features of RISC, PIC Instructions-MOVWF instructions-COMF instruction-DECF instruction –MOVF instruction-ADDLW instruction and Status Register	15

TEXT BOOKS:

1. Mazidi, Mazidi and D.MacKinlay –"8051 Microcontroller and Embedded Systems using Assembly and C "- 2006 Pearson Education Low Price Edition.
2. R.Theagarajan –"Microprocessor and Microcontroller "- Sci Tech Publication, Chennai
3. Kenneth J.Ayala –"8051 Microcontroller"
4. Muhammad Ali Mazidi ,RolindD.Mckinlay,Danny Causey-PIC Microcontroller and Embedded systems using Assembly and C for PIC 18.

REFERENCE BOOKS:

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

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

V SEMESTER

2020-21 onwards

ROBOTICS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049540

Semester : V Semester

Subject Title : **ROBOTICS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
ROBOTICS PRACTICAL	**4**	**64**	**25**	**100***	**100**	**3 Hrs**

OBJECTIVES:

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

Detailed Syllabus

Contents: Practical

LIST OF EXERCISES

1. Teach a simple program using motion commands to draw arectangle in the world frame (in the air). Observe and record thepositions of the corner points of the rectangle in the world frame.
2. Position recording using Cartesian co-ordinate system - (No. of positions to be specified - 9)
3. Position recording using Polar co-ordinate system - (No. of positions to be specified- 9)
4. Set up the tool frame for the new end-effector (EOAT).
5. Generate a program to teach the robot to write an alphabet using JOINT interpolation and LINEAR interpolation motion commands.
6. Generate a program to teach the robot to draw a circle (or arc) using CIRCULAR motion command.
7. Generate a program to trace a hexagon.
8. Generate a program to trace a square inscribed in a circle.
9. Generate a program to trace a square by teaching a single corner in position register and entering the dimension of the side in register.
10. Generate a program to teach the robot to pick and place the objects – (No. of objects to be specified- 6)
11. Generate a program that does pick and stack the objects in a Column Row Layer (2, 2, 2).
12. Arc welding practice – (Length of weld to be specified)
13. Profile cutting practice - (Complicated profile – combination of lines and arcs)
14. Practical’s connected with Photo sensor/transducer

BOARD EXAMINATION

Note: Any one question will be asked for board practical exam from the questions listed below.

DETAILLED ALLOCATION OF MARKS

Writing Program	-	40 Marks
Execution / Simulation	-	40 Marks
Result	-	10 Marks
Viva Voce	-	10 Marks
Total	**-**	**100 Marks**

LIST OF EQUIPMENTS

1. Computer with Accessories: 30 Nos.
2. Compatible Software: Sufficient quantity
3. Hardware: 6 Axis Robot / Separate devices for the individual task – 1 No
4. Teach Pendant control or PC based control through Software

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

V SEMESTER

2020-21 onwards

PLC AND HMI PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049550

Semester : V Semester

Subject Title : **PLC and HMI Practical**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
PLC and HMI Practical	5	80	25	100*	100	**3 Hrs**

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.

OBJECTIVES:

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

Contents: Practical

List of Experiments

Develop a ladder diagram, interface and test with PLC and HMI for

1. Start/Stop operation (Latching & Unlatching) of a motor using two push button.
2. Start/Stop operation (Push ON Push OFF logic) of a motor using one push button
3. Delayed operation of a lamp using push button (On-delay & Off-delay).
4. Event count operation using UP & DOWN counter.
5. Star Delta starter
    A. Single phasing prevention
    B. Adjustable star-delta transfer time
    C. Pre-settable overload trip time
6. 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 effected to prevent action during short time failure
7. 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.
8. Sequential operation of two Double Acting Cylinders for the sequence A+, B+, B-, A-
9. Analog input to PLC as a set of valve for a comparator function block
    a. The input is multilevel illumination control. The input is set 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.
10. Heater control with PID function of the PLC
    a. 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.
11. Round table liquid filling system and display the status in HMI

a. 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

12. Fire alarm and display the status in HMI
    A. Multiple alarms
    B. Sound alarm
    C. If not acknowledged, Sound alarms 1 and 2
13. Develop Ladder logic for Automatic door open and close and interface with HMI
14. Develop Ladder logic for Servo motor control

DETAILLED ALLOCATION OF MARKS

Sl. No	NAME OF ACTIVITY	MARK ALLOCATION
1.	Drawing Connection/Ladder Diagram and Writing Details of the Components/Equipments/Machines used	20
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.	Interpretation of Results Graphical Representation (If required)	20
5.	Viva-voce	10
Total Marks		**100**

LIST OF EQUIPMENTS

S No	Name of the Equipment	No of Quantity
1	PLC Simulation Panel any brand with software	5
2	2 Channel Analog Input and Output Module	2
3	HMI Simulation Panel any brand	5
4	Limit switch	5
5	Reed switch	5
6	Inductive proximity sensor	5
7	Capacitive proximity sensor	5
8	Solenoid valve	2
9	Double acting Cylinder	2
10	Heater Control Trainer kit	1
11	Liquid Level Control Kit	1
12	Fire alarm Control Kit	1
13	Automatic door Open and Close System	1
14	Conveyor Control	1
15	PC or Laptop	10

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

V SEMESTER

2020-21 onwards

MICROCONTROLLER PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049560

Semester : V Semester

Subject Title : **Microcontroller Practical**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Microcontroller Practical	**4**	**64**	**25**	**100***	**100**	**3 Hrs**

Detailed Syllabus

Contents: Practical

List of Experiments

Part A – 8051 ALP or C Programming

1. Write a program for Multiplication and Division of two numbers and execute the same in the 8051 trainer kit.
2. Write a program to convert BCD number into hexadecimal number.
3. Write a program to generate square wave signal of 10 kHz using Timer 0.
4. Write a program to interface a switch or proximity sensor, LED and relay with 8051 and test it.
5. Write a Program for interfacing seven segments LED displays and test it
6. Write a Program for interfacing DC motor and test it.
7. Write a Program for interfacing STEPPER MOTOR and test it.
8. Write a program to display the string to 16 x 2 LCD display to 8051.

9. Write a program to interface temperature sensor using 8051.
10. Write a program to interface voltage and current sensor with 8051.

Part B – 16F877A PIC Controller ALP or C Programming

11. Write a Program for interfacing Digital I/O board and test it.
12. Write a program to Generate square wave P16f877A
13. Write a program to interface a relay with PIC16F877A
14. Write a Program for interfacing DC motor and PIC16F877A.

BOARD EXAMINATION

Note: Any one question will be asked for the board examination.

DETAILED ALLOCATION OF MARKS

Writing Program	:	40 Marks
Execution	:	40 Marks
Output & Result	:	10 Marks
Viva Voce	:	10 Marks
Total	**:**	**100 Marks**

Equipment Required

S. No	Name of the Equipment	Quantity required
1.	AT89C51/52 Evaluation Board or Trainer kit with ISP	15 No's
2.	PIC 16F877A Evaluation board or Trainer kit	6 No's
3.	Digital I/O Boards	2 No's
4.	Seven segment LED display interface board	2 No's
5.	8 Bit ADC Interface Board	2 No's
6.	DC Motor control Interface board	2 No's
7.	Temperature Sensors LM 35	5 No's
8.	Proximity Sensors	5 No's
9.	Desktop Computer	15 No's
10.	8051 simulation software – (μVision Keil software)	Any one free software
11.	PIC Simulation software - (MPLab, ..)	Any one free software

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

V SEMESTER

2020-21 onwards

ENTREPRENEURSHIP AND START-UP

(Common to all branches)

CURRICULUM DEVELOPMENT CENTRE

Annexure – III

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 Robotics and Automation Engineering

Subject Code : 4020570

Semester : V

Subject Title : Entrepreneurship & Startup

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours/ Week	Hours/ Semester	Internal Assessment	Board Examination	Total	
4020570 Entrepreneurship & Startup	4	64	25	100*	100	3 Hrs.

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

Topics and Allocation of Hours

UNIT	Topic	Hours
1	Entrepreneurship – Introduction and Process	10
2	Business Idea and Banking	10
3	Start ups, E-cell and Success Stories	10
4	Pricing and Cost Analysis	10
5	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 start ups 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

4020570 ENTREPRENEURSHIP & STARTUP

DETAILED SYLLABUS

Unit	Name of the Topics	Hours
1	**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
2	**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	10

	• Role of Government policy • Entrepreneurial support systems • Incentive schemes for State Government • Incentive schemes for Central Government	
3	**STARTUPS, E-CELL AND SUCCESS STORIES** • Concept of Incubation centre'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**
4	**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**

5	**BUSINESS PLAN PREPARATION** • Generation of Ideas, • Business Ideas vs. Business Opportunities • Selecting the Right Opportunity • Product selection • New product development and analysis • 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	**10**

REFERNCE 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
3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill (India) Private Limited, Noida - 201301
4. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small business management, Pearson Education India, Noida - 201301
5. Charantimath Poornima M. Entrepreneurship Development and Small Business Enterprises, Pearson Education, Noida - 201301
6. Trott, Innovation Management and New Product Development, Pearson Education, Noida - 201301
7. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing House Pvt. Ltd., New Delhi-110044
8. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited, New Delhi
9. I. V. Trivedi, Renu Jatana, Indian Banking System, RBSA Publishers,

Rajasthan

10. Simon Daniel, HOW TO START A BUSINESS IN INDIA, BUUKS, Chennai - 600018
11. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioners guide to writing the Business Plan, Notion Press Media Pvt. Ltd., Chennai 600095.

Board Examination – Evaluation Pattern

Internal Mark Allocation

Assignment (Theory portion)*	-	10
Seminar Presentation	-	10
Attendance	-	5
Total	**-**	**25**

Note: * Two assignments should be submitted. The same must be evaluated and converted to 10 marks.

Guidelines for assignment:

First assignment	– Unit I
Second assignment	– Unit II
Guidelines for Seminar Presentation	- Unit III

Each assignment should have five three marks questions and two five marks questions.

BOARD EXAMINATION

Note

1. The students should be taught all units and proper exposure and field visit also arranged. All the portions should be completed before examinations.
2. The students should maintain theory assignment and seminar presentation. The assignment and seminar presentation should be submitted during the Board Practical Examinations.
3. The question paper consists of theory and practical portions. All students should write the answers for theory questions (45 Marks)

and practical portions (55 Marks) should be completed for board examinations.

4. All exercises should be given in the question paper and students are allowed to select by lot. If required the dimensions of the exercises may be varied for every batch. No fixed time allotted for each portion and students have liberty to do the examination for 3Hrs.
5. For Written Examination: theory question and answer: 45 Marks
   Ten questions will be asked for 3 marks each. Five questions from each unit 1 & 2. (10 X 3 = 30).

   Three questions will be asked for 5 marks each. One question from each unit 1, 2 & 3. (3 X 5 = 15)

6. For Practical Examination: The business plan/Feasibility report or Report on Unit 4 & 5 should be submitted during the board practical examinations. The same have to be evaluated for the report submission (40 marks).

DETAILED ALLOCATION OF MARKS

Sl. No	Description	Marks
Part A	Written Examination - Theory Question and answer 10 questions x 3 marks = 30 marks 3 questions x 5 marks = 15 marks	45
Part B	Practical Examination – Submission on Business Plan/Feasibility Report or Report on Unit 4 & 5	40
Part C	Viva voce	15
Total		**100**

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

VI SEMESTER

2020-21 onwards

INDUSTRIAL ENGINEERING AND MANAGEMENT

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 : Diploma in Robotics and Automation

Subject Code : 4020610

Semester : VI

Subject Title : Industrial Engineering and Management

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	
4020610 Industrial Engineering and Management	6	96	25	100*	100	3 Hrs.

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

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Plant Engineering and Plant Safety	18
II	Work Study, Method Study and WorkMeasurement	18
III	Principles, Personnel Management and Organizatioal Behavior:	19
IV	Financial and Material Management	18
V	Engineering Ethics and Human Values	16
TEST AND REVISION		07
Total		**96**

RATIONALE:

In the Indian Economy, Industries and Enterprises always find prominent place. After globalization, the students should be trained not only in manufacturing process but also in managing activities of industries. The knowledge about plant, safety, work study techniques, personnel management, financial management and engineering ethics and human values will definitely help the students as managers to suit the industries.

OBJECTIVES:

- To study the different types of layout.
- To study the safety aspects and its impacts on an organization.
- To study different work measurement techniques.
- To study engineering ethics and human values.
- To study the staff selection procedure and training of them.
- To study capital and resources of capital.
- To study inventory control system.
- To study about organization and it's behavior.

4020610 INDUSTRIAL ENGINEERING AND MANAGEMENT

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Time
I	**Plant Engineering and Plant Safety** **Chapter: 1.1:Plant Engineering :** Plant – Selection of site of industry – Plant layout – Principles of a good layout – types – process, product and fixed position – techniques to improve layout – Principles of material handling equipment – Plantmaintenance – importance – Break down maintenance, preventive maintenance and scheduled maintenance.	**9**

	Chapter: 1.2:Plant Safety: Importance –accident-causes and cost of an accident-accident proneness-prevention of accidents-Industrial disputes-settlement of Industrial disputes-Collective bargaining, conciliation, Mediation, arbitration-Indian Factories Act 1948 and its provisions related to health, welfare and safety.	**9**
II	**Work Study, Method Study and Work Measurement** **Chapter: 2.1: Work Study:** Productivity – Standard of living – method of improving productivity – Objectives – Importance of good working conditions. **Chapter: 2.2:Method Study:** Definition – Objectives – Selection of a job for method study –Basic procedure for conduct of method study – Tools used – Operation process chart, Flow process chart, two handed process chart, Man Machine chart, String diagram and flow diagram. **Chapter: 2.3:Work Measurement:** Definition – Basic procedure in making a time study – Employees rating factor – Application of time allowances – Rest, Personal, Process, Special and Policy allowances – Calculation of standard time – Problems – Basic concept of production study – Techniques of work measurement-Ratio delay study, Synthesis from standard data, analytical estimating and Pre determined Motion Time System (PMTS).	**4** **6** **8**
III	**Principles, Personnel Management and Organizational Behavior:** **Chapter: 3.1:Principles of Management:** Definition of management – Administration - Organization – F.W. Taylor's and Henry Fayol's Principles of Management – Functions of Manager – Directing – Leadership –Types of Leadership – Qualities of a good leader – Motivation – Positive and negative motivation --Modern management techniques- Management Information Systems – Strategic management – SWOT Analysis - Business Process Re-engineering (BPR) – Enterprises Resource Planning (ERP) –Activity Based	**7**

	Management (ABM) – Global Perspective – Principles and brief description. **<u>Chapter: 3.2:</u>Personnel Management:** Responsibility of human resource management – Selection procedure – Training of workers – Apprentice training – On the job training and vestibule school training – Job evaluation and merit rating – objectives and importance – wages and salary administration – Components of wages – Wage fixation – Type of wage payment – Halsey's 50% plan, Rowan's plan and Emerson's efficiency plan – Problems. **<u>Chapter: 3.3:</u>Organizational behavior:** Definition – organization-- Types of Organization – Line, Staff, Taylor's Pure functional types – Line and staff and committee type –Organizational Approaches, individual behavior - causes - Environmental effect - Behavior and Performance, Perception - organizational implications.	**7** **5**
IV	**Financial and Material Management** **<u>Chapter: 4.1:</u>Financial Management:**Fixed and working capital – Resources of capital – shares preference and equity shares – debentures – Type of debentures – Public deposits, Factory costing – direct cost – indirect cost – Factory overhead – Selling price of a product – Profit – Problems. Depreciation – Causes – Methods - Straight line, sinking fund and percentage on diminishing value method – Problems. **<u>Chapter: 4.2:</u>Material Management:** Objectives of good stock control system – ABC analysis of inventory – Procurement and consumption cycle – Minimum Stock, Lead Time, Reorder Level - Economic order quantity - problems – supply chain management - Introduction – Purchasing procedure – Store keeping – Bin card.	**9** **9**
V	**Engineering Ethics and Human Values** **<u>Chapter: 5.1:</u>Engineering Ethics**: Definition-engineering ethics-personal and business ethics- duties and rights-engineering as a	**9**

	profession - core qualities of professional practitioners-environment and their impact-code of ethics- procedure for solving ethical conflicts - ethical judgement- Kohiberg's stages of moral development - value based ethics- engineers as managers, consultants and leaders- environmental ethics- computer ethics- Intellectual Property Rights (IPRs). **<u>Chapter: 5.2:</u>Human values :** morals – values – integrity- service learning-civic virtue - respect for others- living peacefully- caring – sharing – honesty- courage - valuing time cooperation - commitments – empathy- selfconfidence – character- stress management.	**7**

Reference Books :

1. Industrial Engineering and Management, O.P. Khanna, Revised Edition Publications(P)Ltd – 2004, 67/4 Madras House, Daryaganj, NewDelhi–110002.
2. Engineering Economics and Management, T.R. Banga& S.C. Sharma, McGraw Hill Editiion. 2 – 2001, NewDelhi.
3. HeraldKoontz and Heinz Weihrich,' Essentials of Management', McGraw Hill Publishing Company, Singapore International Edition.Latest
4. Govindarajan .M, Natarajan. S, Senthilkumar V.V, Engineering ethics , prentice hall of India New Delhi, 2004.
5. Management, Aglobal perspective, Heinz Weihrich, Harold Koontz, 10th Edition, McGraw Hill International Edition.Latest.
6. Essentials of Management,4th Edition, Joseph L.Massie,Prentice- Hall of India, NewDelhi 2004.
7. S.Chandran, Organizational Behaviours,Vikas Publishing House Pvt. Ltd. Latest
8. M.Govindarajan and S.Natarajan ,Principles of Management ,Prentce Hall of India Pvt.Ltd. NewDelhi.Latest.
9. Charles B. Fledderman, Engineering ethics, pearson prentice hall, New Jersey, 2004.

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

VI SEMESTER

2020-21 onwards

INDUSTRIAL ROBOTICS AND MATERIAL HANDLING SYSTEMS

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049620

Semester : VI Semester

Subject Title : **Industrial Robotics and Material Handling Systems**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
			Marks			Duration
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	
INDUSTRIAL ROBOTICS AND MATERIAL HANDLING SYSTEMS	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

Topics and allocation of hours:

Unit No	Topics	Hours
I	Introduction	15
II	Robots for Inspection	14
III	Material Handling	15
IV	Other Applications	15
V	Safety and Economy of Robots	14
	Revision and Test	7
	Total	80

RATIONALE:

In Recent days' industrial robots are gaining more importance in all type of industries due to the introduction of digital manufacturing.A strong foundation of industrial robots will be an added advantage in the digital manufacturing platform.

OBJECTIVES:

- Recognize the role robots in industries
- Compare various types of material handling techniques.
- Study the working of various industrial robot installations.
- Explain the economics associated with robotisation of industries.
- Select the robot based on industrial requirements.
- Explain the applications of machine vision in industries.

Detailed Syllabus

Contents: Theory

UNIT	NAME OF THE TOPIC	HOURS
I	**INTRODUCTION** Need and importance- basics concepts, structure and classification of industrial robots, terminology of robot motion and characteristics, Load handling capacity, general considerations in Robotic material handling, material transfer, machine loading and unloading, CNC machine tool loading, Robot centred cell.	15
II	**INDUSTRIAL APPLICATIONS** Basics of Arc welding: Welding Guns, Welding Electrodes, Welding Power Sources, shielding gases, Robot interfacing. Basics of Spot welding: Spot welding Gun, Spot welding Timer, Utilities, Robot selection, Integrating with Robots. Spray painting, assembly operation, cleaning, robot for underwater applications,TIG welding	14
III	**MACHINE VISION** The Nature of Vision- Robotic vision systems- Robot vision – Need, Applications - image acquisition – illumination techniques- Point sensor, line sensor, planar Sensor-Image representation, object recognition and categorization, depth measurement, image data compression, visual inspection, software considerations, Vision based Part Inspection	15
IV	**MATERIAL HANDLING**	15

	Concepts of material handling, principles and considerations in material handling systems design, conventional material handling systems - industrial trucks, monorails, rail guided vehicles, conveyor systems, cranes and hoists, advanced material handling systems, automated guided vehicle systems, automated storage and retrieval systems(ASRS), bar code technology, radio frequency identification technology.	
V	**SELECTION OF ROBOTS AND ECONOMICS OF ROBOTISATION** Selection of Robots -Factors influencing the choice of a robot, selection of robot components, robot performance testing, work cycle time analysis. Economics analysis for robotics – cost data required for the analysis – methods of economic analysis – pay back method – equivalent uniform annual cost method – return on investment(with Examples) method, Concept of testing methods and acceptance rules for industrial robots, Impact of robot on industry and society	**14**
	TEST & REVISION	**7**

TEXT BOOKS

1. Mikell P Groover& Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, “Industrial Robotics Technology Programming and Applications”, McGraw Hill, 2012.
2. R.K.Mittal, I.J.Nagrath, Robotics and controls, Tata Mcgraw Hill Education Pvt.
3. Janaki Raman. P.A, “Robotics and Image Processing an Introduction”, Tata McGraw Hill Publishing company Ltd., 1995.

REFERENCES

1. Deb .S.R, “Robotics Technology and flexible automation”, Tata McGraw-Hill Education, 2009.
2. Richard D. Klafter, Thomas .A, ChriElewski, Michael Negin, “Robotics Engineering an Integrated Approach”, Phi Learning., 2009.
3. Francis N. Nagy, AndrasSiegler, “Engineering Foundation of Robotics”, Prentice Hall Inc., 1987.

4. Carl D. Crane and Joseph Duffy, “Kinematic Analysis of Robot manipulators”, Cambridge University Press, 2008.
5. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”, McGraw Hill Book co, 1987.

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

VI SEMESTER

2020-21 onwards

ADVANCED AUTOMATION

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049630

Semester : VI Semester

Subject Title : **Advanced Automation**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
ADVANCED AUTOMATION	**5**	**80**	**25**	**100***	**100**	**3 Hrs**

TOPICS AND ALLOCATION OF HOURS

Unit No	TOPICS	TIME (Hrs.)
1	Totally Integrated Automation	14
2	Supervisory Control and Data Acquisition (SCADA)	14
3	Distributed Control Systems (DCS)	15
4	Communication Protocols of PLC, HMI & SCADA	15
5	Factory Automation	15
	Revision & Test	7
	Total	80

Rationale

Totally integrated automation is an engineering framework is widely used for implementing automation solutions across different industries. This enables the industries to avoid the conventional time consuming integration of various

components in an automatic system. By adopting this platform, efficiency of the process will immensely improve and reduces the project cost. A course on this concept will introduce the tools used for designing, commissioning, operating maintaining and upgrading the existing automated system to the students

Objectives

- Understand the fundamentals of Industry 4.0 and TIA platform.
- Explain various programmable automation system used in industries and theirapplications.
- Familiarise about the fundamentals of SCADA and DCS systems.
- Recognise various communication protocols used in an automation system
- Study the advancement in manufacturing systems.

DETAILED SYLLABUS

Contents: Theory

UNIT	NAME OF THE TOPICS	HOURS
I	**Totally Integrated Automation** Overview of Industry 4.0 - Need for TIA - Types: Factory Automation and Process Automation - TIA Architecture - Components of TIA systems: Integrated Engineering, Industrial data Management, Industrial Management, Industrial Communication, Industrial Security, Safety Integrated - Selection of TIA Components – TIA Controllers: Basic controller, Advanced Controller, HMI controller, Motion controller - Programmable Automation Controllers (PAC) - Vertical Integration structure.	**14**
II	**Supervisory Control and Data Acquisition (SCADA)** Introduction, definition and history of SCADA –SCADA system architecture – elements of SCADA. Features of SCADA, MTU - functions of MTU, RTU- Functions of RTU - Developer and runtime packages – Communication Architecture – Tools –	**14**

	Tags – Graphics - Alarm logging – Tag logging – Trends – History – Report generation.	
III	**Distributed Control Systems (DCS)** Introduction –Hardware Architecture of DCS (Processor, Power supply, I/O modules, Communication bus, Operator and Engineering station) - Application of DCS System - Local control unit- Programming language – Communication facilities – operator interface – engineering interfaces - Comparison between PLC, SCADA and DCS – Case study of any one machine/process automation	**15**
IV	**Communication Protocols of PLC, HMI & SCADA** Networking standards & IEEE Standard - RS 232-422-423-485 standards - Proprietary and open Protocols – Industrial field buses: Foundation Field bus, Process bus and Ethernet - OLE/OPC –DDE – Server/Client Configuration – Messaging – Recipe – User administration – MPI bus system for PLC - Integration of Profibus and HMI - Interfacing of SCADA with PLC, drive, and other field device.	**15**
V	**Factory Automation** Classification and Overview of Manufacturing Systems, Manufacturing Cells, GT and Cellular Manufacturing - Flexible Manufacturing Systems concept - Computer Integrated Manufacture - CNC, intelligent automation. Automated Assembly Systems: Design for Automated Assembly, Types of Automated Assembly Systems, Part Feeding Devices, Analysis of Multi-Station Assembly Machines, Analysis of a Single Station Assembly	**15**
	Revision & Test	**7**

TEXT BOOKS:

1. John.W.Webb& Ronald A. Reis, “Programmable logic controllers: Principles and Applications”, Prentice Hall India, 2003.
2. Michael P. Lukas, “Distributed Control systems”, “Van NostrandReinfold Company”1995.

REFERENCES:

1. Win CC Software Manual, Siemens, 2003
2. RS VIEW 32 Software Manual, Allen Bradly, 2005
3. CIMPLICITY SCADA Packages Manual, Fanuc India Ltd, 2004

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

VI SEMESTER

2020-21 onwards

CIM PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049640

Semester : VI Semester

Subject Title : **CIM Practical**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	Duration
CIM PRACTICAL	5	80	25	100*	100	**3 Hrs**

OBJECTIVES:

- Study of parametric modelling
- Understand the part modelling and assembly of parts
- Create the views of the solid model and parts list
- Study the working principle of CNC machines
- Study the datum points and off sets
- Differentiate incremental System with absolute system
- Study the simulation software package
- Write program and simulate in the Lathe software and Milling software
- Understand the SOP and set the CNC machine
- Enter, edit and execute in CNC program
- Produce components in the CNC Turning centre and CNC Machining centre

List of Experiments

PARTA: CAD Practical (20 Hours)

Introduction: Solid Modelling (4 Hours)

Predefined 3D objects – UCS – Datum Plane –– constraint – sketch – dimensioning - creating surfaces - 3D solid primitives - creating region – pedit – extrude – revolve - sweep -blend-rib-shell- union – subtract – intersect – fillet – chamfer - 3D array – mirror 3D - rotate3D - 3D orbit - align – material attaching and detaching – mass properties – analysis – rendering - slice and sectioning – 3D view – viewports – layouts - model space - paper space

Exercises:3DDrawing (20 Hours)

1. Geneva Wheel
2. Bushed bearing
3. Screw Jack
4. Connecting Rod

Note: Print the orthographic view and sectional view from the above 3Ddrawing.

PARTB: CAM Practical (40 Hours)

Introduction: CNC Programming and Machining (2 Hours)

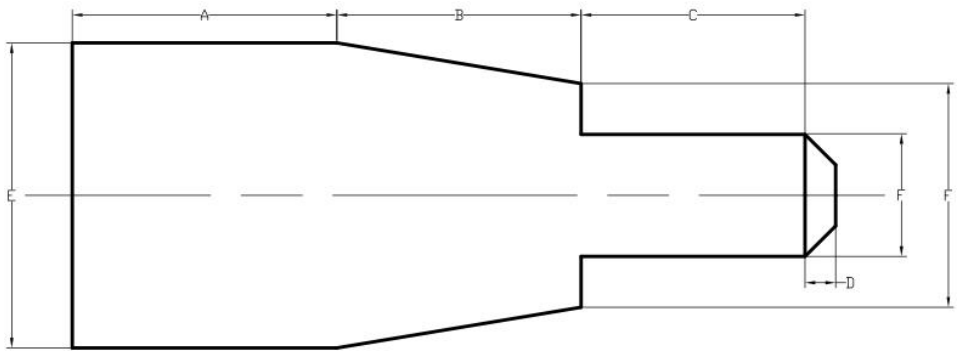
1. Study of CNC lathe and CNC milling
2. Study of international standard codes: G-Codes and M-Codes
3. Dimensioning methods and reference points
4. Manual CNC program writing and simulation
5. Entering and editing the program in the CNC machines
6. Execute the program and produce the components in the CNC machines

Exercises: CNC Programming and Machining (38 Hours)

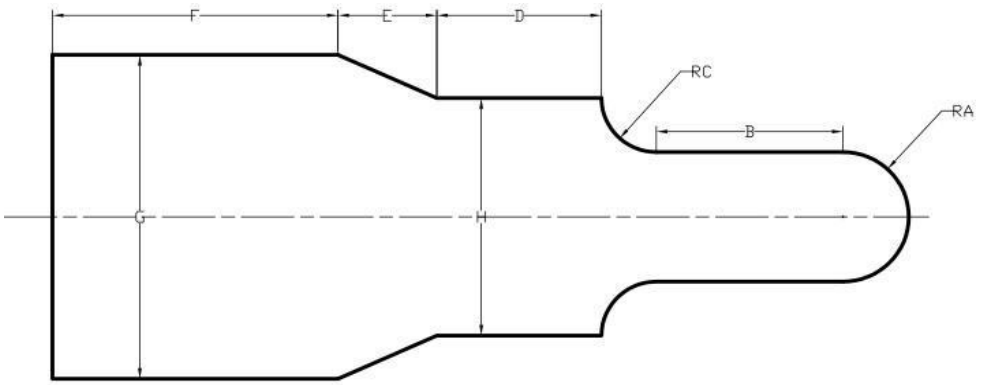
Note: Transfer/ download the part program from the simulation software and make the component in the CNC machine.

CNC Turning Centre **Material:** Mild Steel **/** Aluminum

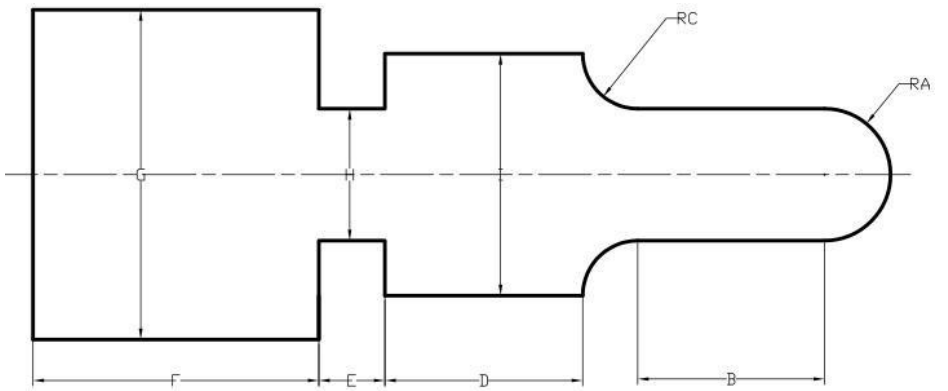
1. Develop a part program for **step & taper turning** using canned cycles**, s**imulate and produce the component in the CNC machine.



2. Develop a part program for **taper & radius turning** using canned cycles**,** simulate and produce the component in the CNC machine

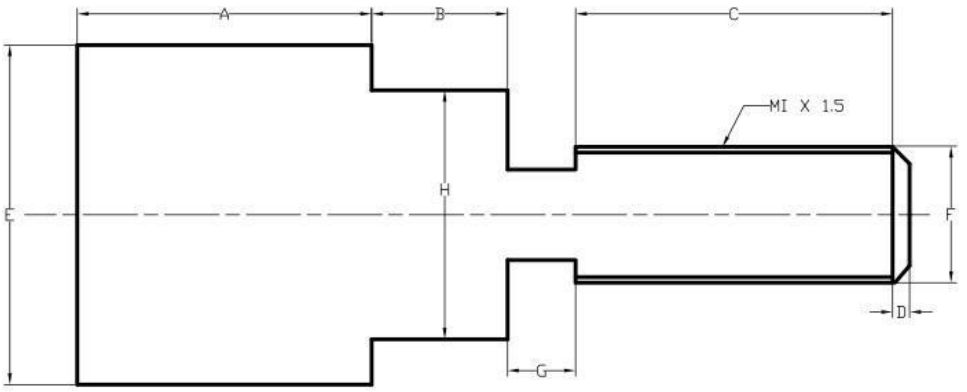


3. Develop a part program for **radius turning & grooving** using canned cycles**,**



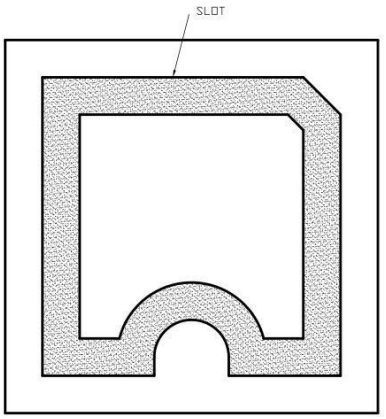
simulate and produce the component in the CNC machine

4. Develop a part program for **grooving & thread cutting** using canned cycles**,** simulate and produce the component in the CNC machine

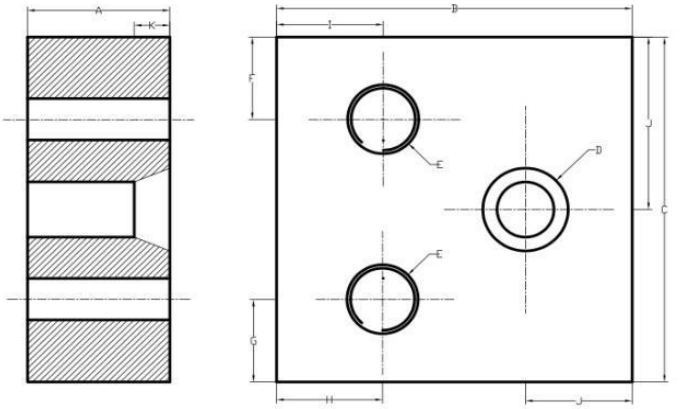


CNC Machining Centre **Material:**Mild Steel/Aluminum

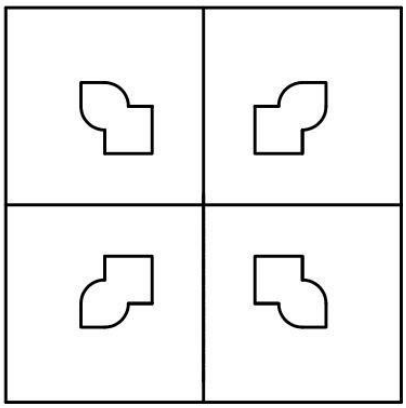
1. Using **linear** interpolation and **circular interpolation**–develop a part program for **grooving** and produce component in the CNC machine.



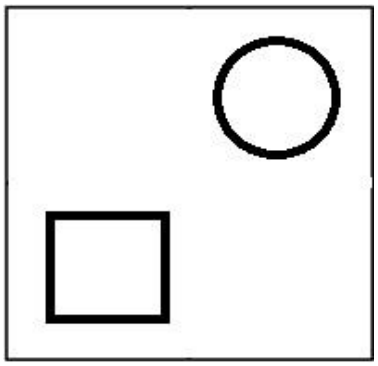
2. Using **canned cycle**-develop a part program for **drilling**, **tapping**, **countersinking** and produce component in the CNC machine.



3. Using**subprograms** - develop apartprogram for **mirroring**andproducecomponentinthe CNC machine.



4. Using **canned cycles**-develop a part program for **rectangular and circular pocketing** and produce component in the CNC machine.



Reference:

1. CNC Programming &Operations, Sankar, Sathish and Balamurugan — MicroPublications,Trichy

BOARD EXAMINATION

Note: Any one question will be asked for board practical exam from the questions listed below.

DETAILED ALLOCATION OF MARKS

PART–A: SOLID MODELING			**35**
Solid modeling	:	15	
Sectional View and Dimensioning	:	15	
Print out	:	5	
PART-B:CNCPROGRAMING			**55**
Program editing and creation	:	30	
Component manufacturing	:	15	
Finish	:	10	
Vivavoice	**:**		**10**
Total	**:**		**100**

List of Equipment's:

Sl. No	Name of the Equipment	No of Quantity
1.	Personal computer (Pentium processor)	30
2.	MS Windows OS (Version 2000 or above)	30
3.	AutoCAD software (release 2000 or above)	30
4.	CNC Lathe and Milling simulation software	30
5.	CNC Machining Centre & Turning Centre	Each 2 No's
6.	Laser jet printer	2

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

VI SEMESTER

2020-21 onwards

INDUSTRIAL ROBOTICS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049650

Semester : VI Semester

Subject Title : **Industrial Robotics Practical**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Internal Assessment	Board Examination	Total	Duration
INDUSTRIAL ROBOTICS PRACTICAL	4	64	25	100*	100	**3 Hrs**

RATIONALE:

In Recent days' industrial robots are gaining more importance in all type of industries due to the introduction of digital manufacturing.A strong foundation of industrial robots will be an added advantage in the digital manufacturing platform.

OBJECTIVES:

- Recognize the role of robots in industries
- Familiarize with different programming techniques of industrial robots.
- Study the industrial robot programs for different applications.
- Explain procedure followed in developing, editing and troubleshooting a program.
- Familiarize with interfacing of robot with controller and integrating with other hardware's in the application.

Detailed Syllabus

Contents: Practical

List of Experiments

1. Simple Teach Pendant Program(TPP) to check robot positional data. (Ex: Drawing a rectangle shape in the world frame)
2. Real time programming (online TPP) for palletizing and Depalletizing operation.
3. TPP/Offline program for vision based inspection.
4. TPP/Offline program for parts assembly.
5. TPP/Offline program for drilling operation.
6. TPP/Offline program for deburring operation.
7. TPP/Offline program for spray painting practise (Area to be specified - 300mm x 300mm)
8. Program and simulate spot welding operation using robot simulation software.
9. Program and simulate machine loading and unloading practice with time delay - (No. of times to be specified- 9)
10. Program and simulate coordinated identification, inspection and part assembly.
11. Line follower robot Programming
12. Obstacle avoidance robot Programming

BOARD EXAMINATION

Note: Any one question will be asked for board practical exam from the questions listed below.

DETAILLED ALLOCATION OF MARKS

Writing Program	-	40 Marks
Execution / Simulation	-	40 Marks
Result	-	10 Marks
Viva Voce	-	10 Marks
Total	**-**	**100 Marks**

Equipment's Required

1. 6 Axis Articulated Robot
    a. Material Handling - 1 No
    b. General Purpose (Welding, Assembly, Drilling) - 1 No
2. Conveyor System - 1 No
3. Assembly Work bench with fixture
4. A mounted vision system with software (Free open source Robot simulation software)
5. E-Yantra Firebird kit - 2 No's
6. Rasberry Pi kit - 3 No's

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

VI SEMESTER

2020-21 onwards

IIOT PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE- III

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 Robotics and Automation Engineering

Subject Code : 4049660

Semester : VI Semester

Subject Title : **IIOT Practical**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 16

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
IIOTPRACTICAL	4	64	25	100*	100	**3 Hrs**

Rationale

Nowadays Industrial Internet of Things is used across several industries to enhance the industrial process. IIoT uses the power of real time data analysis and smart machines and communicates important information that can be used for fast and accurate business decision making. A practical experience in IIoT will open more opportunities in intelligent manufacturing, automation optimization, industrial control, asset performance management and maintenance to students.

Objectives

- Familiarize with the connected devices which can sense, store and communicate information themselves.
- Study about information generation from raw data.
- Explain the device configuration procedure for IOT using Raspberry Pi and Arduino.
- Understand the concept of machine monitoring using IIOT.

List of Experiments

1. Set up Arduino and connect to a network.
2. Write a program to transmit a data to a cloud server.
3. Control a light bulb using Arduino.
4. Set up Raspberry Pi and connect to a network.
5. Speed Control of motors using PWM with python programming.
6. Build a temperature monitoring system using Raspberry Pi.
7. Create Wireless network of sensors using ZigBee.
8. Establish remote connection between PLC and cloud using IOT protocol MQTT.
9. Connect PLC and HMI through cloud using MQTT.
10. Publish new functionalities on the HMI screen using an IOT protocol
11. Remotely edit PLC program using an IOT protocol
12. Predict machine maintenance and analyse upfront which alarm is ON through IOT protocol.

BOARD EXAMINATION

Note: Any one question will be asked for board practical exam from the questions listed below.

DETAILLED ALLOCATION OF MARKS

Hardware Connection	-	20 Marks
Writing Program	-	30 Marks
Execution / Simulation	-	30 Marks
Result	-	10 Marks
Viva Voce	-	10 Marks
Total	**-**	**100 Marks**

Equipment's Required

1. Arduino kit with Wi-Fi network shield - 20Nos
2. Raspberry Pi - 10 No
3. ZigBee modules - 10Nos
4. PLC with IOT Vbox (Virtual Box) - 2 No's
5. Computer - 30 No's

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

VI SEMESTER

2020-21 onwards

PROJECT WORK AND INTERNSHIP

(Common with all Branches)

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE – III

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 : Diploma in Robotics and Automation

Subject Code : 4049670

Semester : VI

Subject Title : Project Work and Internship

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
4049660 Project Work and Internship	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
	6	96	25	100*	100	3 Hrs.

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

RATIONALE: This subject ‘Project Work and Internship” is the continuation of the previuos semester subjects. The students are to implement the detailed project plan, which they have prepared. This project are generally an integration of the various types of skills acquired during their course of study. Hence it is essential that students are given opportunity to develop and integrate the highly esssential industry oriented competencies and skills. This subject build up greater confidence to face in the world of work.

OBJECTIVES:

- Implement the theoreticaland practical knowledge gained through the curriculuminto an application suitable for a real practicalworking environment preferablyin an industrialenvironment.
- Implement the planned activity as a team.
- Take appropriate decisions on collected information.
- Carryout cooperativelearning through synchronousguided discussionswithin theclassinkey dates,asynchronousdocumentsharinganddiscussions,as well as to prepare collaborative edition ofthefinalproject report.

Project Work and Internship:

The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.**

a) Internal assessment mark for Project Work and 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 and 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 Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work and Internship Board examination.

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

III YEAR

N SCHEME

VI SEMESTER

2020-21 onwards

PROJECT WORK AND INTERNSHIP

(Only for Sandwich Diploma Courses)

CURRICULUM DEVELOPMENT CENTRE

ANNEXURE – III

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 : Diploma in Robotics and Automation

Subject Code : 4049710

Semester : VII

Subject Title : Project Work

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	
4049710 Project Work	4	64	25	100*	100	3 Hrs.

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

RATIONALE:

This subject ‘Project Work” is the continuation of the previuos semester subjects. The students are to implement the detailed project plan, which they have prepared. This project are generally an integration of the various types of skills acquired during their course of study. Hence it is essential that students are given opportunity to develop and integrate the highly esssential industry oriented competencies and skills. This subject build up greater confidence to face in the world of work.

OBJECTIVES:

- Implement the theoretical and practical knowledge gained through the curriculum into an application suitable for a real practical working environment preferably in an industrial environment.

- Implement the planned activity as a team.
- Take appropriate decisions on collected information.
- Carryout cooperative learning through synchronous guided discussions within the class in key dates, asynchronous document sharing and discussions,as well as to prepare collaborative edition of the final project report.

Project Work:

The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.**

a) Internal assessment mark for Project Work:

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 and Internship in Board Examinations:

Demonstration / Presentation	40 marks
Project Report	30 marks
Viva Voce	30 marks
Total	**100* marks**

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

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

DIRECTORATE OF TECHNICAL EDUCATION

DEPARTMENT OF ROBOTICS AND AUTOMATION

II & IV YEAR

N SCHEME

IV & VII SEMESTER

2020-21 onwards

INDUSTRIAL TRAINING

(Common with all Sandwich courses)

CURRICULUM DEVELOPMENT CENTRE

SANDWICH DIPLOMA COURSE-INDUSTRIAL TRAINING

4049910 Industrial Training I (Report writing & Viva Voce)

4049920 Industrial Training II (Report writing & Viva Voce)

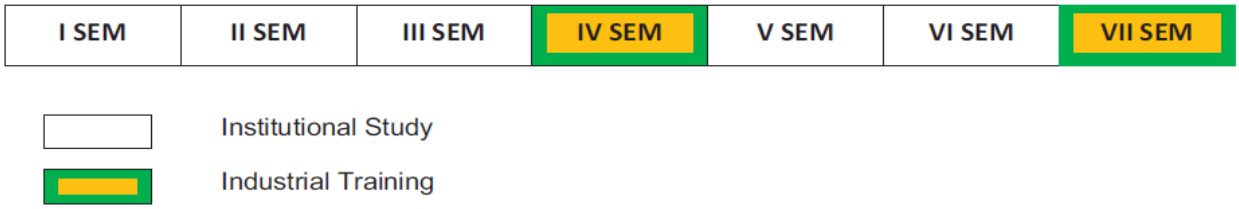
1. Introduction

The main objective of the sandwich Diploma course is to mould a well-rounded technician acclimated with industrial environment while being a student in the institution.

The Sandwich Diploma Course study is pursued by students, in 7 Semesters of 3 ½ years duration, the subjects of 3years-Full Time Diploma Course being regrouped for academic convenience.

While in the 4th semester students under Industrial Training for 6 months (December through May). They also do course work in the institution for one day in a week, while in the 7thsemester they undergo another spell of 6 months (June through November) Industrial training.

The Apprenticeship (Amendment) Act 1973 is followed in regulating the Industrial training procedure for Sandwich Course.



2. Attendance Certification

Every month students have to get their attendance certified by industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

3. Training Reports

The students have to prepare two types of reports:

- Weekly report in the form of diary to be submitted to the concerned staff in-charge of the institution. This will be reviewed while awarding Internal Assessment marks.

- Comprehensive report at the end of each spell which will be used for Board Examination.

3.1 Industrial Training Diary

Students are required to maintain the record of day-to-day work done. Such record is called Industrial Training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc). The concern Industrial supervisor is to check periodically these progress reports.

3.2 Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should be incorporating study of plant/product/process/construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Any data, drawings etc should be incorporated with the consent of the Organisation.

a. Scheme of Evaluation

1.1 Internal Assessment Marks

First Review (during 3rd month)	: 10 marks
Second Review (during 5th month)	: 10 marks
Attendance *	: 05 marks
(Awarded same as in Theory)	
Total	: 25 marks

1.2 Board Examination

Presentation about Industrial Training	: 30 marks
Comprehensive Training Report	: 45 marks
Viva-voce	: 25 marks
Total	: 100 marks

* **For awarding marks to attendance, the Industrial Training attendance has tobe considered.**