SYLLABUS

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

Course Code: 1042

2015 - 2016

M - SCHEME

DIRECTORATE OF TECHNICAL EDUCATION
GOVERNMENT OF TAMILNADU

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

Syllabus Revision Committee

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Tmt. S. Mathumathi I.A.S.,
Director of Technical Education
Directorate of Technical Education
Chennai 600 025

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Principal (I/C)
Government Polytechnic College
Usilampatti

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Tmt. K.R.Mala Devi Lecturer/Instrumentation and Control Engineering Govt. Polytechnic college for women, Madurai	**Thiru Ramesh Nagaraju** Group Engineering Manager Samsung Research Institute Bangaloare
Tmt. D.Rani Lecturer/ Instrumentation Purasaivakkam Chennai	**Thiru V.Vijayakumar** General Manager Q Max Test Equipments P Ltd., Chennai

DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY
(SEMESTER SYSTEM)
(Implemented from 2015- 2016)

M – SCHEME

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

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

1. Description of the Course:

a. Full Time (3 years)

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

b. Sandwich (3½ years)

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

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

c. Part Time (4 years)

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

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

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

2. Condition for Admission:

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

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

(Or)

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

(Or)

The Matriculation Examination of Tamil Nadu.

(Or)

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

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

3. Admission to Second year (Lateral Entry):

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

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

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

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

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

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

4. Age Limit: No Age limit.

5. Medium of Instruction: English

6. Eligibility for the Award of Diploma:

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

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

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

7. Subjects of Study and Curriculum outline:

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

8. Examinations:

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

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

9. Continuous Internal Assessment:

A . For Theory Subjects:

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

i. Subject Attendance **5 Marks**

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

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

ii) Test # **10 Marks**

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

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

Total **10 marks**

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

 # - From the Academic year 2015-2016 onwards.

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

With no choice:

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

	Total	50 marks
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iii) Assignment **10 Marks**

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

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

B. For Practical Subjects:

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

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

	TOTAL	:	**25 Marks**

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

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

10. Life and Employability Skill Practical:

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

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

11. Project Work:

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

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

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

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

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

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

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

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

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

No choice need be given to the candidates.

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

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

12. Scheme of Examinations:

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

13. Criteria for Pass:

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

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

14. Classification of successful candidates:

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

First Class with Superlative Distinction:

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

First Class with Distinction:

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

First Class:

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

Second Class:

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

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

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

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

16. Seminar:

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

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ANNEXURE – I
CURRICULUM OUTLINE

THIRD SEMESTER

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial/ Drawing	Practical Hours	Total Hours
34031	Electronic devices and circuits #	6	-	-	6
34232	Electrical circuits and machines	6	-	-	6
34233	Basics of Instrumentation	5	-	-	5
34234	Electrical and Electronic Practical	-	-	4	4
34235	Basics of Instrumentation Practical	-	-	4	4
34236	C Programming Practical	-	-	5	5
34237	Computer Application and Simulation Practical	-	-	4	4
	Seminar	1	-	-	1
	TOTAL	18	-	17	35

FOURTH SEMESTER

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		Theory Hours	Tutorial/ Drawing	Practical Hours	Total Hour
34241	Analog and Digital Electronics	5	-	-	5
34242	Measurements and Instruments	5	-	-	5
34243	Measurement of Process Variables	5	-	-	5
34244	Industrial Instrumentation	5	-	-	5
34245	Analog and Digital Electronic Practical	-	-	5	5
34246	Measurement of Process variables Practical	-	-	5	5
30002	Life and Employability Skill Practical *	-	-	4	4
	Seminar	1	-	-	1
	TOTAL	21	-	14	35

 # Common with ECE ** Common with all the Branches*

FIFTH SEMESTER

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical Hours	Total
34251	Process Control Instrumentation	5	-	-	5
34052	Microcontroller #	6	-	-	6
34253	Control Engineering	6	-	-	6
	Elective I				
34271	1.Instrumentation System Design	5	-	-	5
34272	2. Programmable Logic Controller				
34273	3.Industrial Power Electronics				
34255	Process Control Instrumentation Practical	-	-	4	4
34056	Microcontroller Practical #	-	-	4	4
34257	LABVIEW & MATLAB Practical	-	-	4	4
	Seminar	1	-	-	1
	Total	23	-	12	35

SIXTH SEMESTER

SUBJECT CODE	SUBJECT	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical Hours	Total
34062	Test Engineering #	6	-	-	6
34262	Industrial Automation and Drives	6	-	-	5
	Elective II				
34081	1.Bio Medical Instrumentation #	5	-	-	6
34763	2 Robotics $				
34061	3.Embedded systems #				
34264	Industrial Automation Practical	-		5	5
34066	Test engineering Practical #	-	-	4	4
34266	Programmable Logic controller Practical	-	-	4	4
34267	Project Work		-	4	4
	Seminar	1	-	-	1
	Total	18	-	17	35

 # Common with ECE

*$ Common with Electronics(ROBOTICS), * Common with all the Branches*

ANNEXURE- II
SCHEME OF THE EXAMINATION
THIRD SEMESTER

SUBJECT CODE	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment marks	Board Exam Marks	Total Mark		
34031	Electronic devices and circuits	25	75	100	40	3
34232	Electrical circuits and machines	25	75	100	40	3
34233	Basic of Instrumentation	25	75	100	40	3
34234	Electrical and Electronics Practical	25	75	100	50	3
34235	Basics of Instrumentation	25	75	100	50	3
34236	C Programming Practical	25	75	100	50	3
34237	Computer Application and Simulation Practical	25	75	100	50	3
	TOTAL	**175**	**525**	**700**		

FOURTH SEMESTER

SUBJECT CODE	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment marks	Board Exam Marks	Total Mark		
34241	Analog and Digital Electronics	25	75	100	40	3
34242	Measurements and Instruments	25	75	100	40	3
34243	Measurement of Process variables	25	75	100	40	3
34244	Industrial Instrumentation	25	75	100	40	3
34245	Analog and Digital Electronics Practical	25	75	100	50	3
34246	Measurement of Process variables Practical	25	75	100	50	3
30002	Life and Employability Skill Practical	25	75	100	50	3
	TOTAL	**175**	**525**	**700**		

FIFTH SEMESTER

SUBJECT CODE	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assessment marks	Board Exam Marks	Total Mark		
34251	Process control Instrumentation	25	75	100	40	3
34052	Microcontroller #	25	75	100	40	3
34253	Control Engineering	25	75	100	40	3
	Elective I					
34271	1. Instrumentation System Design	25	75	100	40	3
34272	2. Programmable Logic Controller					
34273	3. Industrial Power electronics					
34255	Process Control Instrumentation Practical	25	75	100	50	3
34056	Microcontroller Practical #	25	75	100	50	3
34257	LABVIEW & MATLAB Practical	25	75	100	50	3
	Total	**175**	**525**	**700**		

SIXTH SEMESTER

SUBJECT CODE	SUBJECT	Examination Marks			Minimum for pass	Duration of Exam Hours
		Internal assess-ment marks	Board Exam Marks	Total Mark		
34062	Test Engineering	25	75	100	40	3
34262	Industrial Automation and Drives	25	75	100	40	3
	Elective II					
34081	1. Bio medical Instrumentation #	25	75	100	40	3
34763	2.Robotics $					
34061	3. Embedded systems #					
34264	Industrial Automation Practical	25	75	100	50	3
34065	Test Engineering Practical #	25	75	100	50	3
34266	Programmable Logic controller practical	25	75	100	50	3
34267	Project Work	25	75	100	50	3
	Total	**175**	**525**	**700**		

 # Common with ECE

$ Common with Electronics(ROBOTICS)

** Common with all the Branches*

Board Examination - Question paper pattern

Common for all theory subjects

Time: 3 Hrs **Max. Marks: 75**

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

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

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

III SEMESTER

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

ELECTRONIC DEVICES AND CIRCUITS

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implemented from the Academic year 2015 - 2016 onwards)

Course Name : **Instrumentation and control Engineering**
Subject Code : **34031**
Semester : **III Semester**
Subject title : **ELECTRONIC DEVICES & CIRCUITS**

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject	Instruction		Examination			
			Marks			
	Hrs. Week	Hrs Semester	Internal Assessment	Board Examination	Total	Duration
Electronic Devices and Circuits	6	90	25	75	100	3Hrs

Topics and allocation of hours

UNIT	TOPIC	TIME(HRS)
I	Semiconductor and Diodes	16
II	Bipolar Junction Transistor	15
III	Transistor oscillators and FET and UJT	17
IV	SCR,DIAC,TRIAC and MOSFET	16
V	Opto Electronic Devices and Wave shaping Circuits	16
	Revision, Tests and Model Exam (3+4+3 Hrs)	10
Total		90

RATIONALE:

Basic electronic components checking characteristics must be studied by the budding Instrumentation Engineers before they go for further applications. Board level servicing of equipments may cause heavy budgets to the users of the electronic equipment. So chip level/component level servicing is motivated / encouraged for the diploma students. For this basic subject must be taught in full understanding of the principles

OBJECTIVES:

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

- Understand the working principle of PN junction diode zener diode and application
- Understand the working principle of different types of rectifiers
- Understand the different transistor configurations
- Differentiate various types of amplifiers
- Study the performance of special devices like UJT,FET
- Study the performance of different transistor oscillators
- Study the working of SCR, DIAC, and TRIAC
- Study the working and types of MOSFET
- Study the different modes of operations of MOSFET
- Know the working principle of optoelectronic devices
- Study the performance of solar cell with principle and applications
- Explain the concept of mV using IC555
- Study the working principle of clippers, clampers and Schmitt triggers

M 34031 - ELECTRONIC DEVICES AND CIRCUITS

DETAILED SYLLABUS

Unit	Name of the topic	Hrs.
1	**Semiconductor and Diodes:** **Semiconductor** – Definition, Classification, Intrinsic and Extrinsic N type & P type -Drift current & Diffusion current, Diodes-PN junction diode-Forward and Reverse bias characteristics-Specification-Zener diode-Construction & working principle-Characteristics- Zener break down-Avalanche break down-Zener diode as a voltage regulator - Applications-Specifications **Rectifier**-Introduction-Classification of Rectifiers-Half wave rectifier- Fullwave rectifier (Center tapped, Bridge) – (no mathematical equations) – comparison - Applications – Filters – C, LC, and PI Filters	8 5
2	**Bipolar Junction Transistor:** **Transistor** – NPN and PNP transistor – operation- Transistor as an amplifier – Transistor as a switch - Transistor biasing – Fixed bias, Collector base bias, Self bias – CB, CE, CC Configurations – Characteristics – Comparison between three configurations in terms of input impedance, Output impedance, Current gain, Voltage gain – Classification of amplifiers - RC coupled amplifier– Emitter follower and its application - Negative feedback – Basic concept, effect of negative feedback -Types of Negative feedback connections	8 4
3	**Transistor Oscillators and FET and UJT:** **Transistor oscillator** – Classifications – Condition for oscillations (Barkhausen criterion) General form of LC oscillator – Hartley Oscillator – Colpitts Oscillator – RC Phase shift oscillator- Crystal oscillator. **Field Effect Transistor** – Construction – Working principle of FET – Difference between FET and BJT – Classification of FET - Characteristics of FET – Applications – FET amplifier(Common source amplifier). **Uni Junction Transistor** – Construction – Equivalent circuit – Operation – Characteristics – UJT as a relaxation oscillator	9 5
4	**SCR, DIAC, TRIAC & MOSFET:** **SCR** – Introduction – Working – Comparison between SCR and Transistor – VI Characteristics – SCR as a switch , Controlled rectifier - TRIAC- working principle Characteristics - DIAC – characteristics – DIAC as bi-directional switch. MOSFET – Types & characteristics of both N, P channel MOSFET. Characteristics of Enhancement and Depletion Mode MOSFETs.- MOSFET as a switch. Applications of SCR, TRIAC, DIAC and MOSFET	7 6
5	**Opto Electronics Devices and wave shaping circuits:** Classification of opto electronic devices – symbols, Characteristics, working of LDR , LED, 7 segment LED and LCD– optocoupler - Photo transistor. Clipper, Clamper Circuits and waveforms only – Solar Cell Principles – Applications , Astable, Monostable and Multivibrators using Transistors -Schmitt Trigger using Transistors	13
	Revision and Test	10

Text Books:

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

Reference Books:

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

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

ELECTRICAL CIRCUITS AND MACHINES

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name :**DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Semester : **III**
Subject Code : **34232**
Subject : **ELECTRICAL CIRCUITS AND MACHINES**

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

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

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	DC circuits and DC Networks Theorems	16
II	AC circuits	16
III	Resonance and Three phase AC circuits	16
IV	DC Machines and AC Machines	16
V	Transformers	16
	Test & Revision	10
	Total	90

RATIONALE:

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

OBJECTIVES:

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

ELECTRICAL CIRCUITS AND MACHINES
DETAILED SYLLABUS

Unit	Name of the Topic	Hours
I	**DC Circuits and DC Network Theorems** Concept of electrical quantities – Voltage – current – resistance – power – energy – ohm's law – Resistances in series – Resistances in parallel – series parallel circuits – Kirchhoff's laws Super position, Thevenin's, Norton's and maximum power transfer theorems – Statement and explanations – Simple problems.	**16**
II	**AC Circuits** AC fundamentals – AC waveform – sinusoidal and non-sinusoidal – period – frequency – cycle – amplitude – phase – peak value – average value – RMS value (effective value) – form factor – crest factor AC Through pure resistor, inductor and Capacitor – Concept of impedance – vector diagram. Capacitors in series and parallel – energy stored in a capacitor– derivation – simple problems. Power in AC circuits – power factor– RL, RC and RLC series and parallel circuits – simple problems. Introduction of Harmonics - Effects of Harmonics	**16**
III	**Resonance and 3 ϕ AC circuits** Resonance – condition for resonance – series and parallel resonance – resonance curve – effect of resistance on resonance curve – selectivity – Q factor and bandwidth – applications of resonance – simple problems in resonance. Concept of 3ϕ supply – line and phase voltage and current in star and delta connected circuits – three phase power – Measurement of three phase power by two watt meter method – simple problems – advantages of three phase over single phase system.	**16**
IV	**D.C Machines and A.C Machines** DC machines – Types – constructional details of DC machines – DC generators – principle – types – emf equation – characteristics of shunt, series and compound generators DC motor – types – motor action – back emf – torque speed characteristics – starting of motors using 3 and 4 point starters – speed control of DC motor-applications. AC machines – 3ϕ alternator – construction and working – relation between speed and frequency. 3ϕ Induction motor – construction – types – principle of operation – methods of starting of 3ϕ induction motor – slip. Single phase induction motor – principle of operation – capacitor start - motors – Applications – principle of operation -Stepper motor .	**16**

V	**Transformers** Transformer – Ideal transformer – principle of working – constructional details – emf equation – turns ratio – core loss – copper loss – efficiency – regulation – SC and OC tests – simple problems. Transformer on No load – Transformer on load – condition for maximum efficiency – All-day efficiency(simple problems). Auto transformer – construction and working – applications.	**16**
	Revision and Test	**10**

Text books:

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

Reference books:

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

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

BASICS OF INSTRUMENTATION

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name: **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code: **1042**
Subject code: **34233**
Semester : **III semester**
Subject title : **BASICS OF INSTRUMENTATION**

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : **15 weeks**

Subject Title	Instruction		Examination			
	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
BASICS OF INSTRUMENTATION	5	75	25	75	100	3Hrs

Topics and Allocation of Hours :

UNIT	TOPIC	TIME (Hrs)
UNIT I	Basics of Instrumentation	13
UNIT II	Performance characteristics of Instruments	13
UNIT III	Sensors and Transducers	13
UNIT IV	Mechanical and Optical Transducers	13
UNIT V	Electrical Transducers	13
	Revision, Test	10
	Total	75

RATIONALE :

Instrumentation and Control Engineers plays a major role in process industries. The students of Instrumentation and Control Engineering branch need a brief idea about the basic concepts of instrumentation, various transducers and their characteristics which can be helpful to them to study the core subjects during their academics. This subject covers the basic needs of instrumentation and it makes the students to understand the importance of instrumentation in industries.

OBJECTIVES:

On completion of the Units mentioned above, the students would be able to

- Define measurement, Instrument, Instrumentation system.
- List and explain the major components of an Instrumentation system for bourdon tube and pressure thermometer.
- List the three types of standards and describe the purpose of each type of standard Concept of calibration.
- Explain the classification of errors.
- Concept of statistical analysis of test data.
- List the static characteristics and describe the effect of each on the performance.
- List the dynamic characteristics and describe the effect of each on the performance.
- List the standard test input signals.
- Describe the dynamic response of instruments.
- Concept of time constant.
- Describe the purpose of major components in a transducer.
- Explain the difference between primary and secondary transducer.
- Explain the difference between Active and Passive transducer
- Explain the difference between Analog and Digital transducer
- Explain the difference between Transducer and Inverse transducer
- Explain the characteristics of transducer
- Discuss criteria to consider in choosing a transducer.
- Compare and contrast Electrical transducer and mechanical transducer.
- . Explain the pressure sensor, proximity sensor, displacement sensor.
- .Explain the magnetic sensor, Bio sensor, Hall-effect sensor and optical sensor.

- Describe the principle of working, construction and application, of the mechanical transducer.
- Explain the elastic elements.

- Explain the mechanical pressure transducer.
- Explain the Thermal detector.
- Explain the Hydro pneumatic elements.
- Describe the principle of working, construction and application of the optical transducer.
- Describe the principle of working, construction and application of Electrical transducer.
- Explain variable resistive transducer and their types.
- Explain variable Inductive transducer.
- . Explain the principle of LVDT
- . Explain variable capacitive transducer.
- . Explain the piezo-electric transducer.

34233 BASICS OF INSTRUMENTATION

DETAILED SYLLABUS

UNIT	NAME OF THE TOPIC	HOURS
I	**FUNDAMENTALS OF INSTRUMENTATION** Definition – Measurement, Instrument, Instrumentation system. Generalized Functional block diagram of an Instrumentation system – Examples – Bourdon tube pressure gauge, Pressure Thermometer. Definition – Standards, Primary, Secondary and Working Standards –Definition – Error, True value, Correction, Calibration, Zero error, Backlash error- Classification of errors – Gross error, Systematic error, Random error. Statistical analysis of test data – Arithmetic mean, Deviation, Standard Deviation, Variance, Simple problems.	**13 Hrs**

II	**PERFORMANCE CHARACTERISTICS OF INSTRUMENTS** Static characteristics – Range, Span, Accuracy, Precision, Significant of figure, Range of doubt, Dead time, Dead zone, Hysteresis, Threshold, Resolution, Sensitivity, Linearity, Reproducibility, Stability, Loading effect, Input impedance and Output impedance. Dynamic characteristics – Speed of response, Measuring lag, Fidelity and Dynamic error. Standard Test input signals - Dynamic response – Steady state and Transient response.	**13 Hrs**
III	**TRANSDUCERS AND SENSORS** Transducer – Definition, classification – Primary and Secondary transducer, Active and Passive transducer, Analog and Digital transducer, Transducer and Inverse Transducer (with one example for each classification). Characteristics of transducer – Input characteristics, Output characteristics and transducer Response. Factors to be considered in the selecting of Transducers. Electrical Transducer- Advantages of electrical Transducer over Mechanical Transducer. Sensors – Pressure Sensor, Proximity and Displacement sensor, Magnetic sensor, Bio sensor, Hall-effect sensor, Optical sensor.	**13 Hrs**
IV	**MECHANICAL TRANSDUCER** Definition- Mechanical pressure transducer - Elastic element – Bourdon tube, Bellows, Diaphragms. Manometers – U Tube manometer, Well type manometer, Barometer, Inclined tube manometer, Ring balance manometer, Micro manometer, manometric fluids-Construction, Principle, Working and Applications only –Thermal detectors – Liquid in glass thermometer, Filled system thermometer, Bi-metallic thermometer- Construction, Principle, Working and Applications only. Hydro-pneumatic elements – Venturi and Orifice - Construction, Principle, Working and Applications only.	**13 Hrs**

V	**ELECTRICAL TRANSDUCER** Definition- Resistive Transducer-Potentiometer–types, Piezo-Resistive effect- Strain gauge – types – bonded, unbonded and semiconductor. Resistance Temperature Detector - Thermo-couple, Thermistor, Thermo-diodes and transistors – Construction, Principle, Working and Applications only. Variable Inductance Transducer - LVDT, Variable capacitance transducer - Construction, Principle, Working and Applications only. Piezo-electric Transducer – Piezo electric effect, materials, Modes of operation, Properties of Piezo electric crystals, Equivalent circuit – Applications.	**13 Hrs**
	Revision and Test	**10**

TEXT BOOK:

1. A course in Electrical and Electronic measurement and Instrumentation by A.K.Shawney, Dhanpat Rai & co.,Reprint 2010.

REFERENCE BOOKS

1. HERMAN. K. P NEUBERT, Instrument transducers, An Introduction to their performance and design, Oxford University Press, 2nd Edition.
2. A. K .SHAWNEY, PUNEET SHAWNEY, A course in Mechanical measurement and Instrumentation, Dhanpat Rai & co, 12th Edition, 2001 – 2002.
3. D. S. KUMAR, Mechanical measurements & control, Metropolitan Book co Pvt. Ltd, 3rd Edition 1989.
4. S.K. SINGH, Industrial Instrumentation & control, Tata Mc Graw Hill publishing company Ltd. 13th Edition 1997.
5. C. NAKRA, K. K. CHAUDRY, Instrumentation Measurement and Analysis, 2nd Edition, Tata McGraw Hill Publishing company.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

ELECTRICAL AND ELECTRONICS PRACTICAL

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Semester : **III**
Subject Code : **34234**
Subject :**ELECTRICAL AND ELECTRONICS PRACTICAL**

Teaching and Scheme of Examinations: No. of Weeks per Semester: 15

Subject Code & Name	Instruction		Examination			
Electrical Circuits and Machines Practical	Hours / Week	Hours/ Semester	Marks			Duration in Hours
	4	60	Continuous Assessment	End Semester Examination	Total	3
			25	75	100	

RATIONALE:

The fundamental practical knowledge about AC and DC circuit is essential for all diploma holders. The working principle of DC generator and transformer is further Understood by conducting load test . Almost all electronic devices covered in theory is to be tested in practice in this subject..

OBJECTIVES:

- Verify the ohm's law and superposition theorem
- Verify the Thevinin's and Norton's theorems
- Demonstrate the frequency response plot for series resonance
- Conduct load test and No load test on DC generators
- Conduct load test on single phase transformer
- Conduct experiment to use Zener diode as voltage regulator
- Conduct experiment to study the VI characteristics of PN junction Diode
- Conduct experiment to learn the working of rectifiers
- Conduct experiment to learn the working of CE amplifier
- Conduct experiment to observe the output of oscillator.
- Conduct experiment to understand the clipper and clamper circuit

34234 ELECTRICAL AND ELECTRONICS PRACTICAL

List of Experiments:

1. Verify Ohm's law by using voltage drop test and plot the graph
2. Test and Verify Thevanin's theorem for DC circuit
3. Determine the Frequency response of Series resonance
4. Conduct experiment to Measure three phase power by two wattmeter method
5. Conduct Load test on DC shunt generator
6. Conduct the open circuit and short circuit test on single phase Transformer
7. Conduct experiment to learn the Forward and Reverse bias characteristics of PN junction Diode
8. Construct voltage regulator circuit using Zener diode and obtain load regulation and line regulation
9. Construct Full wave rectifier, Bridge rectifier circuit and observe waveforms
10. Construct Common Emitter Amplifier circuit and obtain voltage gain, input impedance & output impedance
11. Construct R-C phase shift oscillator circuit and obtain the frequency of oscillation
12. Construct UJT based Relaxation oscillator circuit and observe output waveform
13. Experimentally obtain the V-I characteristics of SCR obtain its parameters
14. Experimentally obtain the characteristics of LDR
15. Construct clipper and clamper circuit and observe input and output waveforms

SCHEME OF EVALUATION		
No.	**Allocation**	**Marks**
1	Circuit diagram	20
2	Connections & procedure	20
3	Tabulation & Graph	20
4	Result	10
5	Viva Voce	5
Total		75

Equipments Required:

S.NO	Name of the Equipments	Range	Required Nos.
1.	Variable DC power supply	0-15V	6
2.	Single phase Transformer	0-250V	2
3.	Signal Generator	1MHz	5
4.	Dual trace CRO	20 MHz	5
5.	Transformer	12-0-12V	5
6.	DC Shunt Generator		1
7.	Digital Multi meter	-	10

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

BASICS OF INSTRUMENTATION PRACTICAL

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Subject code : **34235**
Semester : **III semester**
Subject title : **BASICS OF INSTRUMENTATION PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : **15 weeks**

Subject Title	Instruction		Examination			
	Hrs Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
BASICS OF INSTRUMENTATION PRACTICAL	4	60	25	75	100	3Hrs

RATIONALE:

As in any process and instrumentation industries calibration is a vital process to be done, and sensor and transducers is fundamental device , in this subject practice is given to the students in this regard.

OBJECTIVE:

- To understand the calibration procedure ammeter , voltmeter and Thermometer is to be calibrated
- To get practice to use Multimeter and CRO to measure electrical parameters
- To understand the characteristics of Transducers , some of their(strain gauge, LVDT, Thermistor, RTD) characteristics to be obtained experimentally

34235 - BASICS OF INSTRUMENTATION PRACTICAL

LIST OF EXPERIMENTS :

1. Calibrate the given Ammeter with the standard Ammeter of same range
2. Calibrate the given Voltmeter with the standard voltmeter of same range
3. Calibrate the given thermometer against the standard thermometer
4. Conduct experiment to Measure pressure using U tube manometer
5. Conduct experiment to Measure the resistance, voltage, current using Multimeter.
6. Conduct experiment to test the Resistance, Diode, Transistor using Multimeter & CRO.
7. Experimentally obtain V-I characteristics of Potentiometer and observe linearity
8. Experimentally obtain the Characteristics of Strain gauge
9. Experimentally obtain the Characteristics of LVDT
10. Experimentally obtain the Characteristics of Thermistor.
11. Experimentally obtain the Characteristics of Resistance Temperature Detector.
12. Experimentally obtain the Characteristics of thermocouple.

34235- BASICS OF INSTRUMENTATION PRACTICAL

Equipments Required:

S.No	Name of the Equipments	Required Nos
1	Ammeter (0 - 50)Ma	4 nos
2	Voltmeter (0 - 10)V	4 nos
3	Regulated Power Supply (0-30)V	4 nos
4	Rheostat	4 nos
5	Thermometer	2 nos
6	Pressure measuring setup using U tube manometer	1 no
7	Digital Multimeter	6 nos
8	CRO Dual Trace 20 MHz / 30 MHz	2 nos
9	Strain measurement module using Strain gauge	2 nos
10	Displacement measurement module using LVDT	2 nos
11	Thermistor with industrial standard	2 nos
12	3 wire RTD (PT-50 / PT-100) with industrial standard	2 nos
13	Thermocouple (J-type / K-type) with industrial standard	2 nos
14	Water bath with heater arrangement	3 nos

SCHEME OF EVALUATION		
No.	**Allocation**	**Marks**
1	Circuit diagram	20
2	Connections & procedure	20
3	Tabulation & Graph	20
4	Result	10
5	Viva Voce	5
Total		75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

C PROGRAMMING PRACTICAL

CURRICULAM DEVELOPMENT CENTRE

M – SCHEME

(Implemented from the academic year 2015 - 2016 onwards)

Course Name : **Diploma in instrumentation and control engineering**
Course Code : **1042**
Subject Code : **34236**
Semester : **III Semester**
Subject Title : **C Programming Practical**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 15 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Internal Assessment	Board Examination	Total	Duration
C PROGRAMMING PRACTICAL	5	75	25	75	100	3 Hrs

RATIONALE:

This subject is a fundamental for the student to learn how to write a program in high level language . so it will be useful for Instrumentation and control engineers to write coding and to develop the software. Further practice for writing simple program for instrumentation application is insisted.

OBJECTIVES:

At the end of the Course, the students will be able to

Analyze the given problem.

Think the logic to solve the given problem.

Describe the concepts of constants, variables, data types and operators.

Develop programs using input and output operations.

Write programs using different looping and branching statements.

Write programs based on arrays.

Write programs using the concept of Pointers.

Write programs for solving simple equations used in circuit theory.

Write programs to convert Celsius to Fahrenheit

Write program to draw the symbol of NPN transistor, Capacitor, etc.,

34236 - C Programming Practical

List of Experiments:

1. Write C language program to find the solution of a quadratic equation

2. Write C language program to find whether the given number is a positive number, negative number or zero

3. Write C language program to find the sum of series using While loop

4. Write C language program to perform the Arithmetic operation based on the numeric key press using switch case statement. (1-Addition, 2-Subtraction, 3 – multiplication, 4 - Division)

5. Write C language program to implement Matrix addition

6. Write C language program to find factorial of given N numbers using function

7. Write C language program to prepare the total marks for N students by reading the Name, Reg.No, Marks 1 to Marks 6 using array of structure

8. Write C language program to swap the values of two variables using pointer

9. Write C language program to calculate the equivalent resistance of three resistances connected (a) in series (b) in parallel.

10. Write C language program to display the average, RMS, form factor and crest factor from the given peak value

11. Write C language program to find the resonant frequency from the given L and C value

12. Write C language program to find the Arithmetic mean, Range, Deviation and standard deviation of the give 10 readings (data)

13. Write C language program to convert Celsius to Fahrenheit using function

14. Write C language program to Draw the symbol NPN transistor symbol using graphics

15. Write C language program to Draw the symbol for capacitor using Graphics

SCHEME OF EVALUATION		
No.	**Allocation**	**Marks**
1	Writing Algorithm	20
2	Writing Program	20
3	Executing program	25
3	Result	05
4	Viva Voce	05
Total		75

HARDWARE REQUIREMENT

Desktop Computers – 36 Nos

Laser Printer – 1 Nos

SOFTWARE REQUIREMNT

C – Compiler with Editor

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

III SEMESTER

2015 – 2016 onwards

COMPUTER APPLICATIONS ANDSIMULATION PRACTICAL

Curriculum Development center

M- SCHEME
(to be implemented to the student Admitted from the Year 2015-2016 on wards)

Course Name : ELECTRONICS AND COMMUNICATION ENGINEERING

Subject Code : 34237
Semester : III
Subject title : COMPUTER APPLICATION ANDSIMULATION PRACTICAL

TEACHING & SCHEME OF EXAMINATION:

No. of weeks per Semester: **15 Weeks**

Course	Instruction		Examination			
			Max. Marks			Duration
	Hours/ Week	Hours Semester	Continuous Assessment	Semester-End Examination	Total	
COMPUTER APPLICATIONS ANDSIMULATION PRACTICAL	4 Hrs	60 Hrs	25	75	100	3 Hrs

RATIONALE:

The application of Computer knowledge is essential to the students of all disciplines of Engineering in addition to their respective branch of study. The Computer Application Practical course facilitates the necessary knowledge and skills regarding creating, working and maintaining the documents, analyzing the data with charts manipulation of databases and presentation of documents with audio visual effects in a computer.

The learning of internet provides students with unprecedented opportunities to obtain information engage in discussion and liaise with individuals, organizations and groups world-wide. It provides the latest tools and technologies in helping the students to fetch better employment.

OBJECTIVES:

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

- Understand the Windows operating systems
- Familiarize and customize the desktop computer
- Use the different facilities available in the word processor
- Analyze the data sheet
- Create and manipulate the database Prepare PowerPoint presentation
- Understand Internet concepts and usage of e-mail
- Understand to use the computer for simulation applications
- Simulate the simple passive circuit using simulation package
- Simulate the simple active circuit using simulation package
- Simulate the behavior of digital logic circuits

LAB EXERCISES

SECTION I

Exercise in WINDOWS:

1. a. Install screen saver and change the monitor resolution by 1280X960
   b. Setting wall papers
   c. Creating, moving, deleting and renaming a folder
   d. Copying files into CD/DVD
   e. Recording and saving an audio file
   f. Set/Change the date and time.

Exercise in WORD PROCESSING:

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

Exercises in SPREADSHEET

4. Create a table of records with columns as Name and Donation Amount. Donation amount should be formatted with two decimal places. There should be at least twenty records in the table. Create a conditional format to highlight the highest donation with blue colour and lowest donation with red colour. The table should have a heading.
5. Prepare line, bar and pie chart to illustrate the subject wise performance of the class for any one semester.

Exercise in DATABASE

6. Prepare a payroll for employee database of an organization with the following details:

   Employee Id, Employee name, Date of Birth, Department and Designation, Date of appointment, Basic pay, Dearness Allowance, House Rent Allowance and other deductions if any.

   Perform simple queries for different categories.

Exercise in POWER POINT

7. Create a Presentation on a mini project with ten different slide transitions with sound effect.

Exercise in INTERNET

8. a. Create e-mail id and perform the following.
    i. Write an e-mail inviting your friends to your birthday party.
    ii. Make your own signature and add it to the e-mail message.
    iii. Add a word attachment of the venue route
   b. Send the e-mail to at least 2 of your friends.

SECTION II

9. Simulate the Nodal analysis for simple DC circuit
10. Simulate the wheatstone bridge circuit and observe the output
11. Simulate the Half wave rectifier circuit and observe input and output waveform
12. Simulate the zener diode based regulator circuit
13. Simulate the common Emitter Amplifier circuit and observe input output waveforms
14. Simulate the RC phase shift oscillator circuit and observe output waveform
15. Simulate the truth table of AND,OR ,NAND, NOR gates

ALLOCATION OF MARKS

1. Internal Assessment – 25 Marks

DESCRIPTION	MARKS ALLOTTED
Record with Printout	10
Procedure /writing steps/observation	10
Attendance	5
Total	**25 MARKS**

2. Board Examinations – 75 Marks

Content	Max. Marks	
	Section I	Section II
Writing steps	10	20
Execution of exercise	10	20
Result with Printout	5	5
Viva voce	5	
Total	**75 Marks**	

IV SEMESTER

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

ANALOG AND DIGITAL ELECTRONICS

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Semester : **IV**
Subject Code : **34241**
Subject : ANALOG **AND DIGITAL ELECTRONICS**

Teaching and Scheme of Examinations: No. of Weeks per Semester: 15

Subject Code & Name	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration in Hours
Analog and Digital Electronics	5	75	Continuous Assessment	End Semester Examination	Total	3
			25	75	100	

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Linear Ics: Op. amp. Timer and their applications	13
II	Boolean Algebra	13
III	Combinational Logic	13
IV	Sequential Logic	13
V	D/A, A/D and Memory	13
	Revision and test	10
	Total	75

RATIONALE:

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

OBJECTIVES:

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

DETAILED SYLLABUS

Unit	Name of the Topic	Hours
I	**Linear ICs: Op-amps, Timers and their applications** Operational amplifier – Ideal Op.Amp – Block diagram and characteristics –Op-amp parameters – CMRR – Slew rate – Virtual ground – Applications of op-amp – Inverting amplifier – Summing amplifier – Non inverting amplifier – Voltage follower – Comparator – Zero crossing detector – Integrator – Differentiator – Op- Amp Specifications. 555 Timer – Functional Block diagram – Astable, Monostable and Schmitt Trigger – Sequence timer,555 timer can be used as PWM.	**13**
II	**Boolean Algebra** Number systems – Decimal – Binary – Octal – Hexadecimal – BCD – Conversion from one number system to other – Boolean Algebra – Basic laws and Demorgan's Theorems – Logic gates – OR – AND – NOT – NOR – NAND – EX-OR Symbols, Truth table and Boolean expression – Realization of gates using universal gates NAND, and NOR – Problems using 2, 3, and 4 variables – Boolean expression for outputs – Simplification of Boolean expression using Karnaugh map (up to 4 variable)- Constructing logic circuits for the Boolean expressions.	**13**
III	**Combinational Logic** Arithmetic circuits – Binary addition – Binary Subtraction – 1's complement and 2's complement – Signed binary numbers – Half adder – Full adder – Half subtractor – Full subtractor – Parity Generator and checker – Digital comparator – Arithmetic Logic Unit – Decoder – 3 to 8 decoder – BCD to seven segment decoder – Encoder – Multiplexer – Demultiplexer – Digital Logic families – TTL – CMOS – LS series – Fan in – Fan out – Propagation delay – Noise immunity for the above families.	**13**
IV	**Sequential Logic** Flip-flops – RS – D – T – JK – Master Slave Flip Flops – Edge triggered FF – Asynchronous Binary Counter – Decade counter – Mod n counter – Up Down Counter – Preset table counter – Ring counter – Johnson counter – Synchronous counter – State diagram – Shift register – 4 bit shift register – Serial in Serial out – Serial in Parallel out – Parallel in serial out.	**13**
V	**D/A, A/D and Memory** D/A Converter – Basic concepts – Weighted Resistor D/A converter – R-2R Ladder D/A converter – Specification of DAC IC. Sampling and quantization – Analog to digital conversion using Ramp method – Successive approximation method – Dual slope method, simultaneous method voltage to frequency converter – Frequency to voltage converter specification of A/D converter. Memory – Static Memory – Dynamic Memory – Static Memory organization in terms of address lines, control lines and data lines –– SDRAM – DDR RAM	**13**

Text Books:

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

Reference Books:

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

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

MEASUREMENTS AND INSTRUMENTS

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Subject code : **34242**
Semester : **IV Semester**
Subject title : **MESUREMENTS AND INSTRUMENTS**

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : **15 weeks**

Subject Title	Instruction		Examination			
	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
MESUREMENTS AND INSTRUMENTS	4	60	25	75	100	3Hrs

Topics and Allocation of Hours :

UNIT	TOPIC	TIME (Hrs)
UNIT I	Measuring instruments	10
UNIT II	Bridges and oscilloscope	11
UNIT III	Test instruments	10
UNIT IV	Digital instruments	10
UNIT V	Operational amplifier applications	11
	Revision, Test	8
	Total	60

RATIONALE :

Instrumentation and Control Engineers plays a major role in process industries.

The students of Instrumentation and Control Engineering branch need a brief idea about the basic concepts of instrumentation, various transducers and their characteristics which can be helpful to them to study the core subjects during their academics. This subject covers the basic needs of instrumentation and it makes the students to understand the importance of instrumentation in industries.

OBJECTIVES:

On completion of the Units mentioned above, the students would be able to

1. Realize the importance of three basic forces required in meters.
2. Explain the construction and working of indicating instruments for voltage,current Power & Energy.
3. Understand the working and applications of Multimeter for Ω, V, A measurement.
4. Explain range extension methods for Ammeters and Voltmeters.
5. Explain the construction and working and practical application of WB Bridge for Resistance measurement.
6. Explain the construction and working of AC Bridges & measurement of Land C using three bridges.
7. Explain the construction and working of AC Bridges & measurement of frequency using Wien bridge.
8. Explain the construction, working and applications of CRO.
9. Explain the voltage probe and current probe with active and passive components.
10. Explain the working and application of Power Supply as a test instrument.
11. Understand the use of Audio signal generator, Frequency generator, and Megger for testing of electronic/electrical circuits.
12. Explain the working and use of CT's and PT's
13. Understand and write the working of recorders.
14. Compare Digital Vs Analog Instruments.
15. Explain the working of different types of DVM.
16. Explain the block diagram and circuit diagram of DFM.
17. Use Digital Multimeter.
18. Explain the working of EC and Digital Panel meter using LCD.
19. Explain the application of Op-amp for wave generation.
20. Explain the use of I differential, instrumentation Amplifiers and Charge Amps.
21. Explain the working and applications of LPF, HPF.
    Explain the principle and working of PLL

34242 MEASUREMENTS AND INSTRUMENTS

DETAILED SYLLABUS

UNIT	NAME OF THE TOPIC	HOURS
I	**MEASURING INSTRUMENTS** Basic forces for indicating instruments – constructional features of permanent magnet and moving coil instrument – moving iron instrument – attraction and repulsion types – rectifier type ac volt meter – ohm meter – series and shunt type – extension of range using shunt and multipliers – analog Multimeter circuits – dynamo meter type wattmeter - 1φ & 3φ induction type energy meter, Multifunctional Meters.	**10 Hrs**
II	**BRIDGES AND OSCILLOSCOPE** Construction, working, balance equation (derivation not required) and application of measurement of resistance by Wheatstone bridge – measurement of capacitance by Scheringbridge – measurement of inductance by Maxwell's bridge –measurement of frequency using Wien bridge - RLC meter. Block diagram of oscilloscope – construction and working of CRT – horizontal deflection and vertical deflection – time base generator – CRO probes –voltage – current – active – passive probes -applications of CRO.	**11 Hrs**
III	**TEST INSTRUMENTS** Block diagram, working and applications of DC power supply –fixed and variable – Audio signal generator – Function generator – Megger – working and applications. Instrument transformer – CT and PT – block diagram, working ofrecorders – XY recorder – strip chart recorder.	**10 Hrs**

IV	**DIGITAL INSTRUMENTS** Digital vs Analog instruments – Digital volt meter-Integrated type, Ramp type and successive approximation – Digital Multimeter– auto ranging – auto zeroing – auto polarity – Digital Frequency Meter –Block diagram- circuit diagram – Digital tachometer – digital panel meter using LCD – Digital storage oscilloscope, mixed storage oscilloscope.	**13 Hrs**
V	**OP - AMP APPLICATIONS** Circuit diagram and working of ramp, triangular, square wave generators using operational amplifier – Differential amplifier – Instrumentation amplifier – Charge amp with zero electric crystal –low pass and high pass filters using op. amps –PWM - PLL –Functional block diagram Capture range – Lock range - - applications.	**14 Hrs**
	Revision and Test	**8 Hrs**

TEXT BOOK:

1. A course in Electrical and electronic measurements and instrumentation –

A. K. SAWHENY, DHANPAT RAI & sons. 1986.

(Page Nos.292-329,585-599,605,1171-1173,785-814,865-867,390-412,1303-1315,1295,825,1372)

REFERENCE BOOKS:

2. Modern electronics Instrumentation and measurement techniques –

ALBERT D. HELFRICK

3. Electrical and Electronics measurements and instrumentation –

UMESH SINHA, SATYAPRAKASHAN, Tech India publication 1992.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

MEASUREMENT OF PROCESS VARIABLES

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Subject code :3**4243**
Semester : **IV Sem**
Subject title : **MEASUREMENT OF PROCESS VARIABLES**

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : **15 weeks**

Subject Title	Instruction		Examination			
	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Measurement of Process Variables	5	75	25	75	100	3Hrs

Topics and Allocation of Hours :

UNIT	TOPIC	TIME (Hrs)
UNIT I	Measurement of Temperature	15
UNIT II	Measurement of Pressure	13
UNIT III	Measurement of Flow (Mechanical)	13
UNIT IV	Measurement of Flow (Electrical)	13
UNIT V	Measurement of Level, Humidity and Moisture	13
	Revision, Test	8
	Total	75

RATIONALE :

Instrumentation engineers must be conversant with the details of measurement of process variables in industries. In any process industries, the major process variables involved are temperature, pressure, flow and level. This subject covers the detailed study of principle, construction, operation, advantages, limitations and applications of the various transducers used in process industries. It also helps the students to understand about the availability of various transducers by different principles to measure the same process variable. This subject gives an idea about the selection of transducers for a given process variable by analyzing the advantages and limitations of each transducer.

OBJECTIVES:

Completion of the following units of syllabus, the students must be able to

- Know what is temperature and its unit.
- Know the concepts of non-electrical methods of temperature measurements.
- Know the concept of electrical methods of temperature measurements.
- Know the Cold junction compensation of thermocouples.
- Know the concepts of high temperature measurements.
- Know the concepts of temperature transmitters.
- Know what is pressure, types of pressure and its units.
- Know the concepts of electrical methods of pressure measurements.
- Know the methods of measuring vacuum.
- Know the concepts of pressure transmitters.
- Know about the telemetry.
- Know about the types of Flow.
- Know about the importance of Reynolds's number.
- know about Bernoulli's theorem.
- Know about Differential pressure type flow meters.
- Know about positive displacement type flow meter.
- Know about Inferential flow meter.
- Know about different type of Electrical flow meters.
- Know about measurement of solid flow.
- Know the concepts of Non-electrical methods of Level measurements.
- Know the concepts of electrical methods of Level measurements.
- Know the concepts of Moisture and Humidity.

34243 MEASUREMENT OF PROCESS VARIABLES

DETAILED SYLLABUS

UNIT	NAME OF THE TOPIC	HOURS
I	**MEASUREMENT OF TEMPERATURE** Mechanical methods – pressure spring – liquid – gas – Vapour in glass – liquid in steel – thermometers,Bimetallic thermometer - Construction,working, range,advantages, disadvantages and applications of above. Electrical methods – Thermo couples – Cold junction compensation – Lead wire compensation – Thermoelectric laws – series and parallel combination – thermopile – Bolo meter – Measurement of output of thermocouples using potentiometer and millivoltmeter – RTD – 3 wire and 4 wire - Thermistors. Construction,working, range,advantages, disadvantages and applications of above. High temperature measurement – Non contact methods – Total Radiation Pyrometers – Selective radiation pyrometer - Photo electric pyrometers – Optical pyrometers – Temperature transmitters.	**15 Hrs**
II	**MEASUREMENT OF PRESSURE** Types and units of pressure - mechanical methods – Manometers (all types) – Elastic elements – Bellows – Diaphragms–Bourdon Tube. Electrical methods – Pressure measurements using strain gauge, capacitive transducer, LVDT and Piezo-electric transducer. Construction, working, range, advantages, disadvantages and applications of above. Pressure calibration – Dead weight tester. Transmitters – Differential pressure transmitters. Data transmission theory and Telemetry system-General telemetry system-Radio frequency telemetry system-Brief theory about modulation and demodulation.	**13 Hrs**

III	**MEASUREMENT OF FLOW (MECHANICAL)** Bernoulli's theorem – Continuity equation – Reynolds's number – Types of flow – Inferential flow meters – Differential pressure type meters – Orifice plates – Venturi tube – Flow Nozzle – Dall tube - Pitot tube (No derivation) – Positive displacement type meters – Nutating type meter – Oscillation piston type – Construction,principle, working,advantages and disadvantages of above.	**13 Hrs**
IV	**MEASUREMENT OF FLOW (ELECTRICAL)** Electromagnetic flow meter – Ultrasonic flow meter – Doppler and Transit time method – Swirl meter – Vortex shedding meter - Cross correlation meter – Thermal mass flow meter – solid flow measurement using conveyor belt method – Turbine flow – Target flow meter – Hot wire anemometer- Construction, principle, working, advantages and disadvantages of the above.	**13Hrs**
V	**MEASUREMENT OF LEVEL ,HUMIDITY AND MOISTURE** Level – Measurement of differential pressure to indicate level, Measuring by the movement of float. Electrical methods – change in conductance – change in capacitance - Radiation method – sight glass – solid level – bin type and diaphragm type – level in open and closed vessel. Moisture – Moisture in granular materials, solid penetrable material in paper and textiles. Humidity – Measurement of humidity – Absolute humidity – Relative humidity – Psychrometer – Hair Hygrometer. Density and specific gravity – Definition – Measurement using weighing tube type. Construction, principle, working, advantages and disadvantages of the above.	**13Hrs**
	Revision and Test	**8 Hrs**

TEXT BOOK

1. A. K. Shawney, A course in Electrical & Electronic measurements and Instrumentation, Dhanpat Rai & CO, Reprint 2010.
(Page nos.1384 – 1402,918-924,964-969,1014-1015,1028-1035,1219-,1225-1230, 1402-1418)

REFERENCE BOOKS:

1.S. K. Singh, Industrial Instrumentation and control Tata McGraw Hill 2005.

2 .D. Patranabis, principles of Industrial Instrumentation,Tata McGraw Hill 2005.

3.Arun K. Ghosh, Introduction to measurements and Instrumentation, 3rd edition. PHI learning Pvt. Ltd.

4.V. Pugazhendhi, Electronic measurement and Instrumentation, RBA Publishers.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

INDUSTRIAL INSTRUMENTATION

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Subject code : **34244**
Semester : **IV Sem**
Subject title : **INDUSTRIAL INSTRUMENTATION**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks / Semester :**15 weeks**

Subject Title	Instruction		Examination			
	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
INDUSTRIAL INSTRUMENTATION	5	75	25	75	100	3Hrs

Topics and Allocation of Hours :

UNIT	TOPICS	TIME (hrs)
I	Comparators	13
II	Measurement of velocity and Acceleration	13
III	Measurement of Force, Torque and Shaft power	13
IV	Measurement of PH and Gas analysis	13
V	Chromatography and spectral method of analysis	13
	Revision / Test	10
	Total	75

RATIONALE:

Industrial Instrumentation covers the topics of measurement of variables related to Mechanical instrumentation and Analytical instrumentation. It gives detailed information to the students about the measurement of variables related to velocity, acceleration, force, torque, shaft power, pH and gas analysis. It also provides an idea about Chromatographs, detectors and spectral analysis. This subject provides an exposure to the environmental pollution monitoring and control.

OBJECTIVES:

- Know about the various Mechanical, Optical, Electronic and Pneumatic comparators.
- Study the different method of measurement of Linear and Angular velocity and Accelerometer.
- Study the different methods of Force, Torque and Shaft power measurement.
- Study about PH and its measuring electrode and PH measurement methods.
- Study about various Gas analysis.
- Study about Chromatography and Spectroscopy.

34244 - INDUSTRIAL INSTRUMENTATION

DETAILED SYLLABUS

Unit	Name of the Topic	Hours
I	**COMPARATORS** Introduction -Types - Mechanical Comparators - Dial Gauge - Reed type comparator - Optical comparators - Optical lever - Cooke Optical Comparator - Zeiss ultra optimeter - Electrical Comparator - Electronic comparator - Pneumatic Comparators - Solex Pneumatic Comparator - Principle of operation, construction, advantages and disadvantages of the above comparators.	13
II	**MEASUREMENT OF VELOCITY & ACCELERATION** Linear Velocity Measurement - Doppler effect method - Linear encoder - Angular velocity measurement – Tachometer - Eddy current or Drug cup rotor A.C tachogenerator - Angular encoder - Accelerometer-Seismic Accelerometer – Piezoelectric Accelerometer – Strain gauge Accelerometer - Principle of operation, construction, advantages and disadvantages of the above.	13
III	**MEASUREMENT OF FORCE, TORQUE AND SHAFT POWER** **Force Measurement:** Definition- Principle of operation and construction - Equal and Unequal arm balance – Pendulum scale – Elastic element spring – Proving Ring - Load cell - Hydraulic load cell – Pneumatic load cell – Strain gauge load cell. **Torque measurement:** Definition - Principle of operation and construction of - Gravity balance method – Optical torsion meter – Electrical torsion meter – Strain gauge torsion meter. **Shaft Power Measurement:** Definition- Principle of operation and construction of - Prony brake Dynamometer – Rope Brake Dynamometer – Fluid Friction (Hydraulic) Dynamometer – Eddy current Dynamometer – D.C Dynamometer.	13
IV	**MEASUREMENT OF pH & GAS ANALYSIS** **pH:** Definition - Electrodes - Principle of operation and construction - Hydrogen electrode - Calomel electrode - Quinhydrone electrode - Antimony electrode - Glass electrode. **Gas Analyzer:** Principle of operation and construction - Oxygen analyzer – Paramagnetic oxygen analyzer – CO analyzer – SO_2 analyzer.	13

V	**CHROMATOGRAPHY AND SPECTRAL METHOD OF ANALYSIS** **Chromatography**: Definition - Classification - Principle of operation and construction – Gas Chromatography – Liquid chromatography – Retention time - Dead time - Chromatogram - Significance and advantages of chromatography. **Detectors:** Principle of operation and Construction of TCD, FID, FPD, ECD. **Spectral Analysis:** EMR Spectrum - Beer's law - IR/UV spectro photometry - General description - range of IR/UV radiation - measurement of IR/UV radiation - Instrumentation - IR/UV radiation sources -monochromator - Sample handling	13
	Revision and Test	10

TEXT BOOK:

1. A.K.Sawhney and Puneet Sawhney, "Mechanical measurements and Instrumentation & Control", Dhanpat Rai & Co (P) ltd, 12th edition 2001.

REFERENCE BOOKS:

1. R.K.Rajpat "Mechanical measurements and Instrumentation" S.K.Kataria & sons, NewDelhi-3
2. Gurdeep R Chatwal and Sham K. Anand "Instrumentation methods and chemical Analysis"-Himalaya Publishing House

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

ANALOG AND DIGITAL ELECTRONICS PRACTICAL

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name **: Diploma In Instrumentation And Control Engineering**
Course Code : **1042**
Semester : **I V**
Subject Code : **34245**
Subject : **ANALOG AND DIGITAL ELECTRONICS PRACTICAL**

Teaching and Scheme of Examinations: No. of Weeks per Semester: 15

Subject Name	Instruction		Examination			
Analog and Digital Electronics Practical	Hours/ Week	Hours/ Semester	Marks			Duration in Hours
	5	75	Continuous Assessment	End Semester Examination	Total	3
			25	75	100	

RATIONALE:

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

OBJECTIVES:

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

34245 ANALOG AND DIGITAL ELECTRONICS PRACTICAL

List of Experiments:

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

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

EQUIPMENTS REQUIRED :

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

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

II YEAR

M – SCHEME

IV SEMESTER

2015 – 2016 onwards

MEASUREMENT OF PROCESS VARIABLES PRACTICAL

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name :**DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course code : **1042**
Subject code : **34246**
Semester : **III Semester**
Subject title : **MEASUREMENT OF PROCESS VARIABLES PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : **15 weeks**

Subject Title	Instruction		Examination			
	Hrs Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Measurement of process variables Practical	5	75	25	75	100	3Hrs

RATIONALE:

Instrumentation and Control Engineers plays a major role in process industries. The students of Instrumentation and Control Engineering branch need practical knowledge to measure various parameters such as Temperature, pressure, Flow,etc.
This subject gives practical exposure to the students about measurement of process variables of instrumentation industries.

OBJECTIVES:

- To understand the extension of the range of meters
- To get practice to measure voltage, current and frequency using CRO
- To get practice to measure Flow, Viscosity
- To get practice to measure resistance, capacitance using Bridges
- To understand the characteristics of DPT experimentally

34246 - MEASUREMENT OF PROCESS VARIABLES PRACTICAL

LIST OF EXPERIMENTS

1. Conduct experiment to extend the range of an Ammeter.
2. Conduct experiment to extend the Range of a Voltmeter.
3. Conduct experiment to Measure the voltage, current using CRO.
4. Conduct experiment to Measure the frequency using Lissajeous pattern in CRO
5. Conduct experiment to Measure resistance using Wheatstone bridge.
6. Experimentally verify thermoelectric laws.
7. Conduct experiment to measure flow.
8. Experimentally measure the viscosity using say bolt viscometer.
9. Conduct experiment to Calibrate the pressure gauge using master gauge.
10. Experimentally obtain the Transient response of Thermocouple with and without well .
11. Experimentally obtain the Characteristics of Temperature transmitter.
12. Experimentally obtain the Characteristics of differential pressure transmitter.

34246 - MEASUREMENT OF PROCESS VARIABLES PRACTICAL

Equipments Required:

SL No	Name of the Equipments	Required Nos
1	Ammeter (0-10)mA, (0-50)mA	2 + 2 nos
2	Voltmeter (0-10)V, (0-50)V	2 + 2 nos
3	Regulated Power Supply (0-30)V	4 nos
4	Rheostat	4 nos
5	CRO Dual trace 20 MHz / 30 MHz	3 nos
6	Signal generator 1 MHz	3 nos
7	Decade Resistance box	2 nos
8	Galvanometer	2 nos
9	Breadboard	2 nos
10	Thermocouple (J Type / K-Type)	4 nos
11	Flow measurement station	1 no
12	Saybolt Viscometer	1 no
13	Pressure Gauges of two different ranges	2 + 2 nos
14	Thermowell for Thermocouple	2 nos
15	Stop watch	2 nos
16	Temperature transmitter with indicator	1 no
17	Differential Pressure Transmitter setup with indicator	1 no
18	Water bath with heater	3 nos

SCHEME OF EVALUATION		
No.	**Allocation**	**Marks**
1	Circuit diagram	20
2	Connections & procedure	20
3	Tabulation & Graph	20
4	Result	10
5	Viva Voce	5
Total		75

DIPLOMA IN ENGINEERING/TECHNOLOGY

II YEAR
IV SEMESTER

M- SCHEME

2015 - 2016

LIFE AND EMPLOYABILITY SKILL PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING – SYLLABUS – M Scheme

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

Course Name : **All Branches of Diploma in Engineering and Technology and Special Programmes**
Subject Code : **30002**
Semester : **IV**
Subject Title : **LIFE AND EMPLOYABILITY SKILLS PRACTICAL**

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

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

Topics and Allocation of Hours:

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

RATIONALE

Against the backdrop of the needs of the Industries, as wells as based on fulfilling the expectations of the Industries, the Diploma Level students have to be trained directly and indirectly in toning up their competency levels. Proficiency in Communication only, equips

them with confidence and capacity to cope with the employment. Hence, there is a necessity to focus on these in the curriculum. At the end of the Course, the student is better equipped to express himself in oral and written communication effectively.

SPECIFIC INSTRUCTIONAL OBJECTIVES

1. Emphasize and Enhance Speaking Skills

2. Increase Ability to Express Views & Opinions

3. Develop and Enhance Employability Skills

4. Induce Entrepreneurship and Plan for the Future

5. Expose & Induce Life Skills for Effective Managerial Ability

LIFE AND EMPLOYABILITY SKILLS PRACTICAL
SYLLABUS

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

LEARNING STRUCTURE **100 Marks**

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

a) Listening **25 Marks**

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

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

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

c) Writing & Reading **20 Marks**

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

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

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

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

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

INTERNAL MARKS **25 MARKS**

EXTERNAL MARKS AT END EXAMINATION **75 MARKS**

MODEL QUESTION

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

A. LISTENING **25 Marks**

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

B. SPEAKING **30 Marks**

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

C. WRITING & READING **20 Marks**

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

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

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

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

3. Prepare a resume for the post of Department Manager. 05
4. Prepare an outline of a project to obtain a loan. (Provide headings and subheadings) 05

I. Guidelines for setting the question paper:

A. LISTENING :

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

B. SPEAKING :

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

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

C. WRITING & READING:

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

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

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

1. Productivity in Industries – Comparison with developed countries
2. Quality Tools, Quality Circles and Quality Consciousness
3. Effective Management
4. House Keeping in Industries

5. Occupational Safety and Hazard
6. Occupational Accident and First Aid
7. Labour Welfare Legislations
8. Labour Welfare Acts and Rights
9. Entrepreneurship
10. Marketing Analysis, Support and Procurement

LABORATORY REQUIREMENT:

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

Suggested Reading:

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

V SEMESTER

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

PROCESS CONTROL INSTRUMENTATION

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Subject code : **34251**
Semester : **V Sem**
Subject title **: Process Control Instrumentation**

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject Title	Instruction		Examination			
	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Process control Instrumentation	5	75	25	75	100	3Hrs

Topics and Allocation of Hours :

UNIT	TOPIC	TIME (Hrs)
UNIT I	Simple process control systems and terminology	14
UNIT II	Control principles	14
UNIT III	Tuning of controllers	12
UNIT IV	Final control elements	13
UNIT V	Complex control systems	14
	Revision, Test	8
	Total	75

RATIONALE :

In industries, there is a huge demand of qualified engineers in the areas of Process Control Instrumentation. The basic concepts and the detailed study of Process Control are covered in this

subject. The importance is given to make the students to understand about the elements of Closed Loop Control System in detail. The students of Instrumentation and Control engineering branch are having wide career options in process industries. This subject provide a general idea to the students to select any one of the career options like Project engineers, Maintenance engineers, Erection and Commissioning engineers, Automation engineers, Design engineers etc.

OBJECTIVES:

*Understand the process and a single loop feed back control

system and its terminology

* Learn the basic Temperature, Pressure, Level single loop feed

back control system

* Learn to draw the P&I diagrams for the single loop level control system
* Concepts Reverse & direct action.
* Compare P,I,D, PI,PD,PID controller action.
* Concept of P\I and I\P converter.
*List the characteristics of control valve.
* Concept of cavitation & Flashing .
* Describe feed forward control system.
* List the advantages of FLC

34251 - PROCESS CONTROL INSTRUMENTATION

DETAILED SYLLABUS

UNIT	NAME OF THE TOPIC	HOURS
I	**SIMPLE PROCESS CONTROL SYSTEMS AND TERMINOLOGY** Process – Continuous and Batch process – process variables Functional block diagram of an automatic process control system – set point – measured value – error - simple liquid level control system – flow control system – temperature control system with transportation lag – self regulation – Introduction to Piping and Instrumentation diagram- symbols for equipments, piping, instrumentation and control, P&ID diagram for simple liquid level control system	**14Hrs**
II	**CONTROL PRINCIPLES** Controller – reverse and direct action, controller modes – discontinuous – ON-OFF Control with differential gap, without differential gap – continuous – proportional controller – proportional band (PB) – effect of PB on a controller output – offset – integral control – Derivative control - PI – PD-PID definition, salient features, applications and limitations of above controllers – selection of control action – electronic controllers – error detector – two position controller – P,I,D, PI, PD, PID controllers – pneumatic controllers for PID action – flapper nozzle mechanism, pneumatic relay	**14 Hrs**
III	**TUNING OF CONTROLLERS** Concept of tuning – criteria for controller tuning – quarter Decay ratio, IAE, ISE, ITAE – methods of tuning – open loop response method – process reaction curve – closed loop response method – ultimate cycle method - damped oscillation method.	**12 Hrs**

IV	**FINAL CONTROL ELEMENTS** Signal converters – P to I converter, I to P converter – actuator – electrical, pneumatic, hydraulic–control valve – characteristics - quick opening, linear, equal percentage- pneumatic valve – solenoid valve –split range control valve – single seat and double seat plug – electric motor actuated control valve – control valve sizing – CV rating – selection of a control valve – effect of cavitation and flashing on control valve performance	**13Hrs**
V	**COMPLEX CONTROL SYSTEMS** Feed forward control system, Feed forward control of heat exchanger. comparison of feedback control system and feed forward control system. Ratio control – examples -Cascade control – cascade control of heat exchanger –cascade control of distillation column. Direct digital control(DDC) of single loop, Direct digital control with multiple control loops.	**14Hrs**
	Revision and Test	**8 Hrs**

REFERENCE BOOKS:

1) Process control instrumentation technology by C.D. JOHNSON (Page No. 1-10, 440-476, 483-504, 339-342)

2) Introduction to Process Engineering and Design by S B Thakore & B I Bhatt,
Tata McGraw-Hill publishing company Limited, Newdelhi
(Page no. 43-44, 54-67)

3) Process control and Instrumentation by R.P. Vyas, Central Techno Publications, Nagpur
Second edition (Page no. 222 – 242, 254-258)

REFERENCE WEBSITES:

1. http://en.wikipedia.org/wiki/PID_controller
2. http://en.wikipedia.org/wiki/Control_valves

VIDEO LECTURE:

1. http://nptel.ac.in/courses/103105064/
2. https://www.youtube.com/watch?v=vCCc2-qYS2A
3. http://freevideolectures.com/Course/3126/Process-Control-and-Instrumentation
4. http://myopencourses.com/subject/process-control-and-instrumentation-2
5. http://www.classiclearn.com/chemical-engineering/process-control-and-instrumentation-video_9569d1936.html

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

V SEMESTER

2015 – 2016

MICROCONTROLLER

CURRICULUM DEVELOPMENT CENTER

M-SCHEME

(Implemented from the Academic year 2015 - 2016 onwards)

Course Name: **Instrumentation and Control Engineering**
Subject code: **34052**
Semester : **V Semester**
Subject title : **MICROCONTROLLER**

TEACHING AND SCHEME OFEXAMINATION:
Number of Weeks/Semester: **15 weeks**

Subject	Instruction		Examination			
Microcontroller	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
	6	90	25	75	100	3Hrs

TOPICS AND ALLOCATION:

Unit	Topic	Time (Hrs.)
I	Architecture & Instruction set of 8051	19
II	Programming Examples	13
III	I/O and Timer	15
IV	Interrupt and Serial Communication	16
V	Interfacing Techniques.	19
	Revision - Test	8
	TOTAL	90

RATIONALE:

The exponential growth of Engineering and Technology has benefited the mankind withextreme sophistication and comfort.
To sustain this development, continuous research and development should take place not only in Engineering and Technology but also in Basic Sciencesuch as Physics.
The various divisions of Physics like Optics, Acoustics, Dynamics, Semiconductor Physics,Surface Physics, Nuclear Physics, Energy Studies, Materials Science, etc provide the Foundation by enlightening the **Fundamental facts, Principles, Laws and Correct sequence of events** todevelop the Engineering and Technology field for the prosperity of human beings.

OBJECTIVES:

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

- 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

MICROCONTROLLER
Detailed Syllabus

Unit	Name of the Topic	Hours
I	**ARCHITECTURE & INSTRUCTION SET OF 8051** **1.1 ARCHITECTURE OF 8051** Comparison of Microprocessor and Microcontroller - Block diagram of Microcontroller –Functions of each block - Pin details of 8051 – ALU – ROM – RAM – Memory Organization of 8051 - Special function registers –Program Counter – PSW register –Stack - I/O Ports – Timer – Interrupt –Serial Port – Oscillator and Clock - Clock Cycle – State - Machine Cycle –Instruction cycle – Reset – Power on Reset – Overview of 8051 family **1.2 INSTRUCTION SET OF 8051** Instruction set of 8051 – Classification of 8051 Instructions – Datatransfer Instructions – Arithmetic Instructions – Logical instructions –Branching instructions – Bit Manipulation Instructions	**14 Hrs** **5 Hrs**
II	**PROGRAMMING EXAMPLES** **2.1 ASSEMBLER AND ADDRESSING MODES** Assembling and running an 8051 program –Structure of Assembly Language –Assembler directives - Different addressing modes of 8051 **2.2 PROGRAMMES** Multibyte Addition – 8 Bit Multiplication and Division – Biggest Number / Smallest Number – Ascending order / Descending order BCD to ASCII Conversion – ASCII to Binary Conversion – Odd Parity Generator – Even Parity Generator -Time delay routines	**6 Hrs** **7 Hrs**
III	**I/O AND TIMER** **3.1 I/O** Bit addresses for I/O and RAM – I/O programming – I/O bit manipulation programming. **3.2 TIMER** Programming 8051 Timers – Timer 0 and Timer 1 registers – Different modes of Timer – Mode 0 Programming – Mode 1 Programming - Mode 2 Programming - Counter programming – Different modes of Counter – Mode 0 Programming – Mode 1 Programming -Mode 2 Programming (simple programs)	**6 Hrs** **9 Hrs**

Unit	Name of the Topic	Hours
IV	**INTERRUPT AND SERIAL COMMUNICATION** **4.1 SERIAL COMMUNICATION** Basics of Serial programming – RS 232 Standards - 8051 connection to RS 232 – 8051 Serial Communication Programming – Programming 8051to transmit data serially - Programming 8051 to Receive data serially. **4.2 INTERRUPT** 8051 Interrupt s – Programming Timer Interrupts – Programming external hardware interrupts – Programming the serial communication interrupt –Interrupt priority in 8051 (simple programs).	**9 Hrs** **7 Hrs**
V	**INTERFACING TECHNIQUES** **5.1. IC 8255** IC 8255 – Block Diagram – Modes of 8255. **5.2. INTERFACING TECHNIQUES** Interfacing external memory to 8051– 8051 interfacing with the 8255 – ASM Programming – Relays – Sensor interfacing – ADC interfacing – DAC interfacing - Keyboard interfacing – Seven segment LED Display Interfacing - Stepper Motor interfacing – DC motor interfacing using PWM	**6 Hrs** **13 Hrs**
	Revision – Test	**8 Hrs**

TEXT BOOKS:

1. Microcontrollers, Principles and Applications – Ajit pal – PHI Ltd., - 2011.

REFERENCE BOOKS:

1. 8051 Microcontroller and Embedded Systems using Assembly and C by Mazidi, Mazidi and D.MacKinlay, 2006 Pearson Education Low Price Edition.
2. Microprocessor and Microcontroller by R.Theagarajan, Sci Tech Publication, Chennai
3. 8051 Microcontroller by Kenneth J.Ayala.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

CONTROL ENGINEERING

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Subject code : **34253**
Semester : **V Sem**
Subject title : **CONTROL ENGINEERING**

TEACHING AND SCHEME OFEXAMINATION:

No of Weeks/ Semester : **15 weeks**

Subject	Instruction		Examination			
	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
CONTROL ENGINEERING	6	90	25	75	100	3Hrs

Topics and Allocation of Hours :

UNIT	TOPIC	TIME (Hrs)
UNIT I	Basics of control systems, laplace transform and transfer function	17
UNIT II	Block diagram, signal flow graph representation and components	18
UNIT III	Time response	16
UNIT IV	Frequency response	16
UNIT V	Stability	16
	Revision, Test	7
	Total	90

RATIONALE:

The aim of this subject is to introduce the basic concepts of control theory to the students. It provides the basic idea about how the physical systems can be represented by a mathematical model to perform a detailed analysis. There are lot of advancements in the field of Control Engineering in which the students can do research during their higher studies.

OBJECTIVES:

- To understand the system, control system and its types
- To practice the Laplace transform and Inverse Laplace transform for given function
- To understand the transfer function and study the transfer function of Mechanical system, Electrical system
- To understand the block diagram of a system and rules to reduce the block diagram and practicing reducing
- To understand the signal flow graph and solve using Masons gain formula
- To study the Time domain specifications of a I order and II order system and its specifications
- To study the Frequency domain specifications of a I order and II order system and its specifications
- To draw the Bode plot for the given transfer function
- To draw the Polar plot for the given transfer function
- To understand the stability of the system and analyze the stability of the system using Routh stability criterion
- To analyze the stability using root locus method

34253 – CONTROL ENGINEERING

DETAILED SYLLABUS

UNIT	NAME OF THE TOPIC	HOURS
I	**BASICS OF CONTROL SYSTEMS, LAPLACE TRANSFORM AND TRANSFER FUNCTION** System – Linear & Non Linear, Continuous & Discrete - Control system - open loop & closed loop –Examples – basics of Laplace transform – Inverse Laplace transform – Transfer function –order and type of a transfer function – pole/ zero plot - Transfer function of Translational Mechanical system (simple second order system with one mass) – Transfer function of Electrical systems using R,L,C	**17 HRS**
II	**BLOCK DIAGRAM AND SIGNAL FLOW GRAPH REPRESENTATION** Block diagram: Introduction – advantages – rules for block diagram reduction – simple problems. Signal flow graph: Rules for reduction – Mason's gain formula – applications of Mason's formula – simple problems – comparison of block diagram reduction and signal flow graph methods.	**18 HRS**
III	**TIME RESPONSE** Standard test signals (step, ramp, sine and Parabolic) – order and Type of system - I order, II order system – derivation – step response of I order, II order system – time domain specifications (definition & formulas only) – steady state error, static error constants – problems.	**16 HRS**
IV	**FREQUENCY RESPONSE** Frequency response of linear system –Advantages – Frequency domain specifications (definitions only) – bode plot – gain margin – phase margin – problems – polar plot – problems.	**16 HRS**

V	**STABILITY** Definition –Location of the roots on the s-plane for stability absolute stability – relative stability– characteristic equation – Routh's stability criterion technique – construction of root locus – problems.	**16 HRS**
	Revision and Test	**7 Hrs**

TEXT BOOKS:

1) Control systems by A.Nagoorkani, RBA publishers,2006
(Page no. 1-36, 70- 129, 255-280, 284-327, 343-417, 455- 490)

REFERENCE BOOKS

1. Automatic control system by Benjamin S.Kuo,Printice Hall of India Pvt. Ltd., Seventh edition,1995.
2. Advanced control theory by I.J.Nagrath and M.Gopal, New Age international publishers, II edition, 2002
3. Control systems by A. Anandkumar, EEE, PHI
4. Control Engineering Theory & Practice by M.N. Bandyopadhiyay, PHI

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

ELECTIVE - 1

INSTRUMENTATION SYSTEM DESIGN

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Subject code : **34271**
Semester : **V Sem**
Subject title : **INSTRUMENTATION SYSTEM DESIGN**

TEACHING AND SCHEME OFEXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject	Nstruction		Examination			
	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
INSTRUMENTATION SYSTEM DESIGN	5	75	25	75	100	3Hrs

Topics and Allocation of Hours :

UNIT	TOPICS	TIME (hrs)
I	Design of Transducers and Signal Conditioning Circuits	13
II	Design of Transmitters and Controllers	13
III	Control Valve Selection	13
IV	Engineering Design Criteria	13
V	Safety in Instrumentation and Control Systems	11
	Revision / Test	12
	Total	75

RATIONALE

Instrumentation engineers must be conversant with the basic design of instrumentation systems. This subject covers the basic design procedure of transducers and signal conditioning circuits, transmitters and controllers. It also includes the concept of Control Valve Selection, Engineering design criteria and Safety in instrumentation and control systems. This subject provides an opportunity to the students to opt for a career in the Design department of instrument manufacturing companies.

OBJECTIVES

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

- Understand the design of Thermocouple circuit with Cold junction compensation.
- Understand the design of RTD bridge circuit with Lead wire compensation.
- Know about the design of flow measurement devices such as Orifice Plate, Venturi meter and Flow Nozzle.
- Know about the design of Charge amplifier and Instrumentation amplifier.
- Acquire knowledge about the design of 2 wire and 4 wire transmitters.
- Know about the design of Pneumatic and Electronic PID Controller.
- Acquire knowledge about the design of annunciators.
- Understand the Control Valve selection in detail.
- Acquire knowledge about the Engineering design criteria.
- Know about the specifications for various measurement and control systems.
- Understand about the Safety in Instrumentation and Control Systems.
- Know about the design of Intrinsically safe systems.

34271 - INSTRUMENTATION SYSTEM DESIGN

DETAILED SYLLABUS

UNIT	NAME OF THE TOPIC	HOURS
I	**DESIGN OF TRANSDUCERS AND SIGNAL CONDITIONING CIRCUITS** Design of Thermocouple Circuit with Cold Junction Compensation, Linearization, Amplification and Conversion of its output to 4 to 20 mA current – Design of RTD bridge circuit with lead wire compensation and conversion of its output to 4 to 20 mA current –Design of Flow measurement devices – Orifice Plate, Venturi meter- Design of Charge amplifier – Instrumentation amplifier	13 hrs
II	**DESIGN OF TRANSMITTERS AND CONTROLLERS** Design of two and four wire transmitters with 4-20 mA output – Smart Transmitters –Design of On-Off Controller – Design of Pneumatic and Electronic PID Controller – Design of annunciators –Low Level and High Level annunciators	13 hrs
III	**CONTROL VALVE SELECTION** Function in the system –Pressure drop requirements for good control – Capacity requirements –Valve Rangeability– Choosing the Flow Characteristic – Choosing the Body Design – Body materials – End Connections – Choice of Single Seat Versus Double Seat design – Selection of Actuators – Split ranging Control Valves – Control Valve Sizing Equations – Constant Pressure System –Variable Pressure system –Valve selection guidelines.	13 hrs
IV	**ENGINEERING DESIGN CRITERIA** Pneumatics Versus Electronics – Control Center design– Specifications for various Measurement and Control Systems – Flow measurement, Pressure measurement, Level measurement, Temperature measurement, Control Valves, Control Panels – Pneumatic and Electronic Transmission systems –Process Connections – Location of taps, Sealing instruments from the Process – Mounting instruments – Selections of Units, Charts and Ranges – Instrument Identification– Construction material	13 hrs

UNIT	NAME OF THE TOPIC	HOURS
V	**SAFETY IN INSTRUMENTATION AND CONTROL SYSTEMS** Area and Material Classification – International Electro technical Commission (IEC)– Classifying a Hazardous Location – Techniques used to reduce Explosion Hazards – Explosion proof Housings – Sealing – Pressurization Systems – Intrinsic Safety – Definition – Design of Intrinsically Safe Systems – Basic techniques in the design of intrinsically safe apparatus – Mechanical and Electrical Isolation – Current and Voltage Limiting – Shunt Elements – System design using Commercially available Intrinsically safe and associated apparatus	**11 hrs**
	Revision and Test	**12 Hrs**

.

REFERENCE BOOKS:

1. Sheingold D.H, 'Transducer interfacing Handbook – A guide to analog signal conditioning'.
2. Anderson N.A, 'Instrumentation for Process Measurement and Control', Chilton book company, 1980.
3. Andrew W, 'Applied Instrumentation in Process Industries', Vol.II Gulf Publications.
4. C.D. Johnson, 'Process Control Instrumentation Technology, Prentice Hall of India.
5. Doebelin E.O. Measurement Systems, applications and design, McGrawHill.
6. Douglas M. Considine, Gregory K. Mcmillan, Process/Industrial Instruments and Controls Handbook', McGraw Hill, Fifth Edition.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

ELECTIVE -2

PROGRAMMABLE LOGIC CONTROLLERS

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME

Course Name:**DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**

Course code : **1042**

Subject code : **34272**

Semester : **V Semester**

Subject title : **PROGRAMMABLE LOGIC CONTROLLERS**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks / Semester: 15 weeks

Subject title	Instruction		Examination			
	Hours/ Week	Hours/ semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Programmable Logic Controllers	5	75	25	75	100	3Hrs

Topics and Allocation of Hours:

UNIT	TOPICS	TIME (Hrs)
I	Architecture and operation of PLC	13
II	Programming of PLC	13
III	PLC Timers and counters	13
IV	Advanced instructions	12
V	I/O Module Communication and networking	12
	Revision – Test	12
	Total	75

RATIONALE:

Programmable Logic Controller is the mandatory for the control Engineers in any Process Industry. As it is the default controller being used in the industries in automation of process such as packing, discrete control etc., It is obvious for the instrumentation and control Engineer to understand Hardware and programming the PLC**.**

OBJECTIVES:

- To understand the detailed Hardware of PLC and its parts
- To understand the working of PLC and scan cycle
- T o understand the program and data memory organization
- To know the Different timers of PLC and programming them
- To know the different counters of PLC and its parameters
- To understand the Ladder logic programming of PLC
- To develop simple ladder programs
- To study the Advanced instructions of PLC
- To understand the communication module of PLC

34272- PROGRAMMABLE LOGIC CONTROLLERS
DETAILED SYLLABUS

UNIT	NAME OF THE TOPIC	HOURS
I	**ARCHITECTURE AND OPERATION OF PLC** Evolution of PLCs – Hard-wired control systems. PLC – definition, features, Advantages, Relays .PLC parts and architecture – CPU – I/O section – Programming device - Memory - input field devices – output field devices - input module wiring connections, output module wiring connections- Power Supply -PLC versus computer - Types of PLC – single ended – multitask – control management- unitary - modular- small – medium – large. Developing circuits from Boolean expression – Hardwired logic to programmed logic – programming word level logic instruction – processor memory organization program files – data files – program scan.	13 Hrs
II	**PROGRAMMING OF PLC** PLC Programming languages -Standard languages- Ladder diagram (LD) - Function block diagram (FBD) Sequential function chart(SFC)- Statement List(STL) (each one example program)- Symbols of a PLC Input and output contact graphical languages(IES)– program format – Typical Numbering mode – Equivalent ladder diagram of AND, OR, NOT, XOR, NAND AND NOR gate equivalent ladder diagram to demonstrates De Morgan's theorem, Ladder design switches- Develop elementary program design of a 4:1 Multiplexer using ladder logic programming wired level logic instructions input, output, flag, timer, counter, latch.	13 Hrs

UNIT	NAME OF THE TOPIC	HOURS
III	**PLC TIMERS AND COUNTERS** Definition and Classification of a timer. Characteristics of a PLC timer – functions in a timer – resetting –retentive functions and function block format- non-retentive – classification – Timer ON-delay- Timer-OFF delay- Simple problems using timer PLC counter – Operation of a PLC counter – Counter parameters – Format of counter instruction and counter data file - count up (CTU)- count down(CTD) simple problems using counter.	13 Hrs
IV	**ADVANCED INSTRUCTION** Introduction - comparison instructions- Addressing format for micro logic system - Different addressing types - Data movement instructions - Mathematical instructions- Program flow control instructions - PID instructions. Program development and execution using Allen bradly PLC. Simplified start up process of a coal feeding to a boiler plant - elevator for 3 floor building - Traffic light control -conveyor belt Selection of PLC - Safety considerations built in the PLC's.	12 Hrs
V	**I/O Module Communication and networking** Introduction – classification of I/O Module Input – Output system – Direct I/O, parallel I/O – Sourcing and sinking of serial I/O system. PLC interfacing-Discrete Input module –DC - AC – Discrete output module – Analog input module single ended and output module - RTD input modules- Thermocouple- High speed Encoder-Stepper motor- RS-232 interface module-Differential input module. Types of Communication Interface. Parallel – serial – Parallel – IEEE 488 BUS- Serial _ balanced – unbalanced- communication mode- simplex – Half duplex – full duplex features of good interface. Serial interface RS 232c. DB-9 connection of Rs232C Network Topology, Bus Ring, Star, Tree.	12 Hrs
	Revision and Test	12 Hrs

Reference Books:

1.Madhuchhanda Mitra ,Samarjit sen Gupta,"PLC and Industrial Automation and introduction", Penram international Publishing (India) Pvt Ltd.
2.Pradeep Kumar Srivastava, "Exploring Programmable Logic Controller with applications", BPB Publication
3.W. Bolton," Programmable logic controller" IV Edition Reed Elsevier India pvt ltd.
4.Gary Dunning," Introduction to PLC", IIIrd edition Thomson del mar learning.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

Elective - 3

INDUSTRIAL POWER ELECTRONICS

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Subject code : **34273**
Semester : **V Sem**
Subject title : **INDUSTRIAL POWER ELECTRONICS**

TEACHING AND SCHEME OFEXAMINATION:

Number of Weeks/ Semester : **15 weeks**

Subject Title	Instruction		Examination			
	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
INDUSTRIAL POWER ELECTRONICS	5	75	25	75	100	3Hrs

Topics and Allocation of Hours :

Unit	Topic	Time (Hrs.)
I	Power devices and Trigger circuits	13
II	CONVERTERS (Qualitative treatment only)	13
III	CHOPPERS	13
IV	INVERTERS & APPLICATIONS	13
V	NUMERICALLY CONTROLLED SYSTEMS	13
	Revision – Test	10
	TOTAL	**75**

OBJECTIVES :

- To Study working principle of power devices.
- To Study the methods of triggering
- To know about use of pulse transformer & opto isolator.
- To learn about converters and its types.
- To understand commutation concepts in SCR
- To Learn about choppers.
- To Study about inverters and types.
- To understand the concept of HVDC.
- To know about UPS and its types.
- To understand about PLC.
- To learn about logic functions & instrutions.
- To discuss about ladder diagrams.
- To study about basics of numerical control of machines.
- To learn about CNC ,DNC systems.
- To know about the basics of Robotics

34273 - INDUSTRIAL POWER ELECTRONICS
DETAILED SYLLABUS

UNIT	NAME OF THE TOPIC	HOURS
I	**POWER DEVICES AND TRIGGER CIRCUITS** Thyristor family –Working principle ,VI characteristics, Applications of SCR – Definitions for holding current, latching current, dv/dt rating, di/dt rating– Symbol, principle of working ,VI characteristics ,applications of Insulated gate bipolar transistor (IGBT), MOSFET and GTO. Triggering of SCR - Gate triggering –Types – Concepts of DC triggering, AC triggering, Pulse gate triggering – Pulse transformer in trigger circuit – Electrical isolation by opto isolator - Resistance firing circuit and waveform – Resistance capacitor firing circuit and waveform, Synchronized UJT triggering (ramp triggering) and waveform – Ramp and pedestal trigger circuit for ac load.	**13 hrs**
II	**CONVERTERS (Qualitative treatment only)** Converters – Definition – Single phase Half controlled bridge converter with resistive load and resistive inductive load- importance of flywheel diode – Single phase fully controlled bridge converter with resistive load – voltage and current waveforms – Single phase fully controlled bridge converter with RL load —voltage and current waveforms. Commutation- Natural commutation – Forced commutation – Types of forced commutation (mention the types only) 3 phase half controlled bridge converter with resistive load - current and voltage waveform -3 phase fully controlled bridge with resistive load – current and voltage waveforms. Dual converter – modes of Dual converter	**13 hrs**

UNIT	NAME OF THE TOPIC	HOURS
III	**CHOPPERS** Introduction – applications -principle of chopper-control strategies (time ratio and current limit control)-types of chopper-type A, B, C, D, and E - step up chopper –Jones chopper – Morgan chopper-chopper using MOSFET – PWM control circuit for driving MOSFET in chopper. DC Transmission- principle – advantages – drawbacks.	**13 hrs**
IV	**INVERTERS & APPLICATIONS** Inverter Definition Requirement of an inverter –Single phase inverter with resistive load – Single phase inverter with RL load –Methods to obtain sine wave output from an inverter- output voltage control in inverters - McMurray inverter – advantages- Basic 3 phase bridge inverter with 120□□conduction mode – circuit, trigger sequence, waveform – Through pass inverter – Parallel inverter using IGBT. UPS – Need for UPS –ON Line UPS -OFF Line UPS - Comparison of ON line and OFF line UPS	**13**
V	**NUMERICALLY CONTROLLED SYSTEMS** Basic concepts of numerical control- Block diagram of numerical control system– Advantages, disadvantages , applications of numerical control system – Driving devices – Hydraulic system , Stepper motor - Programming systems (mention the names only) – Data processing unit – Data reading – Part programming – steps - Post processor Introduction to CNC / DNC – Basic concepts of CNC , DNC and AC system - Types of AC system - -Block diagram of ACO , ACC – Comparison between NC & CNC – Typical CNC system – Block diagram - Advantages of CNC system .	**13 HRS**
	Revision and Test	**10 HRS**

REFERENCE BOOKS

1.Industrial & Power Electronics –Harish C. Rai – Umesh Publication -5th edition- 1994
2.Power Electronics – Dr.P.S. Bimbhra –Khanna publishers -2nd edition- 19983.Power Electronics –M.H.Rashid-PHI Publication-3rd edition 2005
3.Programmable Logic Controller –Pradeep Kumar& Srivashtava-BPB
REFERENCE BOOKS Publications
4.Numerical control of Machines – Yoram Korean &Joseph Ben

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

PROCESS CONTROL INSTRUMENTATION PRACTICAL

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implemented from the Academic year 2015-2016 onwards)

34255 - PROCESS CONTROL INSTRUMENTATION PRACTICAL

Course Name : **INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Subject code : **34255**
Semester : **V**
Subject title : **PROCESS CONTROL INSTRUMENTATION PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION :

Number of Weeks/ Semester : **15 weeks**

Subject Title	Instruction		Examination			
	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
PROCESS CONTROL INSTRUMENTATION PRACTICAL	4	60	25	75	100	3Hrs

RATIONALE:

This is the key subject in an Instrumentation and control Engineering. It is mandatory to study various control strategy being used in process industries. Various elements involved in controlling a plant such as controller, Final control elements are dealt in detail in this subject.

OBJECTIVES:

- To get practice of controlling temperature in a single feedback loop
- To get practice of On-Off controlling of temperature, pressure, level of a process
- To get practice of Proportional control of Temperature process
- To get practice of Proportional-Integral control of pressure process
- To get practice of Proportional-Integral-Derivative control of level process
- To get practice of Proportional –Derivative of level process
- To get practice of Tuning of controller to achieve optimum control
- To understand the characteristics of control valve practically
- To get practice of working with P to I converter

34255 - PROCESS CONTROL INSTRUMENTATION PRACTICAL

LIST OF EXPRIMENTS:

1. Perform Closed loop control of temperature process using thermistor
2. Experimentally implement On - Off Control in a Temperature Process .
3. Experimentally implement On-Off Control in a Level Process
4. Experimentally implement On-Off Control in a Pressure Process
5. Conduct experiment to observe response of a proportional controller in a Temperature Process
6. Conduct experiment to observe response of PI controller in a Pressure Process
7. Conduct experiment to observe response of PID controller in a Level Process
8. Conduct experiment to observe response of PD controller in a Level Process
9. Experimentally obtain the Characteristics of Control Valve
10. Conduct experiment to understand the Tuning of Controller
11. Conduct experiment using Motorized control valve
12. Experimentally obtain the characteristics of P to I converter

EQUIPMENTS REQUIRED:

Sr No	Name of the Equipments	Required Nos
1	Temperature Control Station with accessories	1 no
2	Level Control Station with accessories	1 no
3	Pressure Control Station with accessories	1 no
4	Control Valve setup with accessories	1 no
5	Motorized Control Valve Setup with accessories	1 no
6	P/I Conversion Setup with accessories	1 no
7	Compressor unit	1 no

SCHEME OF EVALUATION		
No.	**Allocation**	**Marks**
1	Circuit diagram	20
2	Connections & procedure	20
3	Tabulation & Graph	20
4	Result	10
5	Viva Voce	5
Total		75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

V SEM

2015 - 2016

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MICROCONTROLLER PRACTICAL

CURRICULUM DEVELOPMENT CENTER

M-SCHEME

(Implemented from the Academic year 2015 - 2016 onwards)

Course Name : **Instrumentation and Control Engineering**
Subject code : **34056**
Semester : **V Semester**
Subject title :**Microcontroller practical**

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : **15 weeks**

Subject	Instruction		Examination			
	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Microcontroller Practical	4	60	25	75	100	3Hrs

RATIONALE:

As microcontroller is like the brain of any Digital control system, it is obvious that control engineer must have practical knowledge about it. Whatever is covered in microcontroller theory is dealt in this subject practically. This subject gives opportunity to learn hardware ,programming and interfacing of real system with microcontroller. This is the basis for embedded system.

OBJECTIVE:

- To write program for performing Arithmetic operations and execute it
- To write program for performing Logical operations and execute it
- To write program for performing Timing operations and execute it.
- To write program for performing Code conversions and execute it.
- To interface Digital input and outputs with microcontroller
- To interface hexadecimal key board with microcontroller
- To interface ADC and DAC with Microcontroller
- To interface DC motor and stepper motor with microcontroller
- To establish communication between two microcontroller

MICROCONTROLLER PRACTICAL

Note1: ALL THE EXPEIMENTS SHOULD BE CONDUCTED
2: Different data are to be given for each batch

Part-A

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

Part – B

INTERFACING WITH APPLICATION BOARDS

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

EQUIPMENTS REQUIRED

S.No	Name of the Equipments	Required Nos
1.	8051 Microcontroller Kit	12 Nos
2.	Digital I/O Interface Board	02 Nos
3.	Matrix keyboard Interface Board	02 Nos
4.	Seven segment LED display Interface Board	02 Nos
5.	Traffic light Interface Board	02 Nos
6.	8 bit ADC Interface Board	02 Nos
7.	8 bit DAC Interface Board	02 Nos
8.	STEPPER MOTOR CONTROL Interface Board	02 Nos
9.	DC motor control Interface Board	02 Nos
10.	Rs232 Serial cable	02 Nos

SCHEME OF EVALUATION		
No.	**Allocation**	**Marks**
1	Algorithm	15
2	Program	25
3	Debugging and Execution	20
4	Result	10
5	Viva-voce	5
Total		75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

V SEMESTER

2015 – 2016 onwards

LABVIEW AND MATLAB PRACTICAL

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implemented from the Academic year 2015-2016 onwards)

ourse Name : **INSTRUMENTATION AND CONTROL ENGINEERING**

Course Code : **1042**

Subject code : **34257**

Semester : **V Semester**

Subject title : **LABVIEW & MATLAB PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks / Semester : 15

Subject Title	Instruction		Examination			
	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessme	Board Examinatio	Total	
LABVIEW AND MATLAB PRACTICAL	4	60	25	75	100	3Hrs

RATIONALE:

As Virtual Instrumentation is one of the key industrial oriented subject, It is essential to give practical exposure to Instrumentation and control engineers. In this subject Experiments are suggested to perform using LABVIEW and MATLAB soft wares. It would be helpful for studying further in this field.

OBJECTIVES:

- To get practice with LABVIEW and MATLAB Softwares
- To develop front panel and block diagram for signal generator
- To generate virtual CRO to add two waveforms
- To develop front panel and block diagram for Temperature control system and Tank level control system
- To develop front panel and block diagram for Linear algebra calculator
- To Write program using MATLAB language to find greatest of two numbers, average of numbers and factorial of a number .
- To write program to draw the bode plot for given transfer function.

34257- LABVIEW AND MATLAB PRACTICAL

Experiments using LABVIEW:

1. Devise virtual Function generator and CRO with front panel and Block diagram for generation of signals using function generator and the measurement of frequency and amplitude using CRO
2. Design virtual CRO capable of Addition of two waveforms with front panel and block diagram.
3. Design front panel and block diagram ,to simulate the logic gate functions AND,OR,NAND,NOR,EX-OR,EX-NOR and NOT.
4. Design front panel and Block diagram to simulate Temperature control system
5. Design front panel and Block diagram to simulate Tank control system
6. Design front panel and Block diagram to simulate Linear algebra calculator

Experiments using MATLAB:

1. Develop MATLAB program to find greatest of two numbers
2. Develop MATLAB program to find factorial of a number
3. Develop MATLAB program to find average of n numbers
4. Develop MATLAB program to find Frequency response of low pass filter
5. Develop MATLAB program to draw Bode plot for the given transfer function
6. Develop MATLAB program to Implement the PID control strategy and study the response for step input

EQUIPMENTS REQUIRED:

Sr No	Name of the Equipments	Required Nos
	Software required:-	
1	LabVIEW Software for Multiuser	1 no
2	MATLAB Software for Multiuser	1 no
	Hardware required:-	
1	PC Pentium Dual Core	30 nos
2	Data Acquisition Card	1 no
3	Laser Printer	2 nos
4	UPS 5KVA with one hour backup	1 no

SCHEME OF VALUATION

LabVIEW/MATLAB PROGRAM	20 MARKS
EXECUTION OF PROGRAM	20 MARKS
OBSERVATION & PROCEDURE	20 MARKS
RESULT	10 MARKS
VIVA VOCE	5 MARKS
TOTAL	75 MARKS

VI SEMESTER

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

VI SEMESTER

2015 – 2016 onwards

TEST ENGINEERING

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implemented from the Academic year 2015-2016 onwards)

Course Name: Instrumentation and control Engineering
Subject code : 34062
Semester : VI Semester
Subject title : TEST ENGINEERING

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject	Instruction		Examination			
			Marks			Duration
Test Engineering	Hrs/ week	Hrs/ semester	INTERNAL ASSESMENT	BOARD EXAM	TOTAL	
	6	90	25	75	100	3Hrs

TOPICS AND ALLOCATION:

Unit	TOPIC	Hrs
I	INTRODUCTION TO TEST ENGINEERING	17
II	AUTOMATED TESTING METHODS AND TECHNOLOGY	17
III	V-I(SIGNATURE) TESTING METHODS AND TECHNOLOGY	15
IV	BOUNDARY SCAN TESTING METHODS AND TECHNOLOGY	15
V	ATE TEST PROGRAM SETS GENERATION & SEMICONDUCTOR TESTING	16
	Revision & Test	10
	TOTAL	90

34062 - TEST ENGINEERING
DETAILED SYLLABUS

UNIT	NAME OF THE TOPIC	HOURS
1	**INTRODUCTION TO TEST ENGINEERING.** Need and Importance of Test Engineering – Principles of Fundamental Testing Methods – Basic Principles of Memory Testing – PCB Track Short Testing Methods –Concepts of Trouble Shooting PCBs - Manual and Automated PCB Trouble Shooting Techniques.	**17**
2	**AUTOMATED TESTING METHODS AND TECHNOLOGY** Introduction to Automated Test Techniques – Fundamental of Digital Logic Families - Concepts of Back-Driving / Node Forcing Technique and its International Defense Standard - Concepts of Digital Guarding - Auto Compensation - Clock Termination – Functional Test Methods - Functional Testing of Digital, Analog and Mixed Integrated Circuit – Different types of Memory Module Functional Test.	**17**
3	**V-I(Signature) TESTING METHODS AND TECHNOLOGY** Fundamentals of Electrical Characteristics - Effects of Curve Trace, Characteristics of Passive and Active Components - Understanding Composite VI-Curve and it deviations – Component Identification of Ageing Effects with VI Curve Trace, Input and Output Characteristics of Digital Integrated Circuits - Good Versus Suspect interpretation Comparison.	**15**
4	**BOUNDARY SCAN TESTING METHODS AND TECHNOLOGY** Introduction to Boundary Scan – Need of Boundary Scan Test Technique - Principle of Boundary Scan Test - Boundary Scan Architecture - Application of Boundary Scan Test- Boundary Scan Standards - Boundary Scan Description Language (BSDL) – Interconnect test – Serial Vector Format (SVF) Test - Basic of JTAG Port - Digital Integrated Circuit Test using Boundary Scan Techniques.	**15**
5	**ATE Test Program Sets generation & semiconductor testing** ATE in PCB Test – Test Fixtures - Basics of Automatic Test Program Generation - Standard Test Data Format STDF – Basic of Digital Simulator - Introduction to Semiconductor Test, Use of Load Boards.	**16**
	Revision and Test	**10**

REFERENCE BOOKS:

1. Test Engineering for Electronic Hardware – S R Sabapathi, Qmax Test Equipments P Ltd., 2011.
2. Practical El**e**ctronic Fault Finding and Trouble shooting by Robin Pain Newnes, Reed Educational and professional publishing Ltd., 1996
3. The Fundamentals of Digital Semiconductor Testing, Floyd, Pearson Education India, Sep-2005

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DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING
III YEAR

M – SCHEME

VI SEMESTER

2015 – 2016 onwards

INDUSTRIAL AUTOMATION AND DRIVES

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implemented from the Academic year 2015-2016 onwards

Course Name:DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING
Course code : **1042**
Subject code : **34262**
Semester : **VI Semester**
Subject title : **INDUSTRIAL AUTOMATION AND DRIVE**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks / Semester: 15 weeks

Subject title	Instruction		Examination			
	Hours/ Week	Hours/ semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
INDUSTRIAL AUTOMATION AND DRIVES	6	90	25	75	100	3Hrs

Topics and Allocation of Hours:

UNIT	TOPICS	TIME (Hrs)
I	Industrial drives	16
II	Pneumatic and hydraulic systems	16
III	Programmable logic controller(PLC)	16
IV	Distributed control system(DCS)	16
V	Robotics	16
	Revision /Test	10
	Total	90

34262 - INDUSTRIAL AUTOMATION AND DRIVES

DETAILED SYLLABUS:

UNIT	NAME OF THE TOPIC	HOURS
I	INDUSTRIAL DRIVES Electric drive - Definition - Parts - Types - Individual - Group - Multi motor. Stepper motor - Definition - Step angle - Slewing rate - Types -Variable reluctance -Hybrid - Closed loop control of stepper motor - Drive system(any one) - logic sequencer - Optical encoder. Servo motor - Definition - Types - DC servo motor - Permanent magnet DC motors - Brushless motor - AC servo motor - Working of an AC servo motor in control system - Induction motors - Eddy current drive for speed control of induction motors.	16
II	PNEUMATIC AND HYDRAULIC SYSTEMS Hydraulic system - Elements of Hydraulic system - Hydraulic power supply and accumulator. Pneumatic system-Introduction - Elements of Pneumatic power supply - Filter - Regulator- lubricator(FRL) - Pressure control valves - Pressure relief valve - Pressure reducing valve - Directional control valve(DCV) - Poppet and spool valve - 3/2 DCV - 4/3 DCV - 5/2 DCV - Valve symbols - Pneumatic circuits - Control of a single acting cylinder and double acting cylinder - Comparison between hydraulics and Pneumatics.	16
III	PROGRAMMABLE LOGIC CONTROLLER(PLC) Definition –Conventional Hard wired logic- Relays- Features of PLC- Advantages of PLC over relay logic - Block diagram of PLC - Programming basics of PLC - Ladder logic - Symbols used in ladder logic - Logic functions - Timers - Counters - PLC networking - Steps involved in the development of Ladder logic program - Program execution and run operation by PLC - Ladder logic diagram for liquid level operation. List of various PLCs and their manufactures.	16
IV	DISTRIBUTED CONTROL SYSTEM(DCS)	

	Evolution of distributed control system - Definition of DCS - Functional elements of DCS - Elements of local control unit -Operator interfaces-Engineering interfaces -Types of information displays - Architecture of anyone commercial DCS - Advantages of DCS - Selection of DCS - List of various DCS and their manufactures.	16
V	ROBOTICS Definition - Robot anatomy - Classification of robots -sensors - Contact and non-contact - Touch, tactile, range and proximity sensor - End effectors -Types of end effectors - Robot programming languages - Robot drives - Applications of robots - One specific application of industrial robot - Material handling - Automated guided vehicle system.	16

Revision and Test: 10 Hours

Reference books:

1.G.K.Dubey, 'Fundamentals of Electrical Drives', Narosa Publication,2002.

2.M.S.Berde, "Electric Motor Drives" Khanna publishers.2008

3..R.Srinivasan"Special electrical Machines" lakshmi publication.2012

4.v.jayakumar"applied hydraulics and pneumatics"lakshmi publication.2010

5.R.srinivasan"hydraulic and pneumatic controls"second edition 2010 MC graw-hill education(india) pvt.ltd

6.frank D.petruzella"programmable logic controls"third edition TATA mc graw-hill edition 2010.

6.pradheep kumar srivastava, 'Programmable logic controllers with applications', BPB publications.2004.

8.John W.Webb, Ronald A.Reis, 'Programmable logic controllers-Principles and Applications', Fifth Edition, Prentice Hall of India.

9.Michel P.Lukas, 'Distributed Control system', van Nostrand Reinhold Co, 1986.

10.Fu K.S, Gonzales et al, 'Robotics-Control, sensing, Vision and Intelligence, McGraw Hill.1987

11.Michel P.Groover, 'Industrial Robots-Technology, Programming and Applications', McGraw Hill.2012.

12. P.Jaganathan " Robotics " lakshmi publication.2012

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

VI semester

2015 - 2016

ELECTIVE THEORY - II -1

BIO MEDICAL INSTRUMENTATION

DIRECTORATE OF TECHNICAL EDUCATION
GOVERNMENT OF TAMILNADU

M-SCHEME

(Implemented from the Academic year 2015 - 2016 onwards)

Course Name : **Diploma in Instrumentation and control Engineering**

Subject code : **34082**

Semester : **VI Semester**

Subject title : **ELECTIVE THEORY - II -1 :BIO MEDICAL INSTRUMENTATION**

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : **15 weeks**

Subject	Instruction		Examination			
			Marks			Duration
	Hrs./ Week	Hrs./ Semester	Internal Assessment	Board Examination	Total	
Bio Medical Instrumentation	**5**	**75**	**25**	**75**	**100**	**3 Hrs**

TOPICS AND ALLOCATION

Unit	Topic	Time (Hrs)
I	Bio-electric signals, electrodes and clinical measurement	13
II	Bio - medical recorders	13
III	Therapeutic instruments	13
IV	Biotelemetry and patient safety	14
V	Modern imaging techniques	12
Vi	Revision, Test	10
	TOTAL	**75**

RATIONALE

Bio medical engineering education is in the growing stage. But every year, there is a tremendous increase in the use of modern medical equipment in the hospital and health care industry therefore it is necessary for every student to understand the functioning of various medical equipments. This subject to enable the students to learn the basic principles of different biomedical instruments vizClinical measurement, Bio - medical recorders, Therapeutic instruments, Biotelemetry and Modern imaging techniques instruments.

Objectives

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

- The generation of Bio-potential and its measurement using various electrodes.
- The measurement of blood pressure.
- The measurement of lung volume.
- The measurement of respiration rate.
- The measurement of body temperature and skin temperature.
- The principles of operations of ECG recorder.
- The principles of operations of EEG recorder.
- The principles of operations of ENG recorder.
- The working principles of audio meter.
- The principles of operations of pacemaker.
- The basic principle of dialysis.
- The basic principle of short wave diathermy.
- The basic principle of ventilators.
- The working principles of telemetry.
- The basic principle of telemedicine.
- To learn about patient safety.
- The various methods of accident prevention.
- The basic principle of various types of lasers.
- The basic principle of CT and MRI scanner.
- The principle of operation of various imaging techniques.

34082 - BIO MEDICAL INSTRUMENTATION
DETAILED SYLLABUS

Units	Name of the topic	Hours
I	**BIO-ELECTRIC SIGNALS AND ELECTRODES** Elementary ideas of cell structure, Bio – potential and their generation – resting and action potential – propagation of action potential. **Electrodes** – Micro – Skin surface – needle electrodes. **CLINICAL MEASUREMENT:** Measurement of Blood pressure (direct, indirect) – blood flow meter (Electro magnetic& ultrasonic blood flow meter) – blood pH measurement - Measurement of Respiration rate – measurement of lung volume – heart rate measurement – Measurement of body and skin temperature - Chromatography, Photometry, Flurometry.	13
II	**BIO - MEDICAL RECORDERS:** Electro cardiograph (ECG) – Lead system – ECG electrodes – ECG amplifiers – ECG recording units – analysis of ECG curves. Nervous system – EEG recorder – 10-20 lead system – recording techniques – EEG wave types – Clinical use of EEG – brain tumour Electro – myograph (EMG) – EMG waves – measurement of conduction velocity – EMG recording techniques – Electro – retinograph (ERG) Audiometer – principle – types – Basics audiometer working	13
III	**THERAPEUTIC INSTRUMENTS:** Cardiac pacemaker – classification – External pace makers – implantable pacemaker – pacing techniques – programmable pacemaker – Cardiac defibrillators – types – AC and DC defibrillators - Heart lung machine with Block diagram. Dialysis – Hemo dialysis – peritoneal dialysis. Endoscopes Endoscopic laser coagulator and applications – physiotherapy equipment – short wave diathermy – micro wave diathermy – ultrasonic therapy unit (block / circuit) – Ventilators – types – modern ventilator block diagram.	13
IV	**BIOTELEMETRY AND PATIENT SAFETY:** Introduction to biotelemetry – physiological – adaptable to biotelemetry – components of a biotelemetry system – application of telemetry – elements of biotelemetry; AM, FM transmitter and receiver – requirements for biotelemetry system – radio telemetry with sub carrier – single channel and multi channel telemetry – Telemedicine; introduction, working, applications. **Patient safety:** Physiological effects of electric current – Micro and macro shock – leakage current – shock hazards from electrical equipment. Methods of Accident Prevention – Grounding – Double Insulation – Protection by low voltage – Ground fault circuit interrupter – Isolation of patient connected parts – Isolated power distribution system. Safety aspects in electro surgical units – burns, high frequency current hazards, Explosion hazards.	14
V	**MODERN IMAGING TECHNIQUES:** LASER beam properties – block diagram – operation of CO2 and NDYag LASER – applications of LASER in medicine. X ray apparatus – block diagram – operation – special techniques in X-ray imaging –	12

	Tomogram – computerized Axial tomography – Ultrasonic imaging techniques – Echo cardiography – Angiography – CT scanner - Magnetic resonance imaging techniques.	

Revision and Test : 10

Text Book:

Dr.M. Arumugam – Biomedical Instrumentation ,Anuradha publications, chennai

(Page no. 1-15, 21-33, 117-136,142-159,164-179, 182-195, 202-209, 212-215, 255 – 256, 274-277, 285-286,

266-268, 293-297, 299- 310, 319-320, 329 – 340, 347-358, 360-367, 374-390, 390-400

Reference Books.

1.Leslie Cromwell –Fred j. Wibell, Erich A.P Feither – Bio medical Instrumentation and measurements, II Edition.

(Page no. 49-64, 63-76, 93-97, 106-149,195-205, 260-276, 296-303, 316 – 339, 363- 383,430-439)

2.Jacobson and Webstar – Medicine and clinical Engineering.

3 .R.S .Khandpur – Hand book of Bio –Medical Instrumentation.

4. Medical Electronics - Kumara doss
5. Introduction to Medical Electronics. B.R. Klin
6. Introduction to Biomedical Instrumentation Mandeep Singh Printice Hall India 2010

DIPLOMA IN INSTRUMENTATION AND CONTROLNGINEERING

III YEAR

M – SCHEME

VI semester

2015 - 2016

ELECTIVE THEORY - II -2

ROBOTICS

DIRECTORATE OF TECHNICAL EDUCATION
GOVERNMENT OF TAMILNADU

M - SCHEME

(To be implemented for the student admitted from the Year 2015-2016 on wards)

Course Name : **Instrumentation and Control Engineering**
Subject Code : **34763**
Semester : **VI**
Subject Title **: ROBOTICS**

TEACHING AND SCHEME OF EXAMINATION:

No of Weeks per Semester: **15 weeks**

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

TOPICS AND ALLOCATION OF HOURS

Sl.No	TOPICS	TIME (Hrs)
1	BASIC CONFIGURATION OF ROBOTICS AND ITS WORKING	14
2	ROBOT CONTROLLER AND SERVO SYSTEMS	14
3	ROBOT MOTION ANALYSIS AND VISION SYSTEM	14
4	ROBOT PROGRAMMING	14
5	ROBOT APPLICATION IN MANUFACTURING	14
6	TEST & REVISION	5
	Total	75

Rationale:

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

Objectives:

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

UNIT	NAME OF THE TOPICS	HOURS
I	**Basic Configuration of Robotics and its Working** Introduction – definition – basic configuration of robotics and its working –robot components – manipulator, end effectors, drive system, controller, sensors –mechanical arm – degrees of freedom – links and joints – construction of links, types of joint – classification of robots – Cartesian, cylindrical, spherical, horizontal articulated (SCARA), vertical articulated – structural characteristics of robots –work envelope and work volume - robot work volumes and comparison – wrist rotations – mechanical transmission, pulleys, belts, gears, harmonic drive – conversion between linear and rotary motion and its devices.	**14**
II	**Robot Controller, Servo Systems** Robot controller – level of controller – open loop and closed loop controller –servo systems –– robot path control – point to point – continuous path control – sensor based path control – controller programming – actuators – dc servo motors – stepper motors – hydraulic and pneumatic drives - feedback devices – potentiometers – optical encoders – dc tachometers.	**14**
III	**Robot Motion Analysis and Vision System** Robot motion analysis – robot kinematics – robot dynamics - end effectors –grippers and tools - gripper design – mechanical gripper – vacuum gripper –magnetic grippers – sensors – transducers – tactile sensors – proximity sensors and range sensors – force and moment sensors and its applications and problems photoelectric sensors – vision system – image processing and analysis – robotic applications – robot operation aids – teach pendent – MDI and computer control	**14**
IV	**Robot Programming** Robot programming – lead through methods and textual robot languages – motion specification - motion interpolation - basic robot languages – generating of robot programming languages – On-Line & Off-Line programming - robot language structure – basic commands – artificial intelligence and robotics.	**14**
V	**Robot Application in Manufacturing** Robot application in manufacturing – material handling –assembly finishing –adopting robots to work station - requisite and non – requisite robot characteristics –stages in selecting robot for individual application – precaution for robot –future of robotics. Economics analysis for robotics – cost data required for the analysis – methods of economic analysis – pay back method – equivalent uniform annual cost method – return on investment method.	**14**

DETAILED SYLLABUS

Text Books:

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

Reference Books:

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

DIPLOMO IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M - SCHEME

2015 - 2016

VI SEMESTER

ELECTIVE THEORY - II -3

EMBEDDED SYSTEMS

CURRICULUM DEVELOPMENT CENTER

M-SCHEME
(Implemented from the Academic year 2015-2016 onwards)

Course Name : Instrumentation and Control Engineering

Subject Code : 34061

Semester : VI Semester

Subject Title : EMBEDDED SYSTEMS

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject	Instruction		Examination			
			Marks			
	Hrs Week	Hrs Semester	Internal Assessment	Board Examination	Total	Duration
Embedded Systems	5	90	25	75	100	3 Hrs

TOPICS AND ALLOCATION:

UNIT	TOPIC	TIME(HRS)
I	ARM processor Architecture	13
II	ARM instruction set and interrupts	13
III	Catch mechanism and Memory Protection and Management unit	13
IV	LPC 2148 ARM processor	12
V	Embedded OS and RTOS	12
	Revision Test	12
	Total	**75**

RATIONALE:

Increasingly, embedded systems developers and system-on-chip

designers select specific microprocessor cores and a family of tools, libraries, and off-the-shelf components to quickly develop embedded system-based products. A major processor in this industry is ARM. Since 1985, the ARM architecture has become the most pervasive 32-bit architecture in the world. ARM processors are embedded in products ranging from cell/mobile phones to automotive Braking systems. A worldwide community of ARM partners and third-party vendors has Developed among semiconductor and product design companies, including hardware engineers, System designers, and software developers. This course has been to describe the operation of the ARM core from a product developer's perspective with a clear emphasis on its architecture by assuming no previous ARM experience.

OBJECTIVES:

On successful completion of the course, the students must be able to

- Distinguish between CISC and RISC architecture
- Understand the ARM design philosophy
- Explain the ARM architecture and the pipeline structure
- Describe the little and big endian methods of representation
- Explain the Instruction sets of ARM processor.
- Understand various operational modes in ARM processor
- List the various exceptions and handling methods
- Develop an assembly level code for basic arithmetic primitive operations
- Understand the cache mechanism and cache policies
- List and explain various cache mechanisms
- Explain the essential of cache memory, write buffers and its policies
- Explain the importance of Lockdown and its method.
- Explain the importance of MPU and MMU
- Understand the functionality of virtual memory.
- Explain the architecture of LPC 2148 ARM processor
- Relate and distinguish between OS and RTOS in their functionality.
- Understand hard time and soft time RTOS.
- Explain multitasking, scheduling, ITC, and synchronization.

- Develop simple application in RTOS.

34061 EMBEDDED SYSTEMS
DETAILED SYLLABUS

UNIT	NAME OF THE TOPIC	HOURS
1	**ARM PROCESSOR ARCHITECTURE** The RISC,CISC and ARM design - Philosophy, Embedded System Hardware - ARM Development tools **ARM PROCESSOR FUNDAMENTALS:** Data Flow model, Registers, modes of operation- Current Program Status Register, Pipeline -Exceptions, Interrupts, and the Vector Table. **ARM** nomenclature and families - Big Endian and Little Endian - ARM development tools.	**13**
2	**ARM INSTRUCTIONS SETS AND INTERRUPTS** ARM and Thumb Instruction Sets, Data Processing Instructions- Branch Instructions, Load-Store Instructions -Software Interrupt Instruction, Program Status Register -Instructions, Conditional Execution, Stack Instructions. **ARM PROCESSOR EXCEPTIONS AND MODES** Vector table, Priorities, link Register offsets -Interrupts, and IRQ / FIQ exceptions interrupt-Stack design and implementation. **SIMPLE PROGRAM:** Addition, Subtraction, Multiplication in assembly language	**13**
3	**CACHE MECHANISM AND MEMORY** Introduction to cache memory- memory hierarchy and Cache memory - Cache architecture and cache policies **CONCEPT OF FLUSHING AND CLEANING CACHE** Flushing and Cleaning ARM cache core. **CONCEPT OF CACHE LOCKDOWN** Locking Code and Data in Cache - Cache and write buffer - Stack and stack pointer - Comparison of cache and stack **MEMORY PROTECTION AND MANAGEMENT UNIT** Introduction to Protection unit, Protected Regions - Demonstration of an MPU system - Components of MPU - Importance of MPU - Memory management unit block diagram - Main components of MMU - Definition of Virtual Memory - Virtual Memory - working principle - Memory size & speed - Importance of MMU	**13**
4	**LPC 2148 ARM CPU** **INTRODUCTION** Architectural overview – Memory mapping – block diagram **SYSTEM CONTROL BLOCK FUNCTIONS** PLL – Power control – Reset – VPB divider – Wakeup Timer - Memory Acceleration module – Timer 0 and Timer 1 - PWM – RTC – On chip ADC – On	**12**

	chip DAC- Interrupts – Vector interrupt controller – General Purpose Input/Output(GPIO) – Universal Asynchronous Receiver/Transmitter - I^2C Interface	
5	**EMBEDDED OS AND RTOS** Fundamentals components to Embedded OS - Simple Little Operating System: Initialization - Memory model, interrupts and exceptions handling - Scheduler, and context switch **INTRODUCTION TO RTOS** Real-time systems concepts, foreground/background systems - Critical sections, resources, multitasking - Context switching, scheduling, re-entrancy - Task priorities, mutual exclusion **SYNCHRONIZATION AND IPC** Introduction to Semaphores and types - Inter process communication: pipes and message box.	**12**
	Revision and Test	**12**

REFERENCE BOOKS:

SL. No	Title	Author	Publisher with Edition
1.	Microprocessor & Microcontroller	B.P.Singa	Reprint-Galgotia Publication Pvt Ltd.,
2.	Real Time Concepts for Embedded System	Qing Li and Caroline Yao	
3.	Embedded Systems-Architecture, Programming and Design	Rajkamal	TMH, 2nd Edition-2008
4.	ARM System Developer's Guide Designing and Optimizing	Andrew N.Sloss	Elsevier publication- 2004
5.	MicroC/OS – II	Jean J. Labrosse	J. Labrosse Publisher- Second Edition
6.	Embedded Systems	B.Kanta Rao	PHI publishers Eastern Economy Edition, 2011-
7.	Embedded/Real Time Systems	Dr. K.V.K.K PRASAD	Curriculum Development Center – DOTE-2009
8.	ARM System- On-Chip Architecture	Steve Furbe	Second Edition

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DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

VI SEMESTER

2015 – 2016 onwards

INDUSTRIAL AUTOMATION PRACTICAL

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTOL ENGINEERING**
Course code : **1042**
Subject code : **34264**
Semester : **VI Semester**
Subject title : **INDUSTRIAL AUTOMATION PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks / Semester: 15

Subject title	Instruction		Examination			
	Hours/ Week	Hours/ semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Industrial Automation practical	5	75	25	75	100	3Hrs

RATIONALE:

As Automation plays the vital role in process industries, manufacturing sectors, it is Essential for an Instrumentation and control engineer to understand the practical aspects Of Automation. In most of the automation process double acting and single acting cylinders plays the role of actuating element. Hence in this subject it is dealt practically.

OBJECTIVES:

- To get practice to operate single and double acting cylinder
- To get practice to operate cylinder from different position using shuttle valve
- To get practice to operate double acting cylinder in multi cycles
- To get practice to operate Hydraulic motor
- To get practice to control the speed of Double acting cylinder, Hydraulic motor
- To get practice to control the DC motor using SCR
- To get practice to measure ratio and efficiency of transformer
- To get practice to operate the single phase and three phase induction motors and obtain their characteristics.

34264 – INDUSTRIAL AUTOMATION PRACTICAL

List of Experiments:

1. Conduct experiment to operate single and double acting cylinder directly.
2. Conduct experiment to Operate single acting cylinder controlled from two different positions using shuttle valve.
3. Conduct experiment to control the speed of Double acting cylinder using metering in and metering out circuit.
4. Conduct experiment to operate double acting cylinder in multi cycles - Using limit switches and memory valves.
5. Conduct Experiment to operate hydraulic motor directly.
6. Conduct experiment to control the Speed of double acting cylinder - using metering in and metering out control.
7. Conduct experiment to control the Speed of hydraulic motor using metering in and metering out control.
8. Conduct experiment to Operate double acting cylinder using solenoid operated Directional control valve.
9. Conduct experiment to control the speed of DC motor using SCR.
10. Conduct experiment to Measure voltage ratio and efficiency of transformer by loading the transformer.
11. Experimentally obtain the Load characteristics of 3-phase induction motor.
12. Experimentally obtain the Load characteristics of 1-phase induction motor.

EQUIPMENTS REQUIRED:

Sr no	Name of the Equipments	Required Nos
1	Pneumatic control Station with accessories	1 no
2	Hydraulic control station with accessories	1no
3	SCR method of speed control of DC motor setup with accessories	1no
4	Load test on single phase transformer setup with accessories	1no
5	Load characteristics of three phase induction motor setup with accessories	1no
6	Load characteristics of single phase induction motor setup with accessories	1no

SCHEME OF EVALUATION		
No.	**Allocation**	**Marks**
1	Circuit diagram	20
2	Connections & procedure	20
3	Tabulation & Graph	20
4	Result	10
5	Viva Voce	5
Total		75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

VI SEMESTER

2015 – 2016 onwards

TEST ENGINEERING PRACTICAL

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implemented from the Academic year 2015-2016 onwards)

Course Name : **Instrumentation and Control Engineering**
Subject code : **34066**
Semester : **VI Semester**
Subject title : **TEST ENGINEERING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : **15 weeks**

Subject	Instruction		Examination			
TEST ENGINEERING PRACTICAL	Hrs/ week	Hrs/ semester	Marks			Duration
			INTERNAL ASSESMENT	BOARD EXAM	TOTAL	
	4	75	25	75	100	3Hrs

Rationale:

A hardware **test engineer** is a professional who determines how to create a process that would best **test** a particular product in manufacturing, quality assurance or related areas, like the RMA department, in order to assure that the product meets applicable specifications. In order to provide practical knowledge in testing to the Diplomo engineers, This subject is introduced.

Objecetives:

- To find short in a PCB
- To test the functionality of Combinational logic circuits
- To test the functionality of Sequential logic circuits
- To test the functionality of memory devices
- To test the open emitter, open collector in Digital circuits
- To test the Inverting, Non inverting amplifier circuits
- To understand the signature method of testing electronic components
- To get practice to obtain V-I signature method of characterization and testing
- To understand the signature method of testing of SCR, MOSFET
- To perform the Boundary scan and Non boundary scan testing of IC using JTAG port
- To perform the device models using device library, Test pattern generation

34066 - TEST ENGINEERING PRACTICAL

List of experiments

1. Locate a Short in a circuit Board using Short Locator.
2. Test and verify the combinational logic circuits NAND, NOR, Half-Adder, Half-Subtractors, Multiplexers, De-multiplexer, Decoder & Encoder using functional test method.
3. Test and verify the Sequential Logic Circuits D-FF, RS-FF, Latch, Counter, Shift Register using functional test method.
4. Test and verify the Memory Devices SDRAM/DRAM Chip . using functional test method.
5. a. Test and verify the digital circuits in a circuit using auto compensation technique.
   .b. Test and verify the open emitter circuit using pull down resistor.
   c. .Test and verify the open collector circuit using pull up resistor.
6. Test the functionality of operational amplifier in Inverting , Non-inverting and voltage follower mode.
7. Test the VI characteristics of R,L,C using signature method.
8. Test the VI characteristics of electronic components Diode, Zener Diode, NPN/PNPTransistor using signature method .
9. Test the VI characteristics of RC Filter, Low Pass Filter , Band Pass Filter using signature method.
10. Test the VI characteristics of electronic components MOSFET and Transistor using Trigger pulse and signature method.
11. Test the VI characteristics of electronic components SCR and Opto coupler using Trigger pulse and signature method.
12. Test RLC circuit using in-circuit measurement method.
13. .Test the Boundary Scan IC using JTAG port and non boundary scan IC using boundary scan IC.
14. Detect and list down the stuck to VCC and stuck to Gnd pins in a boundary scan IC.
15. Develop a device model for NAND and NOR using device library and create a test pattern for testing.

EQUIPMENT REQUIRED:

Sl.No	Name of the Equipments
1	PCB SHORTS LOCATOR TRAINER
2	V-I CHARACTERISTICS TRAINER SYSTEM
3	FUNCTIONAL TESTING TRAINER SYSTEM
4	IN-CIRCUIT MEASUREMENT TRAINER SYSTEM
5	BOUNDARY SCAN TEST TRAINER SYSTEM
6	DIGITAL and ANALOG SIMULATOR

SCHEME OF EVALUATION		
No.	**Allocation**	**Marks**
1	Circuit diagram	20
2	procedure	25
3	Execution and Handling of Equipment	15
4	Output / Result	10
5	Viva Voce	05
Total		75

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING

III YEAR

M – SCHEME

VI SEMESTER

2015 – 2016 onwards

PROGRAMMABLE LOGIC CONTROLLER PRACTICAL

CURRICULAM DEVELOPMENT CENTRE

M-SCHEME
(Implemented from the Academic year 2015-20126onwards)

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Subject code : **34266**
Semester : **VI**
Subject title : **PROGRAMMABLE LOGIC CONTROLLER PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION :

Number of Weeks/ Semester : 15 weeks

Subject Title	Instruction		Examination			
	Hrs. Week	Hrs Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Programmable Logic Controller Practical	4	60	25	75	100	3Hrs

RATIONALE:

This subject gives practical exposure for whatever students study in the theory paper. In any industry PLC is extensively used for automation of a process. Hence it is mandatory for the control engineering students to learn practically a PLC to implement automation in a process.

OBJECTIVE:

- To develop ladder logic program for basic functions and implementing in a PLC
- To develop ladder logic using Timers in a PLC
- To develop and implement ladder logic for the timer application
- To develop and implement ladder logic for the counter function in a PLC
- To develop and implement ladder logic using sequencer in a PLC
- To develop and implement ladder logic to control a motor
- To develop and implement ladder logic to control a conveyor belt
- To develop and implement ladder logic to control a lift
- To develop and implement ladder logic to control a water level in a Tank

34266 – Programmable Logic Controller Practical

List of Experiments:

1. Write and implement a Ladder logic program using Latch circuit.
2. Write and implement a Ladder logic program for the Logical functions.
3. Write and implement a Ladder logic program for the On delay and Off delay timer functions.
4. Write and implement a Ladder logic program for the Cyclic On/Off of an output using Timer instructions.
5. Write and implement a Ladder logic program to count an event.
6. Write and implement a Ladder logic program to toggle an output.
7. Write and implement a Ladder logic program for the sequence control of four outputs repetitively.

(The below experiments can be conducted by interfacing PLC with I/O devices)

8. Write and implement a Ladder Logic program for the On/Off Control of a motor.
9. Write and implement a Ladder logic program for the On/Off Level Control.
10. Write and implement a Ladder logic program for Conveyor control.
11. Write and implement a Ladder logic program for Lift control.
12. Write and implement a Ladder Logic program to count the number of students inside a Classroom by placing photoelectric sensor at the entry and exit.

EQUIPMENTS REQUIRED:

Sr No	Name of the Equipments	Required Nos
1	Programmable Logic Controller (PLC) with battery	4 nos
2	PC Pentium Dual Core	4 nos
3	PC to PLC interface cable	4 nos
	Models required for PLC interfacing	
1	On / Off Motor module with provision for PLC	1 no
2	On / Off Level Control System with provision for PLC	1 no
3	Conveyor Control System with provision for PLC	1 no
4	Lift Control System with provision for PLC interface	1 no
5	Photo electric sensor	4 nos

SCHEME OF VALUATION

LADDER LOGIC	20 MARKS
EXECUTION OF PROGRAM	20 MARKS
OBSERVATION & PROCEDURE	20 MARKS
RESULT	10 MARKS
VIVA VOCE	5 MARKS
TOTAL	75 MARKS

M-SCHEME
(Implements from the Academic year 2015-2016 onwards)

Course Name : **DIPLOMA IN INSTRUMENTATION AND CONTROL ENGINEERING**
Course Code : **1042**
Subject Code : **34267**
Semester : **VI**
Subject Title : **Project work**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 15 Weeks

Subject	Instruction		Examination		
	Hours / Week	Hours/ Semester	Assessment Marks		
			Internal	Board Exam	Total
PROJECT WORK	4	60	25	75	100

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

OBJECTIVES:

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

management. Understand and gain knowledge about disaster management

INTERNAL ASSESSMENT:

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

Detail of assessment	Period of	Max. Marks
First Review	6th week	10
Second Review	14th week	10
Attendance	Entire semester	5
Total		**25**

EVALUATION FOR BOARD EXAMINATION:

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

DETAILED SYLLABUS

ENVIRONMENTAL & DISASTER MANAGEMENT

1. ENVIRONMENTAL MANAGEMENT

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

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

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

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

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

2. DISASTER MANAGEMENT

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

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

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

LIST OF QUESTIONS

1. ENVIRONMENTRAL MANAGEMENT

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

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

2. DISASTER MANAGEMENT

1. What is meant by Disaster Management? What are the different stages of Disaster management?

2. Differentiate Natural Disasters and Man made Disasters with examples.
3. Describe the necessity of Risk identification and Assessment Surveys while planning a project.
4. What is Disasters recovery and what does it mean to an Industry?
5. What are the factors to be considered while planning the rebuilding works after a major disaster due to flood / cyclone / earthquake? (Any one may be asked)
6. List out the public emergency services available in the state, which could be approached for help during a natural disaster.
7. Specify the role played by an Engineer in the process of Disaster management.
8. What is the cause for Earthquakes? How they are measured? Which parts of India are more vulnerable for frequent earthquakes?
9. What was the cause for the Tsunami 2004 which inflicted heavy loss to life and property along the coast of Tamilnadu ? Specify its epicenter and magnitude.
10. Specify the Earthquake Hazard Zones in which the following towns of Tamilnadu lie: (a) Chennai (b) Nagapattinam (c) Coimbatore (d) Madurai (e) Salem.
11. Which parts of India are experiencing frequent natural calamities such as (a) heavy rain fall (b) huge losses due to floods (c) severe cyclones
12. Define basic wind speed. What will be the peak wind speed in (a) Very high damage risk zone – A, (b) High damage risk zone, (c) Low damage risk zone.
13. Specify the minimum distance from the Sea shore and minimum height above the mean sea level, desirable for the location of buildings.
14. Explain how the topography of the site plays a role in the disasters caused by floods and cyclones.
15. Explain how the shape and orientation of buildings could reduce the damages due to cyclones.
16. What is a cyclone shelter ? When and where it is provided ? What are its requirements ?
17. What Precautionary measures have to be taken by the authorities before opening a dam for discharging the excess water into a canal/river ?
18. What are the causes for fire accidents ? Specify the remedial measures to be taken in buildings to avoid fire accidents.
19. What is a fire escape in multistoried buildings ? What are its requirements ?
20. How the imamates of a multistory building are to be evacuted in the event of a fire/Chemical spill/Toxic Air Situation/ Terrorist attack, (any one may be asked).
21. Describe different fire fighting arrangements to be provided in an Industry.
22. Explain the necessity of disaster warning systems in Industries.
23. Explain how rescue operations have to be carried out in the case of collapse of buildings due to earthquake / blast / Cyclone / flood.
24. What are the necessary steps to be taken to avoid dangerous epidemics after a flood disaster?
25. What relief works that have to be carried out to save the lives of workers when the factory area is suddenly affected by a dangerous gas leak / sudden flooding ?
26. What are the difficulties faced by an Industry when there is a sudden power failure? How such a situation could be managed?

27. What are the difficulties faced by the Management when there is a group clash between the workers? How such a situation could be managed?
28. What will be the problems faced by the management of an Industry when a worker dies because of the failure of a mechanical device due to poor maintenance? How to manage such a situation ?
29. What precautionary measures have to be taken to avoid accidents to labourers in the Industry in a workshop / during handling of dangerous Chemicals / during construction of buildings / during the building maintenance works.
30. Explain the necessity of medical care facilities in an Industry / Project site.
31. Explain the necessity of proper training to the employees of Industries dealing with hazardous products, to act during disasters.
32. What type of disaster is expected in coal mines, cotton mills, Oil refineries, ship yards and gas plants?
33. What is meant by Emergency Plan Rehearsal? What are the advantages of such Rehearsals?
34. What action you will take when your employees could not reach the factory site because of continuous strike by Public Transport workers?
35. What immediate actions you will initiate when the quarters of your factory workers are suddenly flooded due to the breach in a nearly lake / dam, during heavy rain?
36. What steps you will take to avoid a break down when the workers union of your Industry have given a strike notice?
37. List out few possible crisis in an organization caused by its workers? What could be the part of the middle level officials in managing such crisis?
38. What types of warning systems are available to alert the people in the case of predicted disasters, such as floods, cyclone etc.
39. Explain the necessity of Team work in the crisis management in an Industry / Local body.
40. What factors are to be considered while fixing compensation to the workers in the case of severe accidents causing disability / death to them?
41. Explain the legal / financial problems the management has to face if safely measures taken by them are found to be in adequate.
42. Describe the importance of insurance to men and machinery of an Industry dealing with dangerous jobs.
43. What precautions have to be taken while storing explosives in a match/ fire crackers factory?
44. What are the arrangements required for emergency rescue works in the case of Atomic Power Plants?
45. Why residential quarters are not constructed nearer to Atomic Power Plants?

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M SCHEME EQUIVALENT ALTERNATE PAPERS

III SEMESTER W.E.F. OCT '16

L SCHEME		M SCHMEME	
Subject code	**Subject Name**	**Subject code**	**Subject Name**
24031	Electronic devices & Circuits#	34031	Electronic devices & Circuits#
24232	Electrical Circuits & Machines	34232	Electrical Circuits & Machines
24233	Basics of Instrumentation	34233	Basics of Instrumentation
24234	Electrical & Electronics Practical	34234	Electrical & Electronics Practical
24235	Basics of Instrumentation Practical	34235	Basics of Instrumentation Practical
25236	'C' Programming Practical	35236	'C' Programming Practical
20001	Computer Application Practical	30001	Computer Application Practical

 # - Common with ECE

IV SEMESTER W.E.F. APR '17

L SCHEME			
Subject code	**Subject Name**		**Subject Name**
24241	Analog and Digital Electronics	34241	Analog and Digital Electronics
24242	Measurements and Instruments	34242	Measurements and Instruments
24243	Measurement of Process Variables	34243	Measurement of Process Variables
24244	Industrial Instrumentation	34244	Industrial Instrumentation
24245	Analog and Digital Electronic Practical	34245	Analog and Digital Electronic Practical
24246	Measurement of Process variables Practical	34246	Measurement of Process variables Practical
20002	Communication and Life skill practical *	30002	Life and Employability Skill Practical *

V SEMESTER W.E.F. OCT '17

L SCHEME		M SCHEME	
Sub. code	**Name of the subject**	**Sub. code**	**Name of the subject**
24251	Process Control Instrumentation	34251	Process Control Instrumentation
24052	Microcontroller #	34052	Microcontroller #
24253	Control Engineering	34253	Control Engineering
Elective - 1			
24271	Instrumentation system Design	34271	Instrumentation System Design
24272	Embedded systems	34061	Embedded systems
24273	Industrial Power Electronics	34273	Industrial Power Electronics
24255	Process control Instrumentation Practical	34255	Process Control Instrumentation Practical
24056	Microcontroller Practical #	34056	Microcontroller Practical #
24257	LABVIEW & MATLAB practical	34257	LABVIEW &MATLAB practical

VISEMESTER W.E.F. APR '18

L SCHEME		M SCHEME	
Sub. code	**Name of the subject**	**Sub. code**	**Name of the subject**
24261	Industrial Process Control Instrumentation		No Alternate paper
24262	Industrial Automation and Drives	34262	Industrial Automation and Drives
24253	Control Engineering	34253	Control Engineering
Elective - 2			
24281	Biomedical Engineering	34081	Bio-Medical Instrumentation
24763	Robotics and Auto Electronics $	34763	Robotics $
24283	Mechatronics $		No Alternate Paper
24264	Industrial Automation Practical	34264	Industrial Automation Practical
24265	P&I Drawing using CAD practical		No Alternate Paper
24266	Programmable Logic Controller practical	34266	Programmable Logic Controller practical
24267	Project work	34267	Project work